this regard is likely to be limited by a degree of disturbance caused by subsequent activities on the site. Such evidence would have Moderate archaeological significance.

Archaeological investigation of relics associated with the operation of the trams on Bennelong Point would have limited potential to yield information relating to the development of Sydney's public transport system. Such evidence would have Low archaeological significance.

3.6 Endnotes

1 James Semple Kerr 2003 (third edition), Sydney Opera House—A Plan for the Conservation of the Sydney Opera House and its Site. Sydney Opera House Trust.

2 *NSW Heritage Manual*, 1996, NSW Heritage Office and NSW Department of Urban Affairs and Planning, Sydney; and *Assessing Heritage Significance* (a *NSW Heritage Manual* update), 2001, NSW Heritage Office.

3 Bickford, A and S Sullivan 1984, 'Assessing the Research Significance of Historic Sites', in Sullivan S and S Bowdler (eds) *Site Surveys and Significance Assessment in Australian Archaeology* (proceedings of the 1981 Springwood Conference on Australian Prehistory), Department of Prehistory, Research School of Pacific Studies, the Australian National University, Canberra.

4 Bickford and Sullivan, op cit, pp 23–24.

5 Kerr, p 32.

6 Sydney Water S170 Heritage Register Item Report—Bennelong SWC No. 29.

7 op cit, Kerr 2003, pp 34–35.

8 op cit, Sydney Water S170 Register.

9 op cit, Sydney Water S170 Register.

4.0 Assessment of Heritage and Archaeological Impacts

4.1 Proposed Works

The proposed works within the Sydney Opera House forecourt area include diversion of the major stormwater channel that runs along Bennelong Point (Bennelong Stormwater Channel No. 29) (see Figures 4.1–4.3).

The proposed junction of the original oviform channel and the new diversion would be located approximately 5m to the north of the Tarpeian Way cliff face. The new diversion would be concrete box culvert construction, 1.5m wide by 1.5m high at the junction point, increasing to 2.4m wide by 1.8m high along the majority of the diversion route. The diversion would generally follow the alignment of the Tarpeian Way cliff face and curve around the major exhaust air shaft for the Bennelong Point Parking Station that is located in the forecourt area.

An area of approximately 8m by 8m would need to be excavated around the area of the proposed new junction to construct and install the required infrastructure. Excavation would also be required along the route of the proposed diversion.

The proposed diversion of the stormwater channel would discharge into Sydney Harbour immediately to the south of the Man O' War jetty. This new discharge point would require construction of a new outlet through the seawall (1.8m high by 2.4m wide). Part of the existing fabric of the seawall would need to be removed for this outlet. The outlet would be located as low as possible in the wall while still allowing for effective water flow. The outlet would be rectangular and left open.

An 8m section of the original Bennelong drain would be removed to allow the construction of the junction between Bennelong drain and the new section. The remaining existing oviform drain would be left in situ and would be unaffected by this project.

4.2 Evaluation of Impacts

4.2.1 Extent of Proposed Excavation

The proposed works would require bulk excavation in the area of the proposed new junction for the Bennelong stormwater channel. The area of excavation is expected to be approximately 8m by 8m wide and at least 4.4m deep. Any archaeological remains that are located in the area of proposed excavation and some sections of the Bennelong stormwater channel (original oviform channel and later diversion) would need to be removed.

The proposed works would also require excavation along the proposed route of the stormwater channel's new diversion, within an easement up to 3.2m wide and up to 3.8m deep.

It is understood that the extent of proposed excavation would be limited to these areas. No potential archaeological evidence beyond these areas would be affected as part of the current program of proposed works.

The proposed works assessed in this report would have no impact on Sydney Opera House itself, or the adjacent Tarpeian Way cliff face, other than temporary visual impacts for the duration of the on-site works.

The proposed works traverse a small part of the north-western section of Lot 6: DP775888. The proposed works will therefore require temporary excavation of this small part of the Royal Botanic Gardens. However, there will be no physical impact on the QEII Gate at the entrance of the Royal Botanic Gardens nor on the Royal Botanic Gardens themselves east of the QEII Gate. The heritage impacts therefore amount to temporary disruption of the visual setting in this part of the Royal Botanic Gardens, removal of subsurface material (which is dealt with elsewhere in this report) and the visibility of the storm water drain outlet, in limited oblique views from the vicinity of the Man O' War Jetty towards the Royal Botanic Gardens. None of these impacts affect the state heritage values of the Royal Botanic Gardens or the QEII Gate.

4.2.2 Potential Archaeological Impacts

The areas of proposed excavation are shown in Figure 4.4 in relation to potential archaeological remains that may be located in these areas. Potential archaeological remains that may be affected by the proposed excavation works include:

Phase	Potential Archaeological Remains	Date	Significance	Potential Impacts
—	Aboriginal evidence	Pre-1788–1802	High	Potential partial disturbance along proposed diversion route
1–2	Deposits associated with the original shorelines (eastern and western sides of Bennelong Point) and original land form	1788–1802	High	Potential partial disturbance along proposed diversion route
1–2	Evidence associated with incidental activities in this area, such as artefact scatters/rubbish dumps	1788–1802	High	Potential partial disturbance along proposed diversion route
1–5	Rubbish dumps into water—Concentrations of artefacts within areas of reclaimed land, beneath introduced fill deposits	1788–1960s	Moderate–High	Potential partial disturbance along proposed diversion route
3	Structural remains and deposits associated with unknown rectangular feature shown on plan adjacent to eastern shoreline	By 1829	High	No proposed disturbance
3–4	Stone foundations and deposits and other features associated with the southeastern section of the Fort Macquarie battery	1817–1901	High	No proposed disturbance
4–5	Structural remains, deposits and other infrastructure associated with boat harbour/slip in southeastern section of Bennelong Point	By 1845 to 1960s	Moderate	No proposed disturbance
4–5	Structural remains and other infrastructure associated with wharves along western shoreline	By 1860s to 1960s (rebuilt/ upgraded 1889)	Moderate	No proposed disturbance
5	Tram tracks, deposits and other infrastructure associated with tram-car house	1901–1950s	Low	No proposed disturbance

The potential archaeological remains within the forecourt area, while generally assessed as being limited in extent or intactness, have also been assessed as having Moderate or High significance for their historical associations as well as their potential to address research questions regarding the nature and extent of the early settlement and development of this part of Sydney and its changing landforms.

The proposed works would have relatively minor and localised physical impacts on the site's archaeological remains. The proposed excavation along the new route of the Bennelong stormwater channel diversion would have relatively minor archaeological impacts, limited to potential evidence of the early shoreline and landform and any incidental (unrecorded) remains in this area of the site.

4.2.3 Potential Impacts to Bennelong Stormwater Channel

The proposed works would require removal of up to 8m of fabric of the original oviform drain of the Bennelong stormwater channel, constructed in 1856. These works may also require removal of some of the decommissioned section of the original channel located to the north of the 1960s–1970s junction point. The proposed works would also require the construction of a new junction point connected to the oviform drain as part of the proposed diversion.

The proposed works would also require removal of up to 50m of fabric of the channel's diversion constructed in association with the development of Sydney Opera House in the 1960s–1970s (concrete box culvert construction).

The channel has been identified as an item of high historical and technical significance at a Local level. The significance of the channel is partly related to its degree of intactness relative to similar infrastructure that was constructed during the same period. However, the section of the channel that extends along Bennelong Point was substantially modified in association with the construction of Sydney Opera House.

The area of proposed disturbance and removal of fabric is adjacent to a section of the channel that has been subject to substantial modification and diversion. The proposed diversion of the channel would have a major impact on the channel's historic fabric but would allow the original stormwater system to continue to function effectively, albeit partly modified.

The significance of the stormwater channel is also partly related to its relationship with cultural and historical structures. The proposed diversion would maintain the relationship of the channel to Sydney Opera House through the location of the proposed diversion.

4.2.4 Potential Impacts to Seawall

The proposed works would require removal of some fabric of the eastern seawall to allow construction of a new outlet for the proposed Bennelong stormwater channel diversion.

This section of the seawall may be original (that is, constructed in the 1860s) or at least pre-date the Sydney Opera House development. For the purposes of this report, and without further evidence at this stage to confirm the date of construction, it has been assumed that this section of the seawall may have been constructed in the 1860s and may represent one of the earlier surviving sections of the seawall surrounding Bennelong Point. On that basis, this section of seawall may therefore include significant historic fabric and have some historical significance itself associated with early

phases of land reclamation of Bennelong Point. It also contributes to the setting of Sydney Opera House.

The proposed construction of a new stormwater outlet through the existing outer sandstone seawall would therefore cause minor impact to potentially significant historical fabric.

4.2.5 Potential Impacts to Sydney Opera House

The proposed works would have no physical impact on Sydney Opera House. The potential visual impacts of the proposed works on this heritage item are discussed below in Section 4.2.7.

4.2.6 Potential Impacts to Man O'War Steps

The proposed works would have no physical impact on the Man O'War Steps, which are located adjacent to but wholly outside of the area of proposed works. The potential visual impacts of the proposed works on this heritage item are discussed below in Section 4.2.7.

4.2.7 Potential Visual Impacts

The majority of the proposed outlet in the seawall would be visible above the Mean Sea Level (MSL), which may have a minor visual impact on the setting of Sydney Opera House. Figures 4.5–4.8 show photomontages of the proposed outlet in the seawall from various viewpoints. The outlet would be visible in some views to Sydney Opera House from the Royal Botanic Gardens, in views from the Man O'War Steps towards the Tarpeian Precinct, as well as incidental views looking west from vessels in Farm Cove. While the outlet may be visible from some locations along the Farm Cove seawall, it would generally not be visible from the Royal Botanic Gardens given the curve of the seawall and the distance of most viewpoints.

There are a number of existing smaller outlets along the seawall but the proposed outlet is much larger than any of the existing outlets and would be more visually prominent. However, as the photomontages show, the proposed outlet would have only a minor visual impact on views towards Sydney Opera House, and to and from adjacent heritage items (Man O'War Steps and the Royal Botanic Gardens). The impact of the outlet on distant views across Farm Cove would be negligible and the proposed outlet would have no impact on views from Sydney Opera House.

There are likely to be temporary visual impacts to and from Sydney Opera House, to and from the Man O'War Steps, and to and from the Royal Botanic Gardens associated with the excavation and construction works for the duration of the proposed works program.

4.3 Recommended Mitigative Strategy

4.3.1 Potential Archaeological Impacts

The significance of the site's potential archaeological resources is primarily derived from their research potential. Therefore, the adverse impacts associated with the proposed works could be mitigated by appropriate archaeological investigation and recording in association with the proposed site works to ensure that the research potential of the site is fully realised. The proposed investigation methodology and research framework is discussed in more detail in Section 5.0.

The potential evidence in this area of the site would be unlikely to warrant in-situ retention. The proposed mitigative strategy does not include retention of any elements within the area of proposed investigation.

4.3.2 Potential Impacts to Bennelong Stormwater Channel

The removal or disturbance of any sections of the original oviform channel (currently functioning or previously decommissioned) should be minimised wherever possible.

Any sections of the channel that are to be removed should be photographed in situ prior to removal (including sections of the original oviform drain and later diversions).

Any exposed sections of the original oviform channel that would not be removed should be protected during excavation works, as well as in association with construction of the new diversion junction.

Removal of any sections of the original oviform channel would be undertaken in consultation with Sydney Water.

Sydney Water would be consulted in relation to any preservation requirements, including the retention and storage of any fabric or artefacts recovered from the Sydney Water asset.

4.3.3 Potential Impacts on Seawall

All works to the seawall should retain and respect the existing material and configuration as much as possible. The amount of sandstone removed for the construction of the outlet should be minimised as much as possible. Removal of this material should be undertaken in a manner that does not disturb, damage or destabilise the surrounding fabric.

4.3.4 Potential Visual Impacts

The proposed outlet would be located as low as possible in the seawall to minimise the amount of the opening that is visible above MSL while still allowing the outlet to function effectively. This would be based on hydrological and engineering requirements.

In order to minimise the visibility of the outlet and to provide for coherence with the surrounding seawall, the treatment of the outlet should be in accordance with recommendations provided by Design 5 Architects (see Appendix A), as follows:

- The drain should be lined with coursed stonework to match the surrounding seawall fabric to a depth of approximately 1.5m from the outside face.
- The external corners should be properly bonded between face and drain returns.
- The lintel over the opening should be finished as a flat solid stone lintel, or a shallow arch in stone.
- The stonework should be configured and built in such a way that prevents erosion of the fill or other fabric behind the stone, and minimises ingress of water beyond the wall.

Where feasible, any sandstone that is removed from the seawall should be reused to line the new drain outlet.

The hydrology/drainage report prepared for this project by GHD identifies that there is some potential for sediment deposition to occur in the water near the outlet. This may result in some impact to views to Sydney Opera House from the Royal Botanic Gardens, and views from the Man O'War Steps towards the Tarpeian Precinct, depending on the nature and amount of sediment and other debris that may be discharged from the stormwater drain. However, this impact is likely to be

minor and variable, depending on environmental conditions. It is likely to be equivalent to the sedimentation and debris that accumulates immediately to the north of the junction between the seawall and the Man O'War Steps.

Management of the construction site should be such that temporary visual impacts for the duration of the proposed works are minimised, including appropriate hoardings that contain all aspects of the proposed excavation and construction. Hoardings should be solid, clean, and well constructed. Movement of vehicles, equipment and construction personnel across the forecourt area should also be controlled to minimise physical and visual disruption to open public areas.

4.3.5 Interpretation

Interpretation of any exposed archaeological features and the contribution of this evidence to archaeological research may also mitigate any adverse archaeological impacts. Any such interpretation should be part of a holistic approach to the interpretation of the site and consistent with requirements and restrictions identified in the Sydney Opera House Management Plan and Signage Manual. Potential archaeological evidence that may be of particular interest would include:

- remains of Fort Macquarie, associated with a major period in the historical development of Bennelong Point; and
- any evidence of Aboriginal use or occupation of the site, including any isolated artefacts that may be discovered during site works.

4.4 Compliance with 2003 Conservation Plan

The 2003 Conservation Plan includes policies that guide the protection of the design principles and heritage significance of the Sydney Opera House site. The policies that are relevant to the current proposal are addressed below.

Views and Vistas

Policy 2.1 All agencies of government and local government involved in planning the continued development of Bennelong Point and nearby peninsulas and bays should give consideration to the creation, retention and recovery of views and vistas to and from the Opera House when considering proposals. These objectives should be progressively incorporated into any relevant development strategies.

The proposed works would not result in any significant visual impacts that would affect the setting of Sydney Opera House or views to and from it and would not include the introduction of any elements that would obstruct or obscure existing views to and from it. The proposal is therefore consistent with Policy 2.1.

The Sea Walling, Broadwalk Skirting and Supports

Policy 14.1 The remains of the early sea walling should only be removed where it becomes necessary for the stability of the broadwalk or associated structures above.

This policy is largely focused on the cladding panels that surround most of Bennelong Point and which were constructed as part of the Sydney Opera House development. The section of seawall that would be affected by the proposed works is constructed of dressed sandstone blocks and located to the south of the precast skirting panels. The proposed works to the sandstone seawall are therefore not inconsistent with this policy.

Excavation

Policy 53.1 Work involving excavation or investigation of sub surface objects, should be planned and executed in accordance with the requirements of the Heritage Act 1977 and advice of the NSW Heritage Office.

This report has been prepared as supporting documentation for an application to the Heritage Branch, Department of Planning (formerly the NSW Heritage Office) to ensure that the potential archaeological impacts of the proposed excavation works are appropriately managed. This process of assessment and approval is consistent with the requirements of Policy 53.1 of the Conservation Plan.

4.5 Compliance with 2005 Management Plan

This report has been prepared to address the heritage impacts of the proposed works in relation to the requirements of the Sydney Opera House Management Plan and to provide supporting documentation for the required statutory approvals. This report is consistent with the objectives of the Management Plan.

This report concludes that the proposed works do not include any activities that would have a significant adverse impact on the National and World Heritage values of Sydney Opera House.

This report also recommends that any approval for the proposed works be conditioned so as to protect the National and World Heritage values of Sydney Opera House. These conditions should be appropriately monitored and enforced.

The conclusions and recommendations of this report are consistent with the objectives of the 2005 Management Plan.

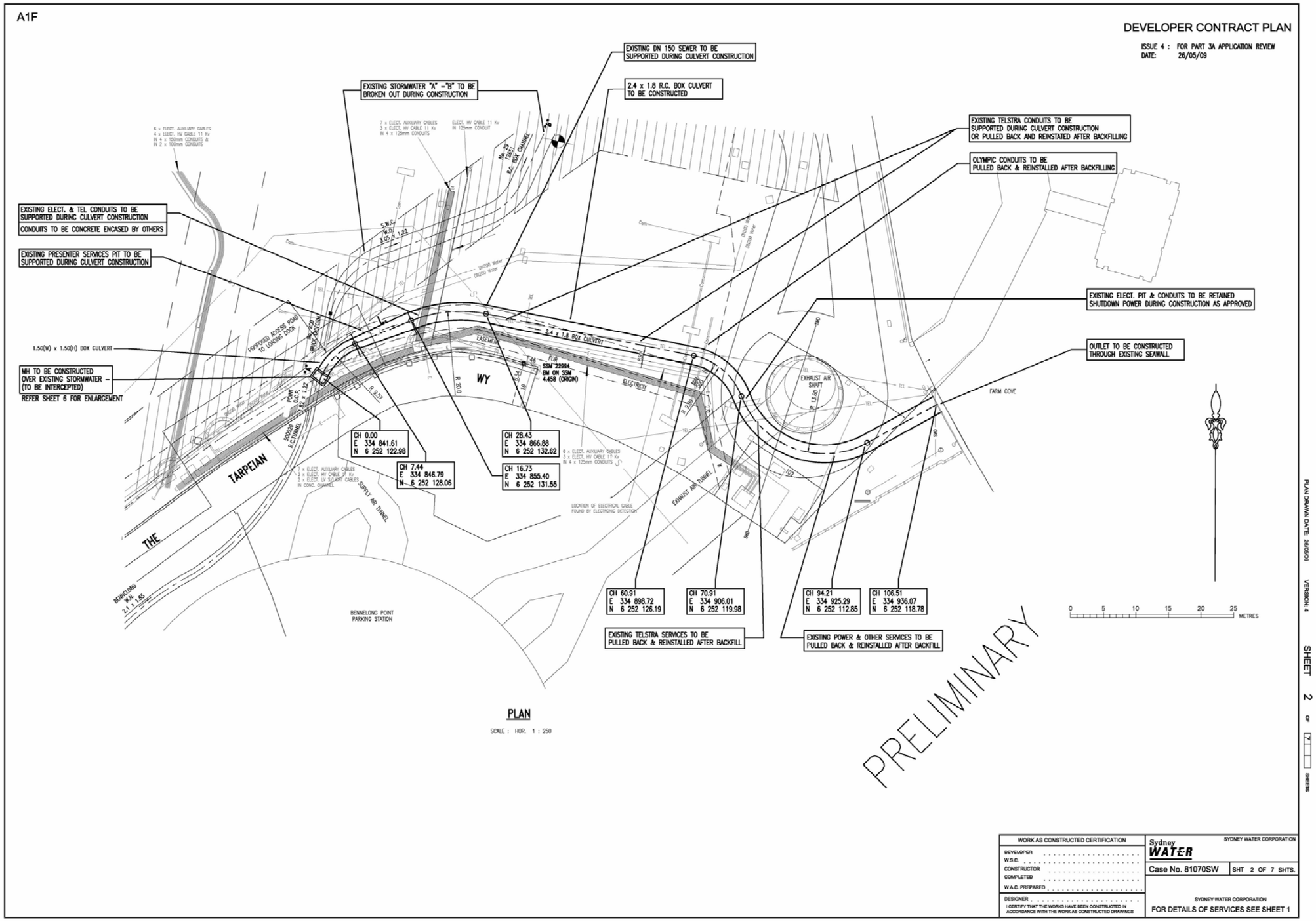

Figure 4.1 Plan of the Sydney Opera House forecourt showing details of proposed works. The study area of this report is outlined. This plan also indicates the location of underground services across this area. (The 'proposed access road to loading dock' also shown on this plan is not the subject of this report.)

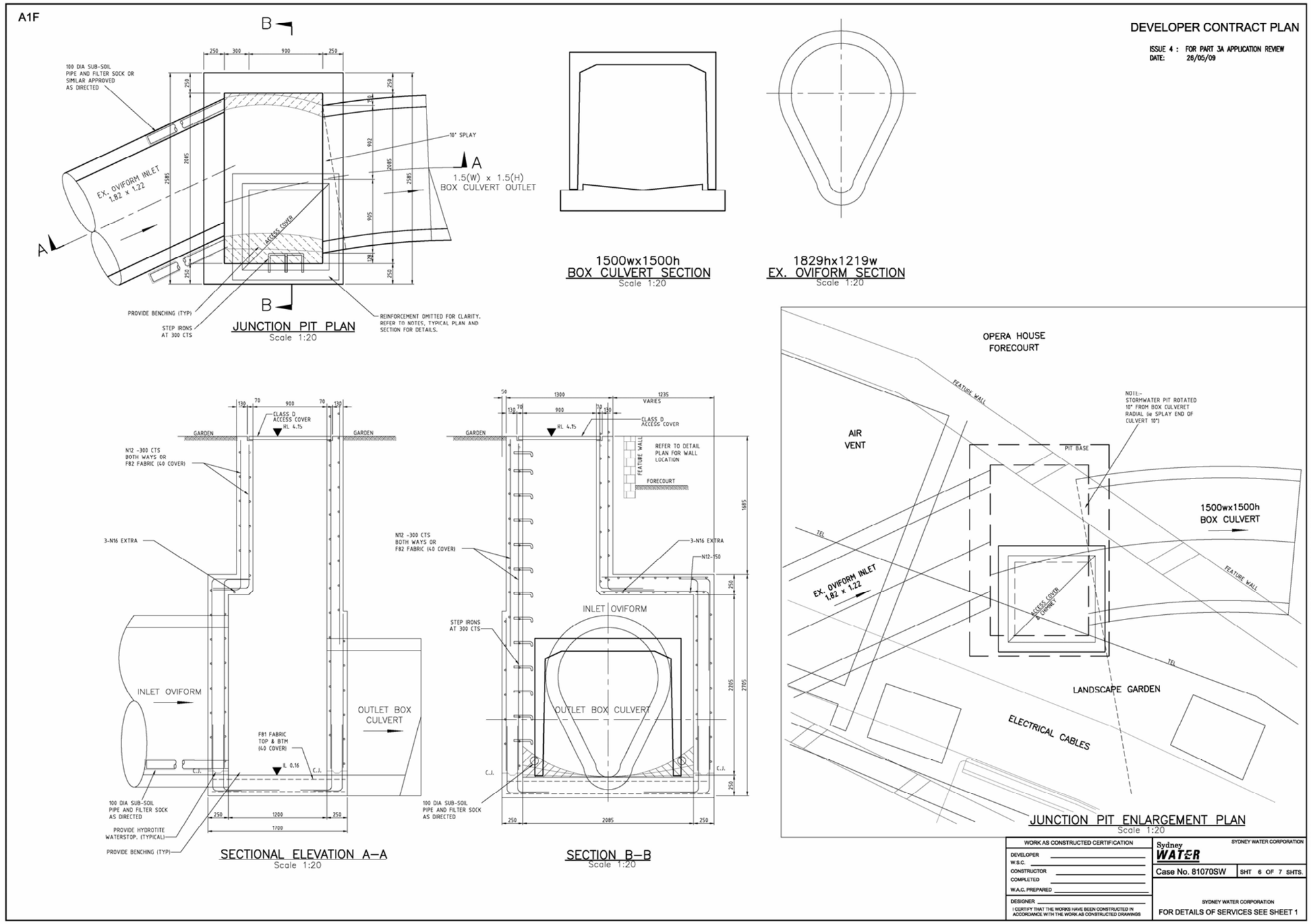

Figure 4.2 Drawings of the proposed diversion of the Bennelong stormwater channel, including details of the new junction pit.

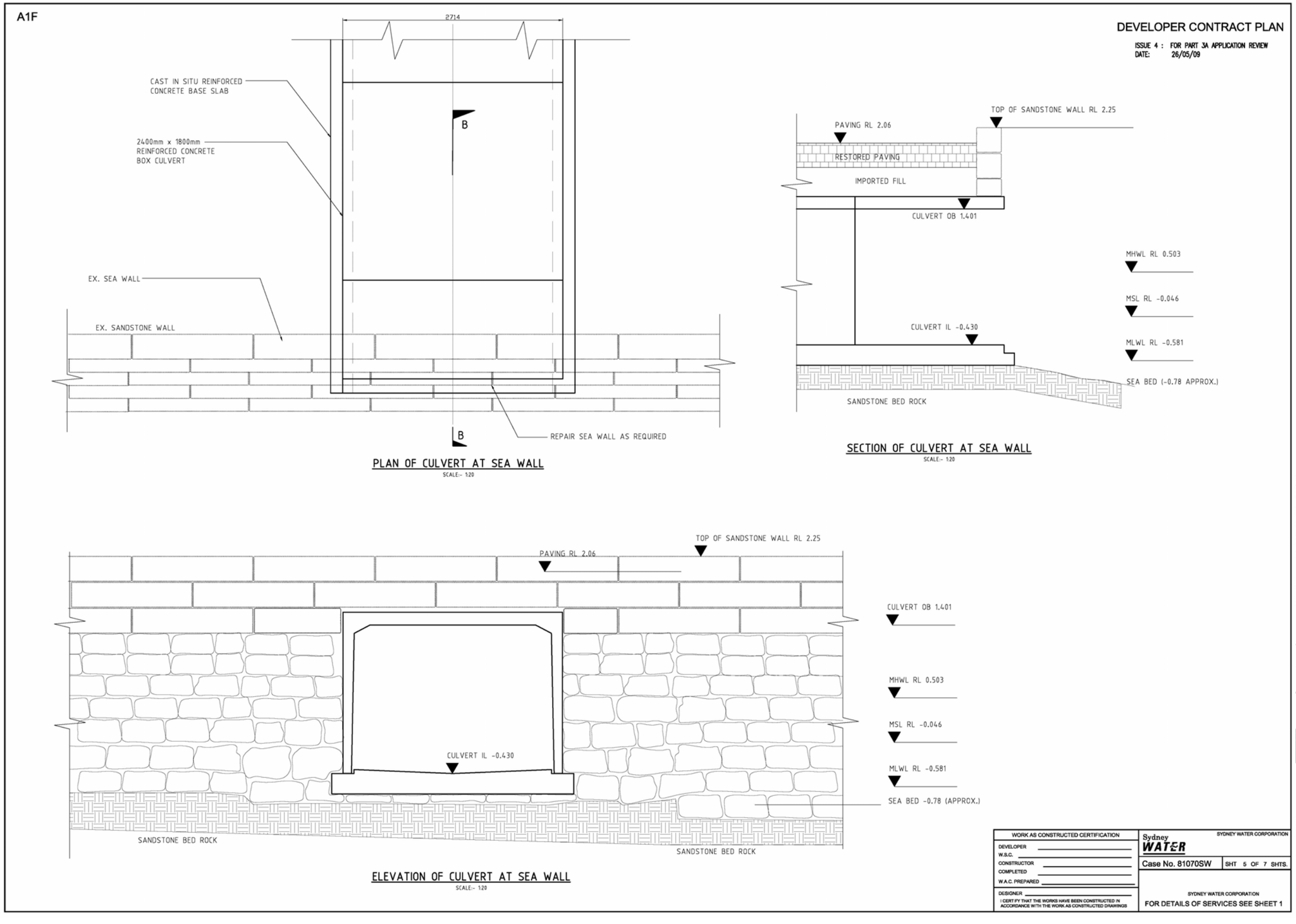

Figure 4.3 Drawings showing the proposed outlet for the Bennelong stormwater channel diversion through the eastern seawall.

Figure 4.4 Plan summarising potential archaeological impacts of the proposed works, showing areas of archaeological potential in relation to areas of proposed excavation.

Figure 4.5 Photomontage looking south from Man O'War jetty towards the proposed drain outlet in the seawall, at low tide.

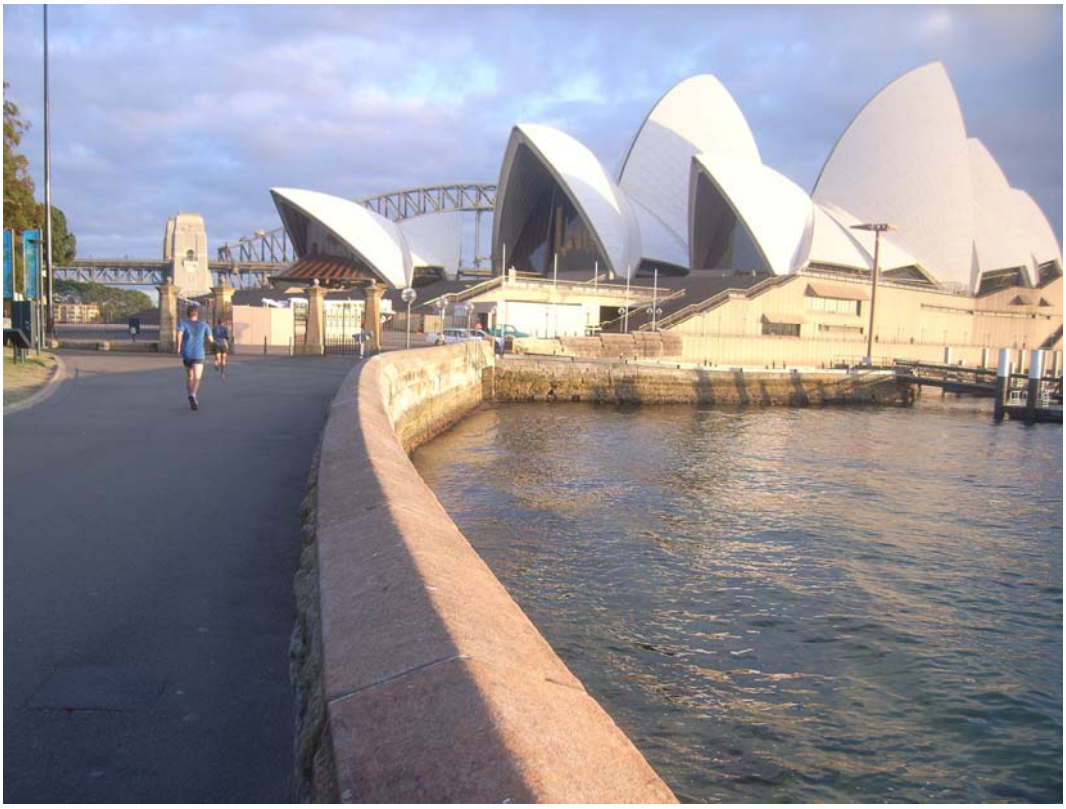

Figure 4.6 Photomontage looking west from the Farm Cove seawall towards the proposed drain outlet, at low tide. Given the curve of the seawall, the proposed drain outlet would be hardly visible from this location.

Figure 4.7 Photomontage looking west from the Farm Cove seawall (further east than Figure 4.6) towards the proposed drain outlet. Given the curve of the seawall and the distance of this viewpoint, the proposed drain outlet would be hardly visible from this location.

Figure 4.8 Photomontage looking west from the eastern side of Farm Cove towards the proposed drain outlet, which would be hardly visible from this distant location.

5.0 Archaeological Management Plan

5.1 Preamble

This section of the report provides an Archaeological Research Design and a proposed investigation and recording strategy to mitigate the impact of the proposed works on the site's potential archaeological resources. This investigation would be undertaken in accordance with a research framework that would guide the information to be recovered from the site during the proposed investigation. This Archaeological Research Design recommends a program of archaeological monitoring in conjunction with proposed excavation works to ensure that any exposed archaeological remains are investigated and recorded prior to their removal. Given the relatively limited potential of the site to contain extensive and intact archaeological remains associated with significant phases of the site's history, as well as the relatively limited extent of archaeological impacts, this approach is considered appropriate to realise the site's research potential, while responding to the nature and extent of the proposed excavation works.

The proposed works would require the disturbance of archaeological relics that are protected under the *Heritage Act 1977* (NSW). This Archaeological Research Design has been prepared as accompanying documentation for an application to the Heritage Council of NSW for approval to disturb or remove these remains in association with the proposed site works. This section includes a research framework and excavation methodology to guide the proposed investigation of the site to ensure that its archaeological remains are appropriately managed throughout the investigation.

5.2 Research Framework

5.2.1 Thematic Research Framework

The proposed archaeological investigation of the site should consider physical evidence associated with the historical development and occupation of Bennelong Point and its surrounds within a broad thematic context. New South Wales Historical Themes have been compiled by the Heritage Council of NSW to assist heritage practitioners (among others) to understand heritage places within a broader research framework, beyond the site itself.

The NSW Historical Themes that are potentially relevant to the study area include:

- Environment—cultural landscape—Activities associated with the interactions between humans, human societies and the shaping of their physical surroundings.
- Defence—Activities associated with defending places from hostile takeover and occupation.
- Industry—Activities associated with the manufacture, production and distribution of goods.
- Transport—Activities associated with the moving of people and goods from one place to another, and systems for the provision of such movements.

5.2.2 Broad Research Framework

One of the main objectives of any archaeological investigation is to recover information from the site that is not available through any other sources. The types of questions that might be asked of the site include:

- What physical evidence of former activities survives on the site?
- What is the extent of the surviving archaeological evidence?
- What is the nature of extant archaeological features?
- What is the date of the identified elements?
- What can the material culture contribute to our knowledge about this site or other sites?

Any site investigation should be designed to answer these basic questions about the nature and extent of the surviving archaeological resource. While these questions provide a basic archaeological context for the site investigation, more specific questions must be asked to address the research potential of the study area.

5.2.3 Site-specific Research Framework

Investigation of the site may allow a number of specific questions to be addressed. These questions arise from consideration of the available historical documentation of the site's development and occupation, observation of its physical condition and assessment of the specific nature and extent of the archaeological remains that may survive there.

Site-specific research questions that may be addressed through physical investigation of the archaeological resource include:

- What can the fill deposits relating to land reclamation activities tell us about the original and early configurations of the western shore of Bennelong Point? How was the natural landform modified to accommodate development?
- Does the site contain any intact natural or topsoil deposits that may have potential to contain evidence of Aboriginal occupation of the area, either prior to the arrival of Europeans in 1788 or during the early colonial period?
- How does the archaeological evidence of the shoreline relate to historical plans and images of it? Does it shed light on the veracity of well-known historical plans and illustrations?
- Does the site contain any evidence of unrecorded buildings or other site features?
- Do any other deposits or artefacts associated with the use and occupation of Bennelong Point survive? If so, what do they reveal about the site's use and history?
- To what extent did periods of redevelopment and modification of Bennelong Point throughout its history disturb or protect the site's archaeological resources?
- What impact did the construction of Sydney Opera House have on the archaeological potential of the study area?

5.2.4 Other

As with all archaeological investigations, this project provides an opportunity to gather information about site formation and disturbance processes. It is expected that analysis of the taphonomy (site formation processes) and stratigraphic analysis will present some challenges. The report on this

aspect of the project may be a useful reference document for those undertaking subsequent excavations at this site or similar sites.

5.3 Previous Archaeological Works at Sydney Opera House Site

5.3.1 2004 Works

In February 2004 excavation was undertaken on the eastern side of the Sydney Opera House site for a new lift well shaft. The excavation works exposed part of a sandstone wall possibly relating to Fort Macquarie and isolated artefacts dating broadly to the second half of the nineteenth century. These relics were managed as part of an Exemption issued by the (then) NSW Heritage Office.

The exposed relics were recorded by an archaeologist from Godden Mackay Logan. They demonstrate the potential for archaeological relics to survive at the site at relatively shallow levels and in areas previously assumed to have been subject to major disturbance.

5.3.2 2007 Works

In 2007, excavation was undertaken in association with the construction of a new lift and pedestrian access corridor as part of the Sydney Opera House Western Foyer Upgrade project. These works involved mechanical excavation from the surface into deposits underlying the western boardwalk and were undertaken in accordance with an Exemption issued by the NSW Heritage Council pursuant to Section 57(2) of the *Heritage Act 1977* (NSW).

As part of the 2007 works, it was believed that it would be necessary to construct a 'coffer dam' that would disturb or destroy an approximately 10.5m stretch of a seawall dating to c1894, running approximately north–south along the eastern side of Circular Quay (to the west of Sydney Opera House). It was proposed to undertake appropriate archaeological excavation and documentation of the wall prior to any disturbance, and to reconstruct the wall in its original position on completion of the works. However, during the course of the works, it was possible to introduce sheet piling along the inside (eastern) face of the wall, instead of the anticipated coffer, without causing damage or disturbance to the seawall itself.

5.3.3 2008 Works

In September 2008, Godden Mackay Logan prepared an Archaeological Assessment and Heritage Impact Statement for proposed works associated with the Sydney Opera House Sea Water Intake Pump Room. It is understood that the proposed works have not yet been undertaken.

5.4 Proposed Archaeological Investigation Methodology

A program of archaeological monitoring and recording in conjunction with the proposed excavation works is recommended in order to mitigate the proposed impacts to the site's potential archaeological resources and to adequately realise the site's archaeological research potential. Archaeological monitoring refers to the observance by an archaeologist of excavation works undertaken by mechanical excavator within areas assessed as having archaeological potential. The objective of archaeological monitoring is to determine the nature and extent of surviving features and/or deposits, to identify and record these features and/or deposits and/or to determine whether further investigation, if any, may be warranted.

An Excavation Director would be appointed as the primary archaeologist who would direct the nature and extent of specific investigation and recording on site, in response to site conditions. The

Excavation Director would also be the key contact for the client and/or project manager of the proposed site works. The Excavation Director would be assisted by other archaeologists on site, as required by the needs of the project. It may also be appropriate for a representative of the Metropolitan Local Aboriginal Land Council (MLALC) to participate in the archaeological monitoring program. (An invitation to participate should be made once the proposed works are approved and the timeframe is known.)

The archaeologist(s) on site would require authority to halt site works, as required, to undertake investigation or recording of any archaeological remains exposed during the monitoring process. Work should not recommence in these areas until directed by the archaeologist(s) on site.

Archaeological monitoring should continue at the site until:

- the archaeologist(s) on site is satisfied that the research potential of the subsurface deposits has been realised;
- culturally sterile deposits have been encountered across the site; or
- the maximum depth of excavation required for the proposed works has been reached.

Archaeological investigation would only need to occur in response to or in conjunction with excavation associated with the proposed project works in areas of archaeological sensitivity. The areas where archaeological monitoring would be required in conjunction with proposed excavation works are shown in Figure 5.1. Any areas of archaeological potential that would remain undisturbed as part of the proposed program of works would not require archaeological investigation.

The proposed works would involve mechanical excavation from the surface into deposits underlying the forecourt area to expose the section of the stormwater channel that would be removed and to provide subsurface access for construction of a new junction pit.

The proposed route of the channel diversion has been assessed as having little archaeological potential other than potential evidence associated with the early shoreline and natural land form, as well as any incidental (unrecorded) remains associated with the site's use. Deposits overlying the original (and functioning) oviform section of the channel would have little potential to contain archaeological remains associated with subsequent phases of the site's history.

On this basis, archaeological monitoring along the proposed diversion route would only be required in the eastern portion (see Figure 5.1). Any archaeological remains encountered during this phase of the excavation should be investigated and recorded prior to their removal. The nature and extent of investigation and recording (eg photography, site drawings, context sheets, other written notes) would be determined by the archaeologist(s) on site, in response to the nature and extent of the archaeological remains.

Given the nature and depth of the proposed excavation works, it is possible that some or all of the recording may be done from the edge of the trench, if safety concerns prevent the archaeologist(s) from entering the trench. The recording and investigation methodology would be adapted to suit site conditions.

Any archaeological evidence exposed would be removed during the course of the excavation following appropriate recording. Any such evidence would be removed only to the extent of the trench (that is, the extent of the archaeological investigation would be limited to the extent of

excavation required to undertake the proposed diversion works). Archaeological features and deposits would be removed by a combination of machine or manual excavation, as appropriate.

Excavation to expose the existing channel should be monitored by an archaeologist(s) (see Figure 5.1). Any sections of the channel (original oviform drain and later diversions) that are exposed during site works should be photographed by the archaeologist(s) on site prior to the removal or reburial of any sections of the channel. This photographic recording should include general, contextual and detail shots and a north arrow and scale where relevant. The form, dimensions and condition of the exposed sections of the drain should also be recorded by the archaeologist(s) on site.

5.5 Other Requirements

5.5.1 Occupational Health and Safety Requirements

Occupational health and safety requirements would need to be adhered to at all stages of the project. The proposed archaeological investigation of the site would need to consider site constraints that may arise throughout the course of the project, such as the identification of levels of contamination of subsurface deposits that may preclude manual excavation or structural instability of areas of the site that would prevent safe access. Such constraints may constrain the areas of the site that may be investigated or the degree to which these areas may be investigated or recorded. Such safety constraints would necessarily override any heritage requirements.

5.5.2 Training of On-site Personnel

All relevant site personnel would attend a site induction prior to commencement of works to ensure that all on-site personnel are aware of the heritage issues associated with the site and the role of the archaeologist(s) on site.

5.5.3 Site Recording

The entire monitoring process would be recorded photographically. Provision should also be made for detailed site recording (photography, measured drawings, context sheets) as required, if and when archaeological deposits and features are encountered. The nature and extent of recording required would be determined by the archaeologist on site in response to site conditions.

5.5.4 Artefacts

Where practical, processing of any artefacts recovered and other preliminary analysis would occur on site during the excavation phase. Artefacts would be collected and provenanced according to their contexts. Those that are recovered would be labelled, cleaned, conserved and catalogued as appropriate. These artefacts (and any samples that may be collected) would be returned to the client for storage pending completion of the project.

5.5.5 Post-excavation Reporting

A report of the results of the fieldwork would be produced at the completion of the archaeological monitoring program in accordance with standard conditions of approval of excavation permits. This report would include:

- a description of the results of the investigation, including a discussion of the nature of the archaeological remains recorded;

- a response to the research questions raised in this Archaeological Research Design, including the results of post-excavation analysis undertaken and artefact or sample analysis;
- site records, including measured drawings and photographs where appropriate;
- conclusions relating to the nature and extent of surviving archaeological remains; and
- recommendations for further archaeological work or site interpretation, as appropriate.

The final archive of archaeological material would consist of all site records produced throughout the physical investigation including context sheets, artefact sheets, photographs, slides, drawings and artefacts (inventoried, boxed, labelled and catalogued).

5.5.6 Interpretation

Opportunities to interpret any evidence discovered during the proposed forecourt works should be considered as part of a holistic approach to interpreting the site.

The proposed on-site works are likely to generate a great deal of interest owing to their visibility in a popular public domain. It is therefore recommended that:

- an online resource be established (eg a dedicated web page as part of Sydney Opera House's existing website) to provide information about the proposed works before they commence, in anticipation of public interest in visible on-site works; and
- signage be erected in relation to the proposed works in the forecourt area to inform site visitors of the nature and extent of site works. (Any signage would need to be consistent with the requirements and restrictions identified in the Sydney Opera House Management Plan and Signage Manual).

The online resource and on-site signage could provide information about the research that has been done for the site, the proposed archaeological investigation and its results, and any ongoing site management and interpretation.

Any artefacts recovered from the site during site works and a full set of archaeological investigation records (including this report) should be included in Sydney Opera House's moveable heritage collection.

Figure 5.1 Plan showing areas of proposed excavation where archaeological monitoring would be required.

6.0 Conclusions and Recommendations

6.1 Conclusions

- The area of proposed forecourt works is located within the curtilage of the World Heritage listing and the State Heritage Register listing of Sydney Opera House. Approval from the Minister for Planning (under the *Environmental Planning and Assessment Act 1979* (NSW)) and the Heritage Council of New South Wales (under the *Heritage Act 1977* (NSW)) is required for any works within this curtilage that would affect the significance of the site.
- The forecourt area of Sydney Opera House has potential to contain significant historical archaeological remains associated with various phases of the historical development of Bennelong Point.
- The proposed works would require at least partial removal of some of these remains; however, the extent of impact of the proposed works on the site's archaeological significance is relatively minor.
- Archaeological monitoring is proposed in areas of archaeological sensitivity that would be disturbed during the proposed site works. Any archaeological remains exposed within the areas of proposed excavation would be removed following appropriate archaeological investigation and recording.
- The proposed works would not affect any known Aboriginal sites and the study area has low potential to contain in-situ Aboriginal archaeological evidence.
- The proposed works would include removal of an original section of the Bennelong stormwater channel (oviform brick construction) and a later diversion constructed in association with the construction of Sydney Opera House. Any sections of the channel (original or later diversion) that are exposed during site works would be recorded prior to their removal.
- The proposed diversion of the Bennelong stormwater channel would require construction of a new outlet through the eastern seawall. The section of seawall that would be affected was possibly constructed in the 1860s and may represent one of the earlier surviving sections of the seawall surrounding Bennelong Point. The proposed construction of the new stormwater outlet through the existing seawall would cause minor impact to potentially significant historical fabric.
- The visual impact of the proposed stormwater outlet on the setting of Sydney Opera House and adjacent heritage items is minor and acceptable, subject to appropriate detailing of the finished works.
- The proposed works would have no physical impact on Sydney Opera House itself.
- The proposed works would have no physical impact on any adjacent heritage items.
- The proposed works would not have an adverse impact on the State, National or World Heritage values of the Sydney Opera House site.

- The proposed works would not have any adverse impact on the State Heritage values of the Royal Botanic Gardens nor any heritage items within the Royal Botanic Gardens that are in the vicinity of the subject site. There will be a temporary visual impact in the north-western section of Lot 6: DP775888 of the Royal Botanic Gardens but there will be no physical impact. There will be no impact on the QEII Gates.
- The proposed works are consistent with the management policies identified in the 2003 Conservation Plan and 2005 Management Plan for Sydney Opera House.

6.2 Recommendations

Archaeological Monitoring

- The program of archaeological monitoring and recording outlined in this report should be adopted as part of the mitigative strategy for these works to address the potentially adverse impacts that these works would have on the archaeological significance of the site.
- Any ground disturbance associated with the proposed works in areas of archaeological sensitivity should be undertaken under the supervision of a monitoring archaeologist and in accordance with the methodologies described in this report.
- In the event that any archaeological remains were to be exposed during site works, they should be appropriately documented according to the procedures outlined in this report.
- Suitable clauses should be included in all contractor and subcontractor contracts to ensure that on-site personnel are aware of the heritage issues associated with the site and the role of the archaeologist(s) on site.
- Subsurface disturbance should be limited to those areas identified in the documentation of the proposed works so as to avoid disturbance of other potential archaeological remains at this site.
- In the event that unexpected historical archaeological evidence were to be encountered during site works, works should cease and the Heritage Branch, Department of Planning, should be notified immediately. Further assessment and/or approval may be required before works could recommence.
- In the event that unexpected Aboriginal archaeological evidence were to be encountered during site works, works should cease and the Department of Environment, Climate Change and Water (DECCW) should be notified immediately. Further assessment and/or approval may be required before works could recommence.
- The proposed works do not allow for in-situ retention of any archaeological evidence in the areas of proposed excavation. In-situ retention of the potential archaeological evidence on this part of the site is not warranted.

Stormwater Diversion

- The removal or disturbance of any sections of the original oviform channel (currently functioning or previously decommissioned) should be minimised.

- Any sections of the channel that are to be removed should be photographed in situ prior to removal (including sections of the original oviform drain and later diversions). This photographic record should be added to the Sydney Opera House collection.
- Any exposed sections of the original oviform channel that will not be removed should be protected during excavation works and in association with construction of the new diversion junction.
- Removal of any sections of the original oviform channel of the Bennelong stormwater channel should be undertaken in consultation with Sydney Water.
- Sydney Water should also be consulted in relation to any preservation requirements, including the retention and storage of any fabric or artefacts recovered from the Sydney Water asset.

Outlet in Seawall

- All works to the seawall should retain and respect the existing material and configuration as much as possible.
- The amount of sandstone removed for the construction of the outlet should be minimised as much as possible.
- Removal of this material from the seawall should be undertaken in a manner that does not disturb, damage or destabilise the surrounding fabric.

Potential Visual Impacts

- The detailing of the proposed outlet in the seawall should be in accordance with the recommendations provided by Design 5 Architects, as follows:
  - The drain should be lined with coursed stonework to match the surrounding seawall fabric to a depth of approximately 1.5m from the outside face.
  - The external corners should be properly bonded between face and drain returns.
  - The lintel over the opening should be finished as a flat solid stone lintel, or a shallow arch in stone.
  - The stonework should be configured and built in such a way that prevents erosion of the fill or other fabric behind the stone and minimises ingress of water beyond the wall.
- Where feasible, any sandstone that is removed from the seawall should be reused to line the new drain outlet.
- Management of the construction site should be such that temporary visual impacts for the duration of the proposed works are minimised. Appropriate hoardings (solid, clean, and well constructed) should be erected to contain all aspects of the proposed excavation and construction works.

Interpretation

- Opportunities to interpret any evidence discovered during the proposed forecourt works should be considered as part of a holistic approach to interpreting the site. Potential archaeological evidence that may be of particular interest would include:
  - remains of Fort Macquarie, associated with a major period in the historical development of Bennelong Point; and
  - any evidence of Aboriginal use or occupation of the site, including any isolated artefacts that may be discovered during site works.
- An online resource should be established to provide information about the proposed works before they commence, in anticipation of public interest in visible on-site works.
- On-site signage should be provided during the proposed works to provide site visitors with information about the nature and extent of the site works. (This signage should be consistent with the requirements and restrictions identified in the Sydney Opera House Management Plan and Signage Manual.)
- Any artefacts recovered from the site during site works and a full set of archaeological investigation records (including this report) should be included in Sydney Opera House's moveable heritage collection.

Aboriginal Consultation

- A copy of this report should be sent to the Metropolitan Local Aboriginal Land Council for information.

7.0 Appendices

Appendix A

'Sydney Opera House—Comments on Impact of Proposed Bennelong Drain Diversion', report prepared by Design 5 Architects, 24 August 2009

Appendix B

Sydney Opera House—A Revised Plan for the Conservation of the Sydney Opera House and its Site (third edition) by James Semple Kerr—site history

Appendix C

World Heritage List Citation—Sydney Opera House

Appendix D

National Heritage List Citation—Sydney Opera House

Appendix E

Register of the National Estate—Sydney Opera House

Appendix F

NSW State Heritage Register—Sydney Opera House

Appendix G

Sydney Water Section 170 Register—Bennelong SWC No. 29

Appendix H

NSW State Heritage Register—Man O'War Steps

Appendix I

NSW State Heritage Register—Royal Botanic Gardens and Domain

Appendix J

Register of the National Estate—Royal Botanic Gardens

Appendix K

Register of the National Estate—The Opera House Gate to the Royal Botanic Gardens

Appendix A

Sydney Opera House—Comments on Impact of Proposed Bennelong Drain Diversion, report prepared by Design 5 Architects, 24 August 2009

DESIGN 5

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SYDNEY OPERA HOUSE

COMMENTS ON IMPACT OF PROPOSED BENNELONG DRAIN DIVERSION

Background and Proposal

The Bennelong Sewer, or Bennelong Stormwater Channel as it is also known was originally constructed around 1857 as part of a system of five combined sewer tunnels to service the growing town of Sydney. It is of high historical and technical significance and the original line was constructed of brick with an oviform section. The lower part of it was constructed under the headland north of Government House, where it exits under the Tarpeian Cliff. Its original function was to deliver the sewer into Sydney Harbour at the end of Bennelong Point. When the Bondi Ocean Outfall Sewer (BOOS) was completed in 1889, the Bennelong Sewer gradually became a stormwater tunnel only.

When the Sydney Opera House was constructed, the original sewer line was intercepted and diverted. This diversion occurred not far north from the face of the Tarpeian Cliff face.

Works proposed in the forecourt area require the Bennelong Sewer to be intercepted closer to the cliff face and diverted eastwards to exit into the harbour just east of the Man o' War jetty. The route is determined by the existing exhaust system for the Bennelong Point Parking Station.

The proposal is as described in the documents prepared by Sydney Water titled:
City of Sydney Sewerage, Sewer Deviation – Sydney Opera House Forecourt

Design 5 has been engaged to review the proposal in terms of its heritage impact and provide comment. An assessment of the archaeological issues is being undertaken separately by Godden Mackay Logan. In that report, details are given of adherence to Burra Charter principles and methodology as well as compliance with the 2003 Conservation Plan by James Semple Kerr. These will not be repeated in this brief report.

Discussion of impact and recommendations

The implications of the proposed deviation in terms of the drain itself are an archaeological issue and will not be commented on here. The drain only becomes an above ground issue where it exits the sea wall.

The sandstone sea wall at this location may be original, or at least earlier than the time of the Opera House construction, and the proposed penetration of it will have an impact. Examination of images and drawings at the time of construction, suggest that this section may not have been disturbed by the works, whereas the section to the north west of the Man o'War jetty was rebuilt at that time. The degree of impact will depend on how old this section of the sea wall is, and because of weathering, that will be difficult to ascertain until it is opened up. Nonetheless, all work to this wall should retain and respect its existing material and configuration as much as possible.

We understand that it is proposed that the new opening to this drain will be rectangular and left open. The coursed stonework should therefore be returned on the side walls of the drain to a depth of approximately 1.5 metres from the outside face. The external corners should be properly bonded between face and drain returns. The lintol over the opening should be finished as a flat solid stone lintol, or a shallow arch in stone. It is important that the new stonework be configured and built in such a way that prevents erosion of the fill or whatever is behind the stone, and minimises ingress of water beyond the wall.

It is our assessment that the proposed deviation with new outfall will have some impact on significant fabric above ground, ie the stone sea wall, but this will be acceptable as long as the stonework is treated as recommended above.

Alan Croker
24th August 2009

Appendix B

Sydney Opera House—A Revised Plan for the Conservation of the Sydney Opera House and its Site (third edition) by James Semple Kerr—site history

http://www.sydneyoperahouse.com/uploadedFiles/About_Us/Corporate_Information/Content_AboutUs_ConservationPlan2003.pdf