Environmental Planning Committee

Monday 3 June 2024
6.30pm

Attachment 1 – Item R2

Environmental Planning Committee

Under Separate Cover Attachment Meeting Agenda

Item No. R2

Hydrogeological and Geotechnical Study of the Rose Bay area and proposed DCP amendments

Attachment 1

Rose Bay Hydrogeological and Geotechnical Impacts (May 2024) by GHD Pty Ltd

Rose Bay - Hydrogeological and Geotechnical Impacts

24 May 2024

→ **The Power of Commitment**

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→ The Power of Commitment

Executive Summary

Woollahra City Council (Council) has engaged GHD to carry out an assessment of geotechnical and hydrogeological impacts associated with urbanised development of the Rose Bay region. Increasing demand for the land motivates developers to consider underground structures to maximise the land value. Construction of these underground structures can have implications for the groundwater environment in the short term and long term, and the magnitude of these implications can be significant when the developments are considered from a cumulative perspective. The development activities such as excavation and dewatering may also have adverse impact on the landform stability when they are not assessed and controlled appropriately. Construction dewatering may also impact groundwater dependent ecosystems.

This report describes the findings of a hydrogeological and geotechnical study for assessing impacts associated with excavation, subterranean building and dewatering in the Rose Bay area. The study area covers Rose Bay, part of Bellevue Hill east of Victoria Road and part of Vaucluse south of Towns Road. The extent of the study area on the south is defined by Old South Head Road, which is the boundary of Woollahra Council local government area. The study primarily focused on detailed assessment of short-term construction dewatering in terms of risk of damage to adjacent buildings. Long term impacts when the basements are constructed below the water table and alter the natural flow regime has been assessed considering geological, geomorphological, and topographical setting of the Rose Bay region. The assessment was in general based on the outcomes of a similar assessment carried out for Double Bay previously. Furthermore, discussion on landform instability, construction induced vibrations and environmental impacts of dewatering is also provided.

The study was based on geotechnical and hydrogeological information provided by Council, available in GHD's archive and accessible in the public domain. Where relevant, references have been made to Australian Standards and technical publications by various authors, professional bodies and government.

Geological units identified in the study area are primarily fill, marine sands, peat and bedrock of Hawkesbury Sandstone. Generally, a shallow sand profile overlies the bedrock in the hillsides of the study area. In the low-lying Rose Bay region, the overall thickness of the marine sand with peat layers is found to be up to approximately 40 m overlying the bedrock. Firm peat layers are typically up to 2 m thick, while stiff peat/peaty sand of varying thickness is also encountered. The groundwater is assessed to be generally at or below the bedrock levels in the hillsides, and at shallow depth within the marine sand in low-lying areas in the vicinity of the Royal Sydney Golf Course.

It is assessed that the lowering of groundwater in areas with compressible peat soils would cause much greater settlement than in other areas without the peat layers. Consequently, a "Settlement Index Plot" in response to an assumed fixed groundwater drawdown depth was developed based on selected analysed settlement points. Settlement was assessed for available site-specific geotechnical investigation data and/or groundwater bore logs. Based on the Settlement Index Plot, a more generalised "Settlement Map" was developed for different zones within the Rose Bay study area (refer to Figure 12). These zones show the different degrees of susceptibility to dewatering-induced ground surface settlement (refer to Figure 13 to Figure 15).

To effectively control the potential damage caused by dewatering, it is essential to assess the likely maximum settlement tolerable by the buildings in the Rose Bay area. For the purpose of the current assessment, a ground surface settlement of 15 mm has been considered as the limiting value to minimise potential damage to existing buildings. This settlement criterion has been developed with consideration of existing buildings in the Rose Bay area, which are typically one to two storeys high and supported on shallow footings. The criterion is based primarily on the Australian Standard AS 2870-2011 and relevant published works by Burland et al. (2002) on building settlements and associated damage.

This threshold surface movement of 15 mm is associated with a deflection ratio of 0.075% for a typical wall length of a residential building. This ratio is commensurate with that of Category 1 damage to walls and concrete floors given in Tables C1 and C2 of AS2870-2011 respectively. The damage Category 1 is described as fine cracks of less than 1 mm in walls and concrete floors which typically do not need repair.

For the different areas identified in the "Settlement Map", the allowable drawdown depths associated with the proposed settlement limit of 15 mm were assessed to vary between 0.3 m and greater than 5 m. A corollary of this

finding is that a 0.3 m depth of dewatering can be considered as a relatively safe limit to minimise potential building damage within Zone A and Zone B, noting the large extent of the “zone of influence” from dewatering based on the study conducted for Double Bay. From a constructability viewpoint, it can be necessary to dewater sufficiently to enable dry excavation during construction. If the abovementioned drawdown limits cannot be achieved, other controls are then needed to effectively reduce groundwater drawdown in the surrounding areas to within the acceptable limit. These controls could include the following:

- Systematic groundwater reinjection/recharge during excavation dewatering;
- Sufficient cut-off depth to limit groundwater drawdown outside of excavations; and
- Elimination of the need for dewatering by providing a sealing layer at the excavation base, which needs to be adequately designed to resist uplift pressure.

Alternative measures can be considered on a case-by-case basis to allow for a review of the drawdown limit. These measures should include the undertaking of sufficient additional geotechnical investigation and subsequent analysis to demonstrate that settlement impacts of surrounding buildings are within the acceptable limits.

No specific assessment of a large basement or underground structure has been undertaken for Rose Bay. Based on the modelling carried out for Double Bay, cumulative mounding and lowering of the water table could be expected over the long term. However, this is generally estimated to be less than 0.3 m assuming full cut-off (basement extending to bedrock) and less than 0.2 m for partial cut-off.

Based on the outcomes from the assessment undertaken for Double Bay, and considering the extensively wider flow path in the Rose Bay area compared to a narrow incise valley in Double Bay, the risk of impeding the regional groundwater flow is considered much lower in Rose Bay compared to that assessed for Double Bay. However, specific groundwater modelling would be required to assess the long-term impact that could be anticipated from any future major development proposal, with an extensively large and deep basement that blocks a significant portion of the flow path.

The landform and geological conditions on part of the hillsides east and west of the golf course area indicate landslides or slope instability are possible where a deep sand profile overlies bedrock. This may be triggered by construction activities such as excavation if not assessed properly and adequate measures are not provided. Rock fall and erosion hazards have also been identified in parts of the study area. These must be managed by proper risk assessment and analysis as required. The requirements for assessment of these hazards should be considered in development control plans.

Vibrations resulting from construction activities such as building demolition, pile driving, soil compaction and rock excavation can have negative impacts on both human comfort and potential building damage. A review of existing guidelines has shown that the methods described in Department of Environment and Conservation (DEC, 2006) NSW, which is based on British Standards BS 6472-1992, is appropriate when acceptable vibration limits for human comfort are being determined. BS 7385.2-1993 is considered appropriate for vibration limits with respect to building damage. However, the German Standard DIN 4150-3 includes guidelines for residential buildings together with criteria for both commercial/ industrial buildings and high sensitivity structures and may be considered most appropriate for vibration limits on building damage in most cases. In addition to vibration limits, vibration monitoring as well as pre and post construction dilapidation surveys should be carried out for adjacent buildings of a constructions site. Settlement resulting from densification of loose sand due to vibration was assessed to be minimal (less than 0.4 mm per metre thickness of sand), and is not expected to contribute to building damage.

Another impact of dewatering is potential generation of acid sulfate soils, which would have environmental impacts and durability concerns for underground structures or buried structural components such as footings. Further, impact on groundwater dependent ecosystems needs to be considered and assessed when construction dewatering is proposed.

Based on the outcome of this study, changes to existing DCP and guidelines have been proposed as shown in Appendix B.

GHD has carried out this assessment in accordance with the scope agreed with Council as set out in Section 1.4. This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.5 and the assumptions and qualifications contained throughout the Report.

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1. Introduction

1.1 Purpose of this report

GHD Pty Ltd (GHD) has been engaged by Woollahra Municipal Council (Council) to undertake an assessment of geotechnical and hydrogeological impacts associated with urbanised development of the Rose Bay region at the southern edge of Sydney Harbour.

This report has been prepared in accordance with the GHD proposal (ref: 12588469) dated 2 August 2022, and discussion with Council representatives during site visits on 3 February 2023 and 18 April 2023. Findings from the site visits are also detailed in this report.

1.2 General

Urban development is increasingly aiming to maximise the value of land in the Rose Bay region. Many developments are considering the construction of basements, underground car parking, car stacking and other associated below ground structures. Where the water table is intersected, temporary dewatering is required to ensure safe and stable construction conditions, and longer term dewatering occurs where drained subsurface structures have been built. The construction of these underground structures can have implications for the groundwater environment in short term and long term, and the magnitude of these implications can be significant when the developments are considered from a cumulative perspective. In terms of the built environment, the depressurisation of compressible sediments can lead to consolidation settlement, and settlement differentials can have significant impacts on the existing buildings. Dewatering can also result in other impacts associated with managing (disposal) of the seepage, reduced access to groundwater by the environment, and activation of acid generating geological materials.

Hillside developments can pose a significant challenge in terms of land stability. Factors such as soil/rock composition, drainage, slope angle and vegetation can influence the stability of hillside developments.

Construction can also present issues when it comes to vibrations emitted from construction machinery, which may transmit through the ground to nearby residences. This can cause discomfort to occupants of these residences or, at higher vibration levels, potentially lead to building damage.

1.3 Objectives

The main project objective is to provide Council with a better understanding of the geotechnical and hydrogeological risks associated with developments in the Rose Bay area which would then drive amendments, where appropriate, to Council's development guidelines and planning controls.

GHD has previously undertaken a similar hydrogeological and geotechnical impacts study for Double Bay. The outcomes of the study provided necessary inputs to Council's Development Approval (DA) Guidelines and relevant Local Environmental Plan (LEP) and Development Control Plan (DCP).

A similar approach has been adopted for the study in the Rose Bay area. However, the study excludes regional groundwater modelling as requested by Council and detailed in GHD's proposal dated 2 August 2022. Council has not provided any detail of specific development proposals that should be considered as part of the study. Further, the previous (Double Bay) study has provided necessary outcomes for Council to include in the LEP. At this stage, it is not expected the LEP would need to be revised for the Rose Bay area. Therefore, the outcomes of the proposed study for Rose Bay area will be used mainly for informing the Rose Bay DA Guidelines and the DCP.

The proposed changes to DA Guidelines and the DCP are shown in Appendix B.

1.4 Scope of works

The delivery of the project includes four stages as per GHD's proposal dated 2 August 2022:

Stage 1 – Identification of the hydrogeological study area.

Stage 2 – Desktop review. Information from Council and publicly available sources was interrogated to characterise the geological and hydrogeological setting of the study area.

Stage 3 – Engineering analysis and assessment.

Stage 4 – Review of planning controls.

At present, the project has advanced to Stage 3 of the scope of works outlined above. Engineering assessment of surface settlement as a result of groundwater drawdown caused by short term construction dewatering has been carried out and presented in this report. Based on the outcomes of the assessment from Stage 3, the review of planning controls, i.e., Stage 4 works, will be undertaken.

1.5 Limitations

This report has been prepared by GHD for Woollahra Municipal Council and may only be used and relied on by Woollahra Municipal Council for the purpose agreed between GHD and Woollahra Municipal Council as set out in the GHD proposal (ref: 12588469) dated 2 August 2022.

GHD otherwise disclaims responsibility to any person other than Woollahra Municipal Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

GHD has prepared this report on the basis of information provided by Woollahra Municipal Council and that available in the public domain, which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

2. Available information

The sources of information that have been used to assist with the hydrogeological and geotechnical impact assessment are listed below:

- Geotechnical and hydrogeological data provided by Council
- Data from GHD archive
- Data from public domain
- Australian Standards and relevant published technical papers
- Observations from site visits (discussed in Section 8.4)

As part of our Stages 1 and 2 work, we have reviewed and used available information relevant to our assessment.

2.1 Geotechnical reports supplied by Council

Council has supplied GHD with information which comprised geotechnical and contamination investigation data and relevant assessment reports. Geotechnical reports from Council have been considered the primary source of information for the assessment.

Locations of the provided geotechnical reports by Council are shown in Figure 1 as blue dots. A list of these reports is provided in Appendix A.

Council has also provided the flood study and flood risk study report for Rose Bay, which have also been reviewed and taken into consideration.

Figure 1 Locations of geotechnical reports supplied by council (Base map: Google Earth Pro)

2.2 Data from GHD archive

The below geotechnical reports from GHD archive have been used for the study:

- Detailed Geotechnical Investigation, William St, Rose Bay
- Victoria Road Landslide, Bellevue Hill

2.3 Data from public domain and references

Data from the public domain in relation to geological and hydrogeological mapping, topographical information, groundwater base and vibration have been referenced, where relevant, throughout the report. A list of references is as follows:

- Groundwater databases including WaterNSW and the Bureau of Meteorology (Groundwater atlas). Locations of available groundwater wells are shown in Figure 2.
- Herbert C., 1983, Sydney 1:100 000 Geological Sheet 9130, 1st edition. Geological Survey of New South Wales, Sydney
- Hiller, D.M. and Crabb, G.I., 2000. Groundborne vibration caused by mechanised construction works. Transport Research Laboratory Report No. 429.
- Ishihara, K. and Yoshimine, M., 1992. Evaluation of settlements in sand deposits following liquefaction during earthquakes. Soils and Foundations, 32(1): 173-188.
- Mesri, G. and Ajlouni, M., 2007. Engineering properties of fibrous peats. ASCE Journal of Geotechnical and Geoenvironmental Engineering, Vol. 133, No. 7, pp. 850 – 866.
- Middelmann, M.H., 2007, Natural Hazards in Australia – Identifying Risk Analysis Requirements by Australian Government
- Tokimatsu, K. and Seed, H.B., 1987. Evaluation of settlements in sands due to earthquake shaking. Journal of Geotechnical Engineering,113(8): 861-878.
- Troedson A.L., 2015, Sydney Area 1:100,000 Coastal Quaternary Geology Map. Geological Survey of New South Wales, Sydney
- Department of Environment, Climate Change and Water 2009, Sydney 1:100,000 Soil Landscape Map 9130, 4th edition.
- Topographical information provided by the NSW Government Spatial Services

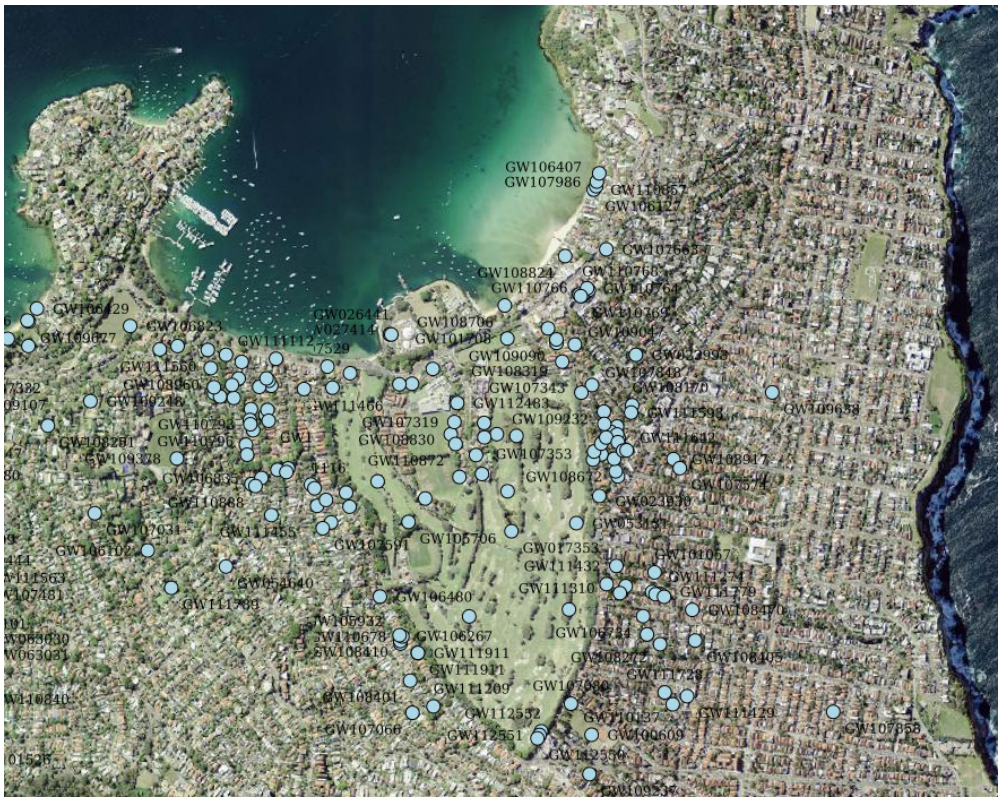


Figure 2 Locations of groundwater wells (https://realtimedata.waternsw.com.au/)

3. Regional Setting

Rose Bay is located east of the ridgelines of Bellevue Hill/Point Piper and west of Vaucluse/Dover Heights hillside, occupying the low elevation harbour front area in the north. South and south-east of Rose Bay is bounded by North Bondi and Dover Heights, respectively.

The hillside comprises steep slopes with medium density development with few non-residential developments and little open space. The low-lying areas comprise flatter slopes occupied with low to medium residential development and a significant part occupied by the Royal Sydney Golf Courses.

The Council has not defined the study area in the brief. Therefore, the study has been defined based on the geotechnical information provided by council, topography, and council boundary. As such, the study area covers Rose Bay, part of Bellevue Hill east of Victoria Road and part of Vaucluse south of Towns Road. The extent of the study area on the south is defined by Old South Head Road, which is the boundary of Woollahra Council local government area. Boundary of the study area is shown by the red line in Figure 3. Nevertheless, some groundwater bore data available within North Bondi of Waverly Council area south of Old South Head Road have been considered in the study.

Elevations along the Victoria Road is up to 80 mAHD in the south and fall towards east to the golf course. The golf course is gently sloping towards north from approximately 15 mAHD on the south to 3 mAHD on the north. The

elevation along Towns Road is up to 80 m AHD and slopes westward towards the golf course. Majority of Old South Head Road on the southern boundary of the study area is between 10 m AHD and 15 m AHD.

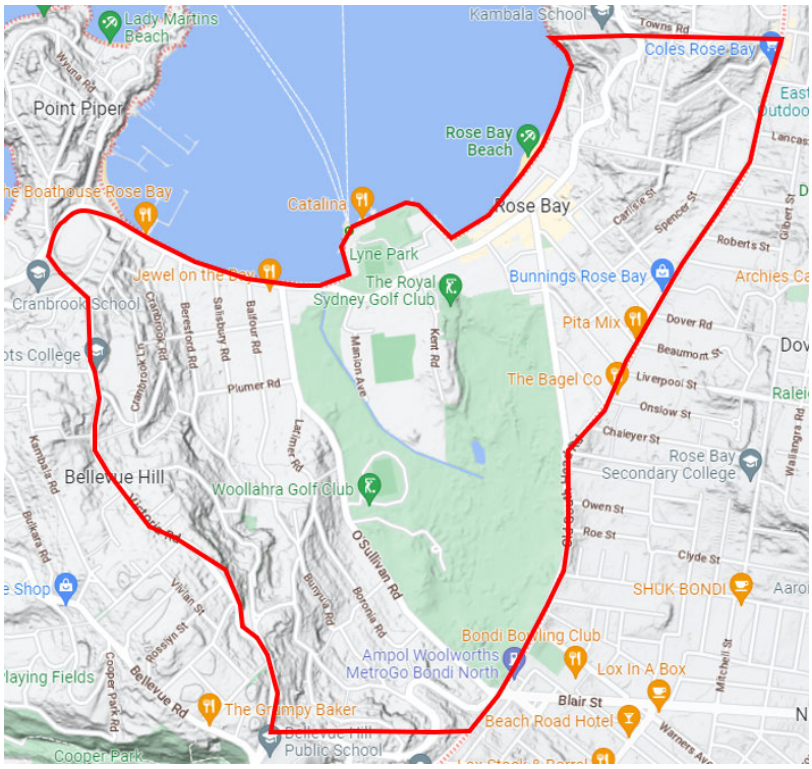


Figure 3 Study area

4. Geological setting

4.1 Regional Geology

A summary of the stratigraphy based on 1:100,000 scale geological sheet for Sydney has been presented in Table 1 which indicates geology of the study area can be broadly simplified into a two-layer system, with Quaternary age unconsolidated sediments overlying Mesozoic age sandstones.

The early Triassic and older geology have been omitted for brevity.

Table 1 Summary of study area stratigraphy

Era	Period	Epoch	Formation
Cainozoic	Quaternary	Holocene	Anthropogenic filling
		Pleistocene	Transgressive dune formation of medium to fine-grained marine sand with podsols
	Tertiary	Miocene	Absent from Study Area

Mesozoic	Jurassic		Absent from Study Area A period of erosion, forming valleys within the Hawkesbury Sandstone, with some volcanic intrusions.
	Triassic	Middle	Hawkesbury Sandstone

An extract of the 1:100,000 scale geological sheet for Sydney is shown Figure 4. The map shows the bedrock zones of Point Piper and Bellevue Hills on the west and Vaucluse and Dover Heights on the east and low-lying areas within Rose Bay filled with Pleistocene age Transgressive dune sands. The dune sand extends to Bondi Beach to the south.

The map shows a man-made fill (dredged estuarine sand and mud) in the northern portion of Rose Bay.

It is noted from the provided flood study report that the sand dune within Rose Bay has been levelled in 1920 for development.

Within the incised valley at Cooper Park, there is an east-west trending dyke shown in Figure 4. Another dyke, with a north-south trend, intersects perpendicular to the dyke at Cooper Park. Much of the study area falls within Hawkesbury Sandstone and soils developed over such terrain.

An extract of the 1:100,000 Coastal Quaternary Geology Map (Troedson A.L., 2015) for Sydney is shown Figure 5. The map indicated presence of a Holocene interbarrier creek deposits comprising marine sand, silt, clay, organic mud, peat, gravel and shells.

The 1:100,000 Sydney Soil Landscape Map (Sheet 9130 4th edition) indicates that the majority of the study area within Rose Bay (low-lying) is underlain by Tuggerah soil landscape. This is typically described as gently undulating to rolling coastal dune fields. The sand is described as wind-blown, fine to medium grained, well sorted marine quartz sand. Shell fragments are absent, and the sand appears to be finer than sands found on foredunes and on beaches.

The majority of remaining portion of the study area consists of Newport or Hawkesbury landscapes. Newport is described as gently undulating plains to rolling rises of Holocene sands mantling other soil materials or bedrock. Hawkesbury landscape is described as rugged, rolling to very steep hills on Hawkesbury Sandstone.

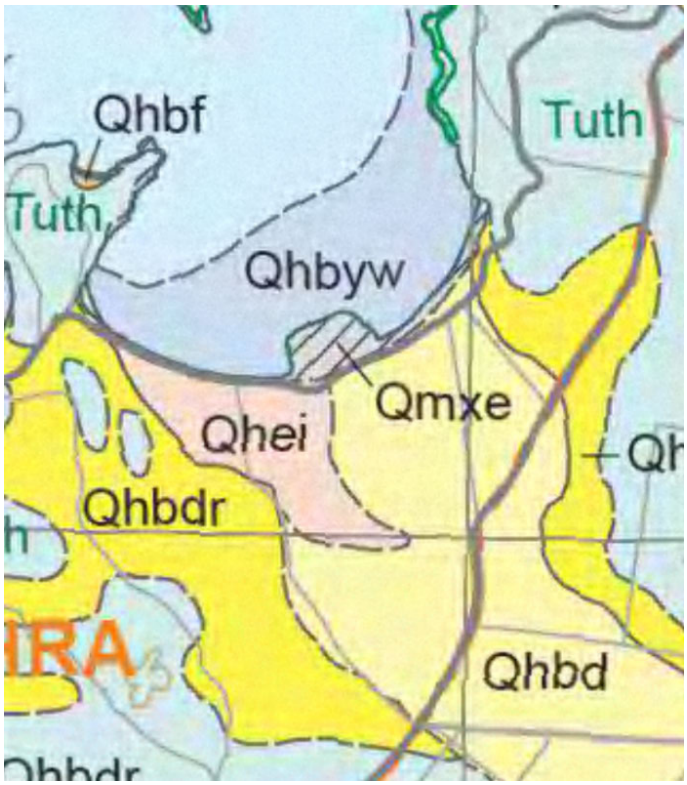
Legend

mf – Man-made fill, Dredged estuarine sand and mud, demolition rubble, industrial and household waste.

Qd (Qhd & Qpd) – Medium to fine-grained "marine" sand with podsols

Rh – Medium to coarse-grained quartz sandstone, very minor shale and laminate lenses

Figure 4 Rose Bay Geological Map (Extract of 1:100,000 scale Sydney geological map sheet)



Legend

Coastal Barrier System

Qhbf Holocene backbarrier flat: marine sand, silt, clay, gravel, shell

Qhbd Holocene dune: marine sand

Qhbdr Holocene bedrock-mantling dune: marine sand

Estuarine Plain System

Qhei Holocene interbarrier creek deposits: marine sand, silt, clay, organic mud, peat, gravel, shell

Subaqueous

Qhbyw Holocene bay sand sheet: marine sand, shell, fluvial sand

Anthropogenic

Qmxe Modern reclaimed estuarine areas

Triassic sedimentary rocks of the Sydney Basin

Tuth Hawkesbury Sandstone: cross-bedded to massive quartz sandstone with mudstone lenses

Figure 5 Rose Bay Geological Map (Extract of 1:100,000 scale Sydney geological map sheet- Coastal Quaternary)

4.2 Geological units

Relevant information summarised in Section 2 have been reviewed and used in our assessment to define geological units.

The subsurface profile encountered in the Rose Bay study area can be broadly categorised into fill, sand, peat and bedrock as follows:

- *Fill* - The fill profile is generally consisted of concrete, topsoil and/or sand composites. The fill extends across the majority of the study area associated with commercial and residential developments.
- *Peat* – This layer has been identified in borehole logs drilled for the site at 75-77 O'Sullivan Road at a depth between 11 m and 13 m and for 27 Salisbury Road at a depth between 2.0 m and 2.5 m. The peat layer identified at 75-77 O'Sullivan Road is described as dark grey, fibrous, and low plasticity. Hand penetrometer reading is noted to be between 80 kPa and 140 kPa, indicating firm to stiff consistency. The peat layer identified at 27 Salisbury Road is described as soft, dark grey/dark brown, and low plasticity. No *in-situ* test results are available for the peat at this site. No other geotechnical reports provided by Council identified a peat layer within the study area. However, some of the groundwater bore summary logs from Water NSW website located within the golf course areas have identified various thicknesses of peat layers at various depths. Description or consistency of these layers are not indicated. Noting the peat layers identified in the Double Bay at depths are with very stiff to hard consistency, the peats identified at depth in Rose Bay is also assumed to be very stiff to hard. The peat layers are considered to have significant influence on dewatering induced settlements.
- *Marine Sand* – The underlying marine sand is generally clean and medium to fine grained. It varies in consistency from loose at shallow depth to very dense at depth. Thin interlayered clays of typically up to 1 m thick with stiff to very stiff consistency are also encountered. The marine sands generally fill the valley and in topographic depressions and extend to a maximum depth of about 40 m.
- *Bedrock* - Hawkesbury Sandstone underlies the Quaternary deposits. Hawkesbury Sandstone generally comprises medium to coarse grained quartz sandstone with minor shale and laminate lenses. It is typically extremely to highly weathered and fractured at the top and becomes moderately to slightly weathered and only slightly fractured with depth. Collation of available data suggests that the weathered sandstone bedrock surface follows the general shape of ground surface, which is presented in Figure 6. An assessed contour of bedrock level is presented in Figure 7.

The general site geology within Rose Bay study area has been subdivided into geological units based on the available geotechnical investigation data. A summary is presented in Table 2.

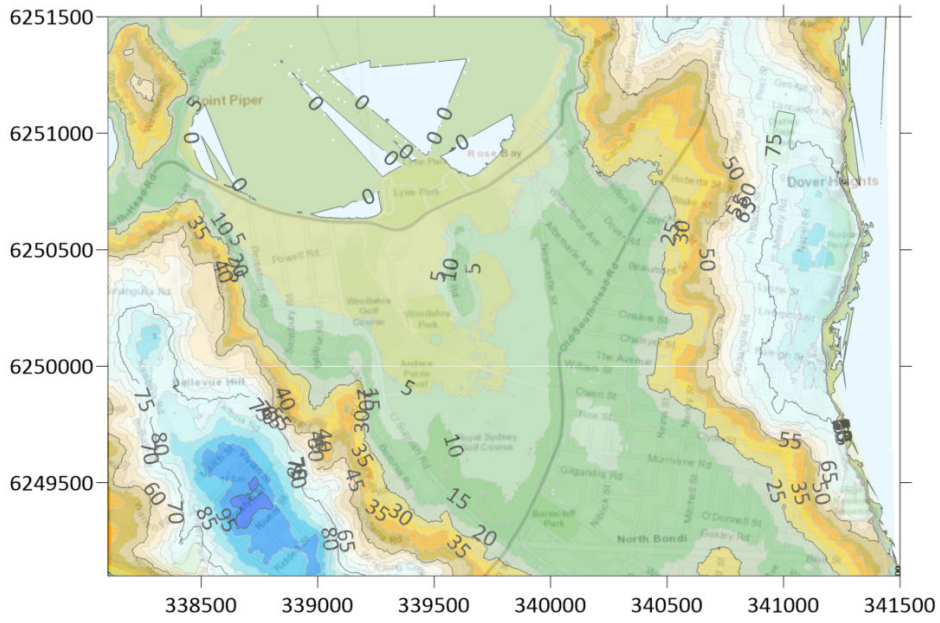


Figure 6 Contours of Surface Elevation within study area

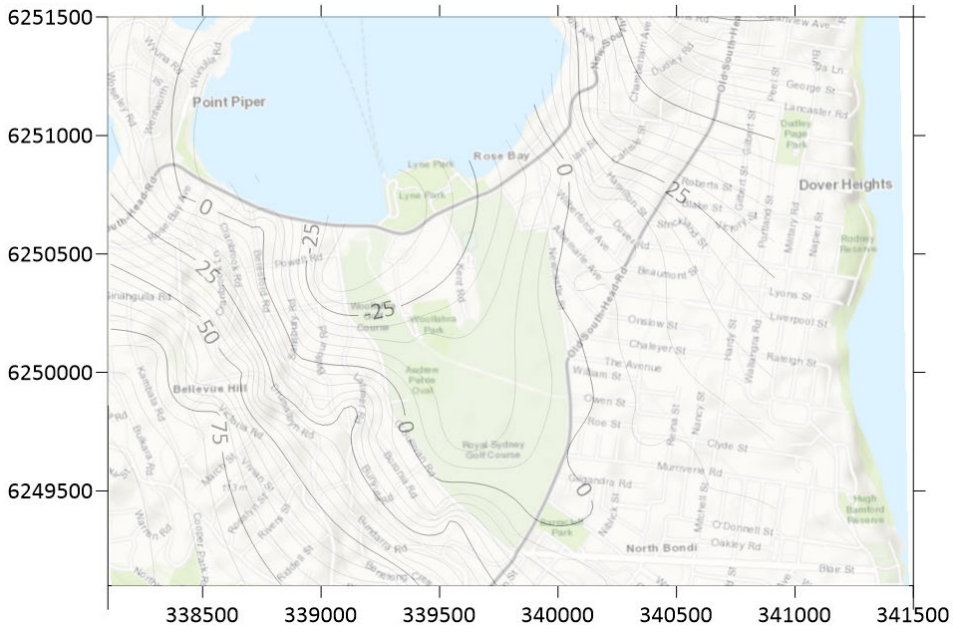


Figure 7 Contours of inferred top elevation of bedrock within study area

Table 2 Geotechnical units identified with Rose Bay area

Unit	Typical Depth (m bgl) to the top of layer	Unit thickness (m)	Description and Comments*
1 – Fill	0 – 0.3	0.1 – 1.75	Concrete, topsoil and/or sand, dry to moist
2 – Stiff to Hard Clay	0.15 - 9	0.1 – 2.8	CLAY or silty CLAY or sandy CLAY, medium to high plasticity, stiff to hard consistency
3A – Very Loose Sand	0– 2.1	0.1– 7.8	SAND or silty (clayey) SAND, fine to medium, dry to wet, very loose
3B – Loose to Medium Dense Sand	0.1 – 11.7	0.1 – 10.9	SAND or silty (clayey) SAND, fine to medium, dry to wet, loose to medium dense
3C – Dense to Very Dense Sand	0.1 – 13.6	0.5 - 27.5	SAND or silty (clayey) SAND, fine to medium, wet, dense and very dense
4A – Firm Peat	0.6 – 18.5	0.2 – 3	PEAT, firm to stiff, with organic odour and materials
4B – Stiff to Hard Peat	18.3 – 19.5	0.3 - 6.1	PEAT, stiff to hard, with organic odour and materials
5A – Residual Soil	0.2 – 19.0	0.2 - 2.8	Sandy CLAY or Clayey SAND, medium to high plasticity clay, fine to medium grained sand, typically dense to very dense sand, very stiff clay
5B/5C Bedrock	0.3 – 40.0	Not proven	Fine to medium grained SANDSTONE, extremely low to medium (estimated) strength, defect partings 0-5° planar, crushed seams, clay seams and joints (variable angles)
Notes to Table 2: Units 2 and 4 occurred intermittently across the data points, at varying depths and thicknesses. *Soil type in capital letters indicates primary constituent material			

4.3 Groundwater

Contours of water table have been prepared using groundwater level data extracted from the existing geotechnical and hydrogeological investigation reports and groundwater bore logs from Water NSW and is shown in Figure 8. The contours are interpreted from groundwater levels taken at different points in time, many of which are opportunistic measurements collected from open holes at the time of field investigations. As such, there are some local variabilities and the contours should be considered indicative only. Despite these limitations, the interpreted contours provide useful indications of groundwater levels and flow direction within the study area.

Groundwater is derived from rainwater that percolates through cracks and pores in rocks and sediments. Groundwater discharges at surface in low-lying areas and along coastal boundary to the north, whereas in topographically elevated areas the water table rises to higher elevations. The difference in the elevation of hydraulic heads resulting from these recharge and discharge mechanisms drives the flow of groundwater from topographically higher levels to topographically lower levels. This results in the water table typically being a subdued reflection of the ground surface, with shallow groundwater potentially interacting with surface watercourses along drainage lines and vegetation (via evapotranspiration). It can also be noted that the groundwater levels in the hillside is generally near or below the rock levels.

The data currently available is insufficient to ascertain local variability in the water table due to anthropogenic influences such as groundwater pumping and existing basement structures. It should also be noted that the groundwater levels obtained from some of the records are dated to many years back and may not accurately represent the current groundwater level. Climatic and seasonal changes may also influence the groundwater levels. Tidal effects and rainfall are also some of the factors that may influence the groundwater levels.

Assessment of the groundwater level variation due to seasonal, tidal or rainfall effects is not possible due to the absence of groundwater monitoring for a considerable period.

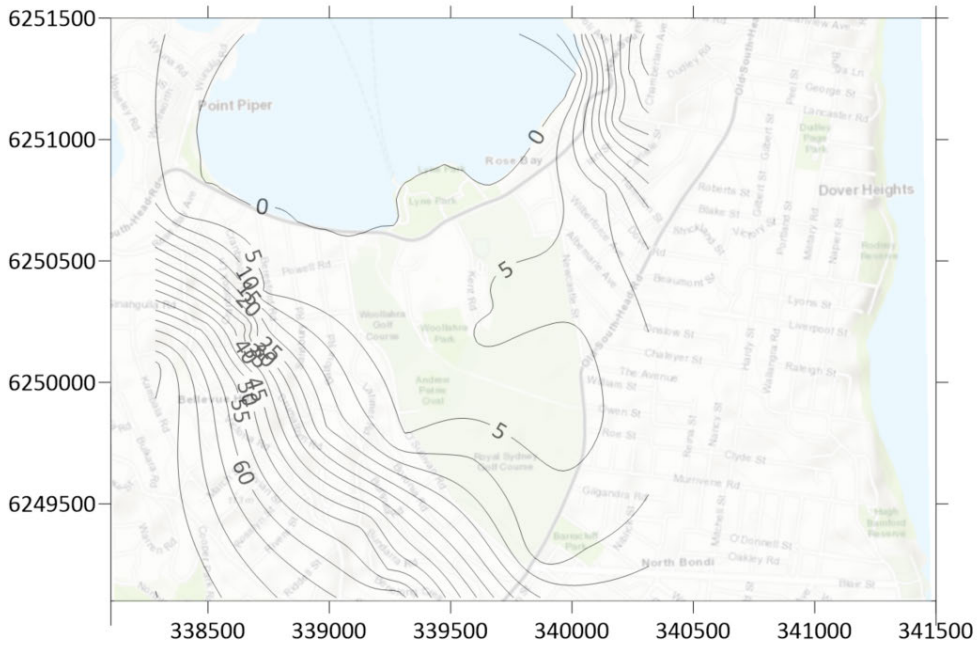


Figure 8 Contours of inferred groundwater levels

5. Impact of groundwater lowering (construction dewatering)

5.1 Why buildings settle upon dewatering?

When new developments involve basement construction, excavation into existing ground is required. Such excavation when carried out below the water table can be difficult to execute and the excavation side walls often become unstable due to the presence of groundwater within the construction site. In that instance, side wall retention and dewatering can be adopted to facilitate the excavation work and to allow construction to proceed in dry soil conditions.

There are many forms of retention system for the support of the excavation side walls. In areas where groundwater flow rate is high, vertical cut-off walls are often adopted to act as both the retention system and flow barrier to control groundwater seepage. However, the cut-off walls need to be properly designed to minimise the groundwater flow into the excavation site effectively. Such cut-off walls could be constructed as full depth penetration by extending the walls to the relatively impermeable bedrock or as partial cut-off system. In situations where the groundwater seepage into the excavation is relatively high and the cut-off system does not extend to full depth, dewatering within the construction site is employed to supplement the cut-off system.

However, such dewatering method could cause the lowering of water table not only within the site and in the vicinity of the excavation footprint, but also extend to a certain distance away from the excavation. The extent or

zone of influence of dewatering depends on a number of factors including the cut-off system, initial groundwater conditions, and ground conditions, etc.

The lowering of water table by dewatering can induce soil settlement which is detrimental to buildings and structures located above the affected water table. When the water table is lowered, the effective load on the underlying soil is increased by amount equal to the difference between the drained and submerged weights of the entire soil mass between the original and lowered water table. If the underlying soil is compressible, the increased overburden pressure will cause compression of the soil, inducing settlement of the ground.

Such phenomena could occur in most soil types. However, in situations involving weak compressible soils, dewatering can cause more substantial settlements. When there is spatial variability in ground conditions within a given region, it is clear that difference in settlement (i.e., differential settlement) can be expected.

Such total settlement and differential settlement will then impact the structures bearing on the ground surface including residential and commercial buildings, leading to movement and distortion of the structures.

5.2 Adopted settlement criteria

To effectively control the potential damage caused by dewatering, it is essential to assess the maximum acceptable settlement for the buildings in the Rose Bay area. The settlement criteria applicable to the existing buildings, typically one to two storeys constructed on shallow footings, have been developed primarily based on Australian Standards AS2870-2011 and relevant published literature by Burland et al. (2002) on building settlements and associated damages.

5.2.1 Assessment of settlement criteria

The Australian Standard AS2870-2011 has been developed for the purpose of site classification, design and construction of foundation systems associated with typical residential buildings. This standard also provides typical surface movements for various site classifications along with the related damage category.

Consistent with the works presented by Burland et al. (2002), AS2870-2011 provides five categories of damage with reference to walls, numbered 0 to 4 in increasing severity. Normally categories 0, 1 and 2 relate to ‘aesthetic’ damage, 3 relates to ‘serviceability’ damage and 4 represents damage affecting ‘stability’. Burland et al. (2002) have indicated that the dividing line between categories 2 and 3 damage is particularly important. If the damage exceeds Category 2 the cause is usually much easier to identify and is frequently associated with ground movement. To minimise the residual risks of property damages in Rose Bay, the design settlement criterion should be selected based on a more cautious Category of 1 or better.

Cracking in masonry walls is usually, but not always, caused by differential settlement. With reference to the schematic representation shown in Figure 9 regarding the deflection ratio Δ/L at which cracking is initiated, Burland (1997) provided the limiting Δ/L values in percentage for the different categories of damage for masonry wall with zero horizontal strain (see Table 3). With a clear notion of minimising the risks of property damages in the Rose Bay area, the threshold for a cautious damage Category 1 was considered. Then using Δ/L of 0.075% (maximum value for category 1) and for a building comprising full masonry construction with a typical wall length of 20 m, a differential wall settlement of 15 mm could be adopted as the maximum tolerable value before cracking become visible and is classified as being at risk of Category 2 damage.

In relation to pipe drain tolerances, the acceptance criteria of 0.1 degree for joint rotation of relatively rigid pipes such as cast iron pipe can be adopted based on consultation with Sydney Water for past projects, as well as CIRIA (1996) publication titled “Prediction and effects of ground movements caused by tunnelling in soft ground beneath urban areas”. The aforementioned threshold deflection ratio of 0.075% corresponds to a rotation of about 0.043 degrees, which is deemed to be satisfactory for the allowable joint rotation of rigid pipes.

Theoretically correct and simple as it may seem, the evaluation of differential wall settlement is not always straight forward. Alternatively, total ground (surface) settlement limits could be used as an ultimate measure to control damage of buildings caused by dewatering. Table 2.2 of AS2870-2011 indicates that damage categories 0 to 1 for masonry (veneer or full) are normally present in Class S site, where the site classifications are defined in Table 2.1 of AS2870-2011. Further, the characteristic surface movements (ys) for Site S is 0 - 20 mm in accordance with Table 2.3 of AS2870-2011. This threshold surface movement is commensurate with the above differential wall

settlement of 15 mm for category 1 damage. If the building is conservatively assumed to have no stiffness so that it conforms to the 'greenfield site' subsidence trough, then it is possible to consider ys to be conservatively the same as the differential wall settlement. The adoption of this conservative assumption is reasonable because the surface settlement limit that is applicable to existing buildings will have to be assessed in light of possible past damage and flexibility of the buildings. Relatively rigid and damaged structures now are likely to be more sensitive to increased surface movement due to loss of stiffness, and therefore some reduction in the settlement limit might be appropriate. The above differential wall settlement of 15 mm occurs within the conditions of Class S Sites, where damage Category 1 ('aesthetic' damage) is applicable. In Tables C1 and C2 of AS2870-2011, damage Category 1 is described as fine cracks to walls and concrete floors of less than 1 mm which typically do not need repair.

For the purposes of current assessment of dewatering, we have considered a total ground surface settlement of 15 mm as being the limiting value to control potential damage of existing buildings.

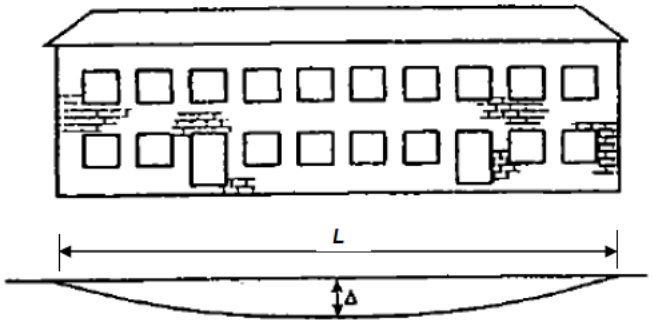


Figure 9 Schematic representation of wall deflection

Table 3 Relationship between category of damage and limiting Δ/L for zero horizontal strain in accordance with Burland et al. (2002)

Category of damage	Normal degree of severity	Limiting Δ/L (%)
0	Negligible	0.05
1	Very slight	0.075
2	Slight	0.15
3	Moderate	0.3
4	Severe to very severe	> 0.3

5.2.2 Surface settlement and water table fluctuation

The amount of settlement which could be induced into the existing buildings in the vicinity of a construction site will depend upon the extent of external water table lowering caused by the dewatering and the intrinsic soil properties.

For a water table fluctuation of typically within 1 m, the surface settlement caused by the initial loading (i.e. the initial drop of groundwater level) would be the greatest. The settlement induced by the subsequent groundwater variation of the same magnitude would be only about one-tenth to one-half of that experienced under initial loading. Therefore, if the drawdown of the groundwater level is within the range of the water table fluctuation, then the induced surface settlement is anticipated to be small and should be similar to that observed due to groundwater variation. However, a further drop in water table beyond the historic groundwater fluctuation range would lead to settlements of increased magnitude rapidly approach the estimate for the initial loading. For the assessment of dewatering induced settlement presented in the following sections, our adopted initial groundwater

level has generally been based on the relatively low side of the fluctuation range in accordance with the available groundwater records.

6. Geotechnical Assessment of dewatering-induced settlement

6.1 Methodology

6.1.1 Overview of assessment approach

The general methodology for the geotechnical assessment of settlement can be described as per the flowchart given in Figure 10 below. In essence, the severity of the dewatering-induced settlement is strongly related to ground conditions present on site. For example, the lowering of groundwater in areas with presence of highly compressible peaty soils would cause a much greater settlement than other areas without peat. It is essential to examine the variability of ground conditions and to identify areas susceptible to ground movements upon dewatering. Therefore, the "first part" of the settlement assessment was to develop site specific geotechnical models and to assess and compare the ground settlement responses upon dewatering for the different sub-divided areas within the Rose Bay study area. These results were presented on 'settlement index plots' to provide a visual identification of areas with different degrees of ground settlement response to groundwater drawdown due to construction dewatering.

The "second part" of the settlement assessment was to establish the relationship between dewatering of the developments and the groundwater lowering for the different sub-divided areas identified in the first part of the assessment. The ultimate goal of the assessment is to establish groundwater drawdown limit that can be used to develop recommendations in relation of dewatering controls.

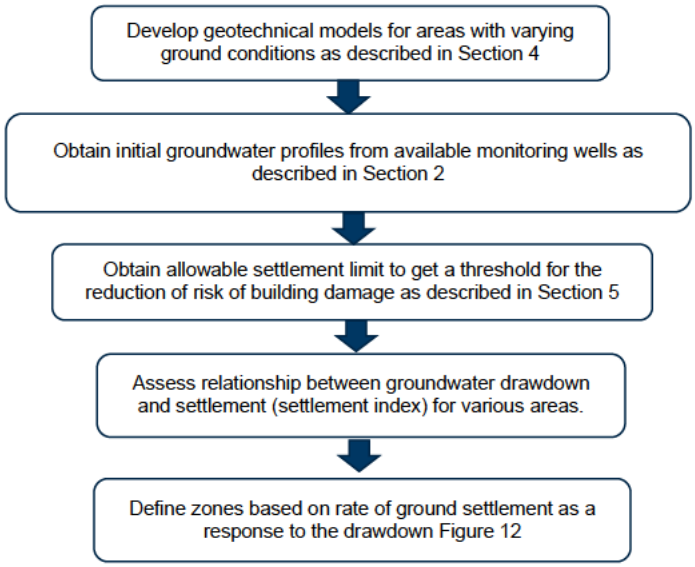


Figure 10 Flow chart showing general methodology for the settlement assessment

6.1.2 Settlement index analysis

Settlement analyses corresponding to predefined depths of groundwater drawdown were conducted for selected data points outlined in Figure 1 and Figure 2. The data points were selected based on the following approach:

- Available geotechnical data with groundwater levels and top to the rock were initially filtered out. It was noted that geotechnical information at many locations did not include both groundwater level and depth to rock.
- Using available groundwater and rock level information, counters of rock levels and groundwater levels were prepared. The rock level contours indicated a shallow soil profile on the hillsides with groundwater levels generally near or below rock levels. Therefore, the settlement at the sites on the hillsides is small and are considered not critical for dewatering induced settlement.
- Additional locations where both groundwater and rock level information are available were selected based on the following considerations. The rock and groundwater levels at these locations were inferred from the rock and groundwater contours.
    - Geotechnical or groundwater bores that encountered peat layers. It should be noted only the geotechnical reports for 75-77 O'Sullivan Road and 27 Salisbury Road indicated the presence of peat. However, there are a few groundwater bores, mostly located within the golf course area, indicated layers of peats.
    - Where the soil profile is deep
    - Areas with large data gap spatially.
- Where more than one borehole data available at a selected site, the borehole with worst soil profile (very loose and/or deep) has been selected.

For each selected data point, site specific geotechnical model was developed based on the available geotechnical investigation and groundwater bore summary data. The results of all assessed settlement points were subsequently compiled to form a "Settlement Index Plot" in response to an assumed fixed groundwater drawdown depth. The drawdown depth of up to 5 m was considered because an uncontrolled dewatering of 2-level basement construction could potentially result in lowering of the original water table by up to 5 m.

Based on this Settlement Index Plot together with the consideration of the spatial variability in ground conditions between the data points, a more generalised settlement map was developed, which shows degrees of susceptibility to dewatering-induced ground surface settlement for different sub-divided zones within the Rose Bay study area. The settlement index provides a means to understand the response of ground settlement to various levels of drawdown at a given location, irrespective of any profile of groundwater drawdown caused by any particular development.

The dewatering induced settlement for each data points was analysed based on one-dimensional (1D) settlement method where soil layers were modelled as follows:

- Elastic models with characteristic Young's moduli for granular materials
- Consolidation models with recompression and compression coefficients for fine grained soils

The compressibility properties adopted for the different soil / rock units are summarised in Table 4. These engineering parameters were derived on the basis of:

- Review of in-situ testing results from available geotechnical investigation data
- Use of empirical or semi-empirical correlations applicable for similar soil types
- Our experience on local geology, projects with similar soil types and challenges

The following considerations and assumptions were made in developing the geotechnical models and assessing settlement:

- Settlement of rock is negligible.
- Groundwater bore summary logs do not include consistency of the materials. Therefore, it was assumed that Unit 3A extends up to 3 m depth, Unit 3B extends up to 10 m depth followed by Unit 3C to the top of the rock. Assumptions on the depth of 3A and 3B are based on the review of information from geotechnical reports.
- Upper peat layer is assessed to be firm consistency with undrained shear strength of 40 kPa based on the hand penetrometer results available at 75-77 O'Sullivan Road. Lower peat layer is assumed to be stiff to hard with undrained shear strength of 85 kPa.
- Groundwater levels are based on that noted during borehole drilling or available limited monitored groundwater levels. Seasonal variation has not been considered.

Table 4 Summary of geotechnical properties for all foundation units

Unit/Material	Bulk Unit Weight (kN/m^3)	Compressibility parameters for fine-grained soil		Undrained Shear Strength s_u (kPa)	Young's Modulus of Elasticity E for sandy soils (MPa)
		Compression Ratio CR (1)	Recompression Ratio RR (2)		
1 – Fill	18	N/A	N/A	N/A	10
2 – Stiff to hard Clay	19	0.1	0.014	85	N/A
3A – Very loose to loose Sand	17	N/A	N/A	N/A	5
3B – Loose to medium Dense Sand	18	N/A	N/A	N/A	10
3C – Dense to very dense Sand	20	N/A	N/A	N/A	30
4A – Firm Peat	15	0.325	0.054	30	N/A
4B – Stiff to Hard	17	0.3	0.05	85	N/A
5A – Residual Soil (Clayey Sand)	19	N/A	N/A	N/A	50
5B – Extremely to highly weathered Sandstone	21	N/A	N/A	N/A	100
5C – Moderately weathered to Fresh Sandstone	23	N/A	N/A	N/A	250

6.2 Settlement Index Plot and settlement zones

The analysed settlement index obtained for various drawdown depths was used to assess the sensitivity of ground settlement response to the groundwater drawdown due to construction dewatering. The assessed settlement index in response to an assumed 1m depth of groundwater drawdown are presented as Figure 11.

Note that there are inherent uncertainties associated with the settlement index plot owing to the following factors:

- Inevitable spatial variability in ground conditions between settlement points that could result in differential settlements beneath structures.
- Uncertainty within locations where sufficient investigation data was not available.

Based on the Settlement Index Plot depicted in Figure 11 and the uncertainties outlined above, a more generalised settlement map was developed that delineates three settlement zones with different degrees of susceptibility to dewatering-induced ground surface settlement. The settlement zones and their descriptions are given in Table 5 below. The zones and their extent were superimposed in a plan with topographical contours as shown in Figure 12. Further, the variation of settlement with drawdown depths was plotted for various zones. These plots are shown as Figure 13 to Figure 15. The significance of these settlement plots is further discussed in the subsequent section.

Table 5 Description of various Settlement Zones

Zone Assignment	Description	Typical Settlement for given Drawdown Levels
A	Areas which are highly sensitive to drawdown due to the ground conditions. Consequently, higher settlement magnitude can likely occur and adversely impact adjacent properties.	Settlement of more than 15 mm for 1 m drawdown depth Differential settlement which can exceed 15 mm for drawdown up to 4 – 5 m
B	Areas which are moderately sensitive to drawdown due to the ground conditions. Although the assessed settlement was generally less than Zone A, this zone can continue settling with the increase in drawdown due to thicker soil profile or compressible layer located at deeper strata.	Settlement between 5 mm and 15 mm for 1 m drawdown depth Settlement can exceed 15 mm for excessive drawdown up to about 4 – 5 m
C	Areas which are less sensitive to drawdown due to ground conditions (e.g. shallow bedrock, lower original water table with respect to soil layers)	Settlement of less than 5 mm for 1 m drawdown depth Settlement is likely to be limited with the increase in drawdown depth due to shallow rock profile

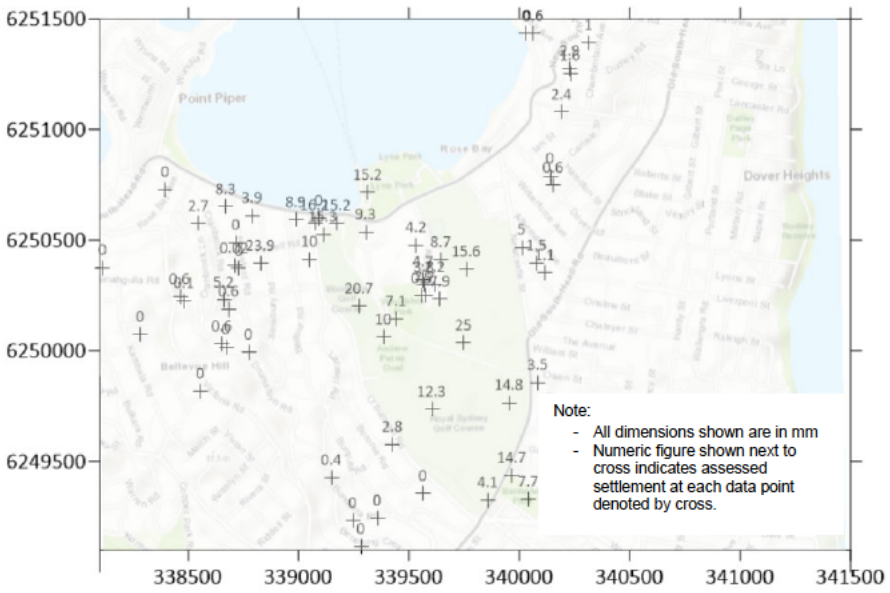


Figure 11 Assessed settlement index for 1-m drawdown depth

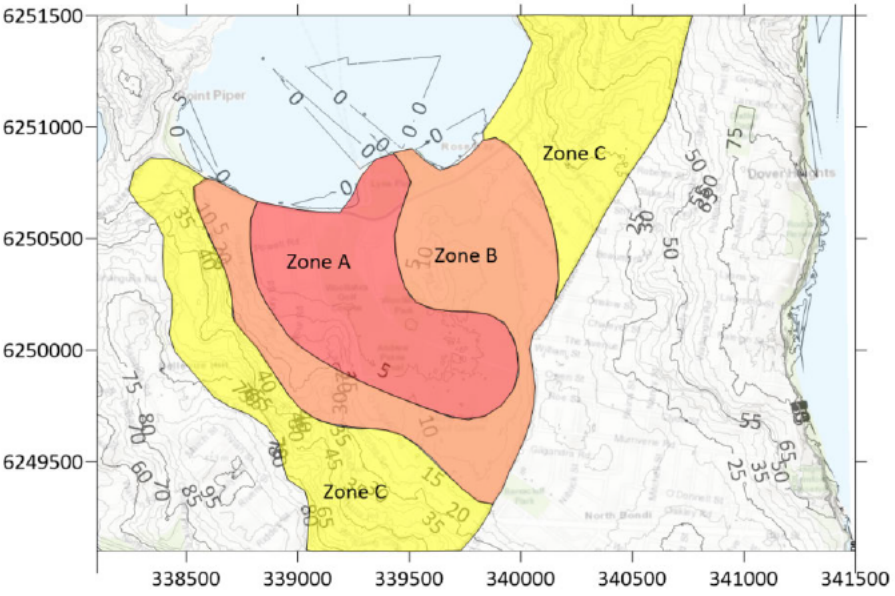


Figure 12 Settlement zones and their extent on a plan overlaying elevation contour

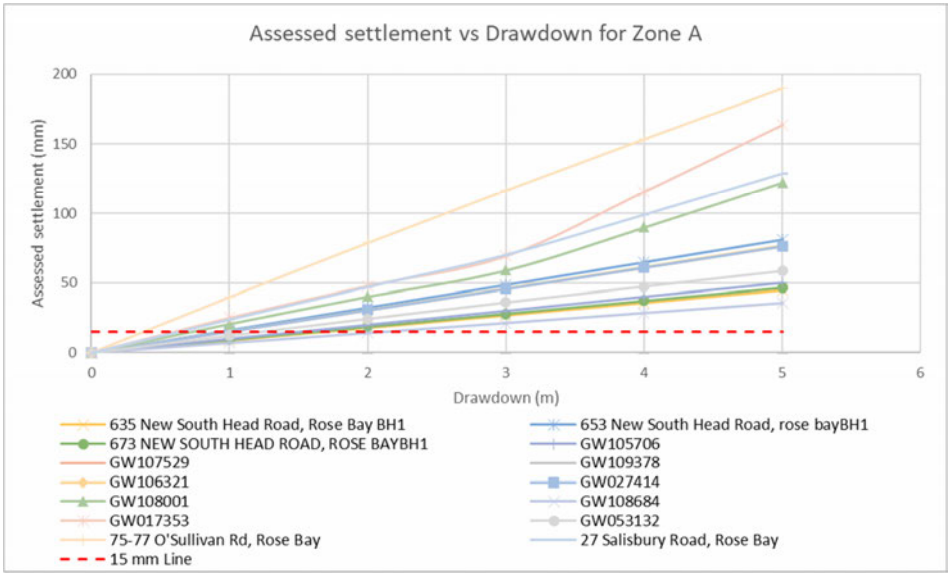


Figure 13 Settlement Index for various drawdown for Settlement Zone A

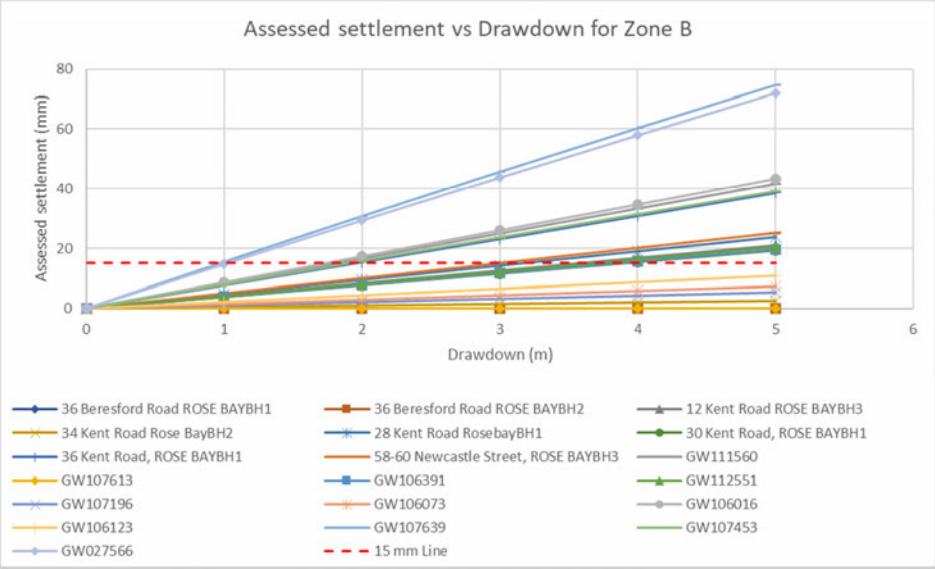


Figure 14 Settlement Index for various drawdown for Settlement Zone B

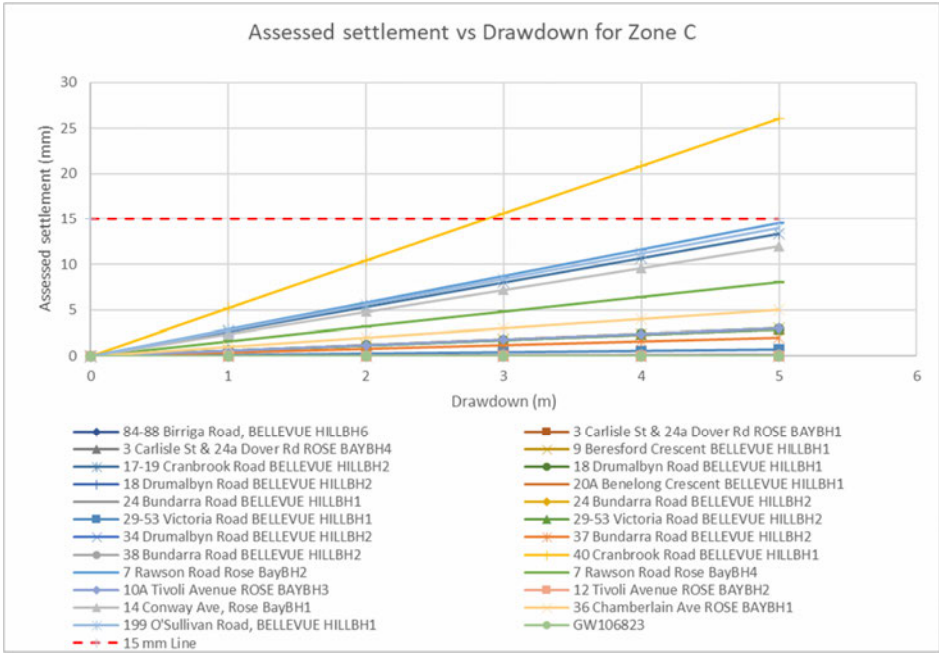


Figure 15 Settlement Index for various drawdown for Settlement Zone C

6.3 Discussions

The magnitude of assessed settlement will depend on the original and lowered groundwater levels as well as the ground conditions. The settlement index analysis has been conducted by considering an increasing drawdown depth of up to a maximum of 5 m below the original groundwater levels as shown in Figure 13 to Figure 15. These figures indicate the following points:

- The general trend of the analysis results indicates that the greater the groundwater drawdown depth, the greater surface settlement will be experienced in the different sub-divided zones.
- Settlement at locations of peat layer is larger than 15 mm for 1 m drawdown and these areas fall into Zone A. For example, the total settlement at 75-77 O'Sullivan Road in Zone A can be as high as 190 mm for a drawdown depth of 5 m as shown in Figure 13.
- Majority of Zone A locations are within the geological unit Qhei, where peat is anticipated, as shown in Coastal Quaternary Geological Map presented in Figure 5. This unit is described as Holocene interbarrier creek deposits comprising marine sand, silt, clay, mud, peat, gravel and shell. Presence of peat induces greater settlement than that in other surrounding areas which consist of mostly marine sand
- Some variability in the assessed total settlements could be observed among the data points located within the same zone. These spatial variabilities become more pronounced with the increase in total settlements which consequently can increase the risk of the occurrence of differential settlement. It can be recalled from Section 5 that certain value of differential settlement would be sufficient to increase the risks of building damage.
- Based on the Settlement Index Plots,

- For Zone A, the drawdown depths associated with proposed settlement limit of 15 mm were assessed to vary between 0.3 m and 2 m.
- For Zone B, the drawdown depths associated with proposed settlement limit of 15 mm were assessed to vary between 1.0 m and greater than 5 m.
- For Zone C, the drawdown depths associated with proposed settlement limit of 15 mm were assessed to vary between 2.9 m and greater than 5 m.

A corollary of this finding is that a 0.3 m depth of dewatering can be considered as a relatively safe limit to control building damage within Zone A.

- The water table drawdown due to dewatering could extend up to a considerable distance away from the dewatering location based on the seepage analysis carried out for Double Bay for specific development. From the analysis outcome from Double Bay and considering the sensitivity of ground settlement response in some areas (e.g, Zone A) to the drawdown, it is practical that the safe limit of dewatering of 0.3 m is applied for settlement Zones A and B of the study area.

From constructability viewpoint, it can be necessary to dewater sufficiently to enable the dry excavation during construction. If the above drawdown limits cannot be achieved, other controls are also available to reduce groundwater drawdown in the adjacent areas to within the acceptable limit. These include the following:

- Systematic groundwater reinjection/recharge during excavation dewatering;
- Sufficient cut-off depth to limit groundwater drawdown outside of the excavations; and
- Elimination of the need for dewatering by providing a sealing layer on the excavation base which needs to be adequately designed to resist uplift pressure.

Alternative measures can be considered on a case-by-case basis to allow for a review of the drawdown limit. These measures should include the undertaking of sufficient additional geotechnical investigations and subsequent analysis to demonstrate that settlement impacts of surrounding building are within acceptable limit.

It is noted that the water table will likely stabilise to a level that is near the original groundwater levels following a certain period after the dewatering is terminated. However, the settled ground and other environmental features impacted by the groundwater drawdown will not likely return to the original conditions.

7. Long term groundwater related settlement

Another potential impact arising from developments with large basement or underground structures is the impact on the regional groundwater flow. Mechanisms to reduce depressurisation and subsidence such as tanking of below water table structures, can create impediments to regional groundwater flow.

Total and differential settlement due to these hydrogeological changes are also equally important and needs to be considered during the planning stage.

No specific assessment with large basement or underground structures have been undertaken for Rose Bay. However, the modelling of cumulative impacts associated with multiple subterranean structures (basements) carried out for Double Bay has shown that mounding and lowering of the water table could occur over the long term albeit this is generally estimated to be less than 0.3 m assuming full cut-off (basements extending to the Bedrock) and up to 0.2 m assuming partial cut-off, with mounding of <0.2 m in areas of shallow water table. It should be noted that the geomorphological/geological setting of Double Bay is a narrow incise valley filled with alluvium sand.

Based on the outcome from the assessment undertaken for Double Bay and considering the extensively wider flow path in the Rose Bay area, the risk of impeding the regional groundwater flow and associated impact is considered much lower in Rose Bay compared to that assessed for Double Bay. However, specific groundwater modelling

would be required to assess impact if major development proposal with extensively large and deep basements that block significant portion of flow path are considered in future.

8. Landform stability

8.1 Landslide/ Slope instability

Reviews of the accessible records did not indicate occurrences of any major landslides or slope failures within the study area due to natural factors such as heavy rain and erosion. However, geological, topographical, and geo-morphological conditions within the hillside of the study area in the west and east of golf course indicates that a landslide or slope instability could be possible, particularly during extreme rainfall events when the sand is saturated.

It is noted that a failure of road shoulder at Victoria Road near Cooper Park occurred due to a burst water main. Although this occurrence was not considered to be due to landform instability, it is a good example indicating collapsible nature of a saturated sand. Therefore, it is essential that the stability of a development site or neighbouring sites which may be affected by the construction activities such as excavation needs to be assessed by a qualified geotechnical engineer or engineering geologist.

8.2 Erosion

Erosion is the process by which wind or water removes sand particles from a surface. It is a natural phenomenon that occurs in areas where there is a significant amount of loose sand, such as beaches, deserts and sand dunes.

In coastal areas, sand erosion is often caused by the impact of waves and tides, which can carry away sand from the beach and deposit it elsewhere. This can lead to beach erosion, which can have negative impacts on the local ecosystem and community.

Given the sloping terrain with surficial very loose to loose sand in the study area, natural events such as heavy rainfalls and flooding may cause sand erosions and lead to instability of slopes.

Sand erosion can also cause damage to buildings, infrastructure, and other human-made structures. Construction sites often involve the excavation of soil and the movement of large quantities of earth, which can cause soil erosion and sedimentation in nearby waterways. It is important to implement erosion control measures to prevent erosion due to construction activities. This can include the use of erosion control blankets, silt fences, and sediment basins, as well as the planting of vegetation to stabilize the soil.

In addition, construction activities should be planned and managed in a way that minimises their impact on the environment. This can include avoiding construction in sensitive areas such as wetlands and floodplains and minimizing the amount of soil disturbance and grading.

Cases of sand erosion problems in Rose Bay area have been documented.

8.3 Rock falls/ wedge failures

Rock falls or rock wedge failures can be caused by a variety of factors, including presence of adverse rock defects, natural geological processes, for example erosion, weathering, and seismic activity, as well as human activities, such as excavation.

Review of the geotechnical reports provided by the Council and observations from site visit indicates a number of properties with exposed rock cliffs or walls/faces.

Rock fall hazard assessment is required to identify areas where there is a risk of rock falls and to develop appropriate strategies to mitigate the risk. These assessments typically involve a combination of field observations, geotechnical analysis, and computer modelling to predict the probability and magnitude of rock fall events.

To reduce the risk of rock falls, measures such as rockfall barriers, retaining walls, slope stabilization, and drainage systems can be implemented. It is also important to educate people about the potential dangers of rock falls and to establish emergency response plans to deal with any incidents that may occur.

8.4 Observations from site visits

A site walkover was conducted by a senior technical director in geotechnical engineering from GHD on 20 January 2023, to appreciate the overall geotechnical conditions and ongoing constructions activities within a part of the Rose Bay area. This included Norwich Road, Kent Road, Elanora Street, Manion Avenue and O'Sullivan Road.

Two subsequent walkovers were conducted along with Council representatives on 3 February 2023 and 18 April 2023. During the first walkover, the visited locations included Cranbrook Road, 53-55 Drumalbyn Road and Victoria Road in Bellevue Hill. During the second walkover, the properties at 82 and 84 Beresford Road, Bellevue Hill were visited.

The following observations were made during the visit on 3 February 2023:

- Tension cracks on the footpath along Cranbrook Road were observed. Figure 16 presents photos taken during the visit showing the tension cracks. Tension cracks are often a sign of distress indicating ground movement. Noting the footpath is on top of a slope, these cracks could potentially be associated with/indicative of a slope instability issue. However, other soil characteristics such as shrink-swell may also cause tension cracks.

Figure 16 Tension cracks on footpath along Cranbrook Road

- Overhanging rock face at the back of 53-55 Drumalbyn Road, Bellevue Hill. Photos taken during the visit are shown in Figure 17.

Figure 17 Overhanging rock at the back of 53-55 Drumalbyn Road, Bellevue Hill

- External stairs with cracked hand-rail kerb. The cracks are potentially associated with ground movement. Figure 18 shows the observed cracks.

Figure 18 Cracked hand-rail kerb along an external stair.

- Sandstone block vertical retaining walls of greater than 3 metres high. Figure 19 shows photos of some of these walls.

Figure 19 Sandstone block retaining walls

- Ongoing multi-level developments on Kent Road as shown in Figure 20.

Figure 20 Ongoing multi-level developments on Kent Road (photo from Manion Avenue Car Park)

- Ongoing deep (greater than 5 m) excavation supported anchored contiguous pile wall in Drumalbyn Road.
- Residential stormwater line outletting on a slope.

The following observations were made during the site visit on 18 April 2023:

- Cracking of exterior rendered brick walls, with examples shown in Figure 21.

Figure 21 Exterior rendered brick walls

- Cracking and leaning of brick/block retaining walls, with examples shown in Figure 22.

Figure 22 Brick/block retaining walls

- Cracking of interior walls, with examples shown in Figure 23.

Figure 23 Interior walls

- Cracking in tiles and timber window frame as shown in *Figure* 24.

Figure 24 Tiles and timber window frame

- Distortion of timber fence, garage door and ceiling cornice as shown in Figure 25.

Figure 25 Timber fence and garage door

Based on the information provided by the residents at the properties, we understand that the defects were noticed during or shortly after recent constructions on Drumalbyn Road, located approximately 100 m away. Furthermore, residents at the above 2 properties informed that vibrations were felt during the recent constructions.

Development of guidelines around construction induced vibrations and assessment of ground settlement that may arise from these, is discussed in Section 9.

8.5 Recommended practice – Landslides

Practice Note Guidelines for Landslide Risk Management 2007 by Australian Geomechanics Society (AGS) provides some guidelines for hillside construction, and good and bad examples of hillside construction practice. This practice notes provide guidelines for regulators and practitioners.

Chapter 8 of *Natural Hazards in Australia – Identifying Risk Analysis Requirements* by Australian Government detail the requirements of landslide hazard identification, risk analysis and mitigations measures. It includes responsibilities of various parties including federal, state and local governments, professional bodies and property developers.

It states *"Developers are required to prepare development applications which address councils' provisions relating to development in areas susceptible to landslides. The developer is required to provide a geotechnical assessment of the site which demonstrates that the development proposal takes into account appropriate mitigation techniques, and to seek advice from qualified engineering geologists and geotechnical engineers on site slope instability as part of that assessment. A qualified geotechnical professional may assess the reliability of these reports in landslide-prone areas".*

9. Construction induced vibrations

9.1 General

During basement construction, vibration from construction machinery is likely to transmit through the ground to other nearby properties. There is a range of construction activities which could result in the transmission of significant vibration, including building demolition, pile driving, soil compaction and rock excavation via ripping, hammering or blasting. There are two main types of detrimental effects that vibrations can have, one being the disruption of human comfort and the other causing building damage. The magnitude of vibration is often measured in terms of peak particle velocity (ppv) expressed in mm/s. Typically, a significantly higher ppv is required to cause building damage as opposed to disrupting human comfort. Limits imposed upon construction induced vibration are typically developed with consideration of both human comfort and building damage.

9.2 Existing guidelines

The following publications provide guidance with respect to limits imposed upon construction induced vibration for sites in New South Wales:

- AS ISO 2631.2-2014 Mechanical vibration and shock – Evaluation of human exposure to whole-body vibration. Part 2: Vibration in buildings (1 Hz to 80 Hz).
- AS 2187.2-2006 Explosives – Storage and use. Part 2: Use of explosives.
- Assessing Vibration: A technical guideline, Department of Environment and Conservation NSW (February 2006).
- German Standard DIN 4150-3 -2016- Vibrations in buildings - Part 3: Effects on structures.

AS ISO 2631.2-2014 supersedes the Australian Standard AS 2670.2-1990, which specified vibration limits with respect to human comfort. The new standard does not specify any limits and states that *"In Australia, state and territory government regulators provide guidelines and limits for the immission of vibration in buildings and it is recommended that reference be made to their publications for such advice".* In this case, the technical guideline by

the Department of Environment and Conservation (DEC) NSW referenced above can be utilised to obtain vibration limits with respect to human comfort. The limits in this guideline are based on the British Standard BS 6472-1992. The guideline also makes reference to a report by Hiller and Crabb (2000) which contains useful data on attenuation, i.e. the reduction in ppv that occurs with increased distance from the source of vibration.

With regards to building damage, there is guidance provided in Appendix J of AS 2187.2-2006, which makes reference to the limits defined in the British Standard BS 7385.2-1993 and the United States Bureau of Mines (USBM) report RI 8507. The limits in USBM RI 8507 were developed with respect to vibrations resulting specifically from surface mine blasting, whereas those in BS 7385.2 relate to building damage resulting from ground-borne vibration more generally..

The limits from BS 7385.2 are therefore considered more applicable when considering the range of vibration sources that could be present on construction sites and the building types within Rose Bay. However, BS 7385.2 does not provide any guidance on acceptable vibration limit for sensitive structures. German Standard DIN 4150-3 includes guidelines for residential buildings together with criteria for both commercial/ industrial buildings and high sensitivity structures. This standard provides increased levels of vibration (i.e., higher ppv) as the wave frequency increases.

9.3 Calculation of limits

9.3.1 Human comfort

Vibration limits for human comfort may be determined in accordance with Tables 2.2 and 2.4 in the above-referenced DEC guideline. The use of these tables requires selection of:

- The location where vibration levels are to be assessed (residence, office, school etc).
- The time of day/night that the vibrations occur.
- Whether the vibration is continuous (uninterrupted), impulsive (a small number of short occurrences) or intermittent (repeated occurrences).
- Whether the vibration is felt from back to chest (x axis), side to side (y axis) or head to foot (z axis) by those who perceive it.

The limits in Table 2.2 of the DEC guideline for continuous and impulsive vibrations are expressed as root mean square accelerations in m/s^2. Equivalent values of ppv are provided in Appendix C of the guideline for vibrations along the z axis, which is the most critical axis when the limits are expressed in terms of ppv. The limits in Table 2.4 of the DEC guideline for intermittent vibration are expressed as vibration dose values, which quantify cumulative vibration experienced over a specified period of time.

9.3.2 Building damage

Vibration limits for building damage can be determined in accordance with BS 7385.2-1993, which requires knowledge of the vibration frequency. The limits for cosmetic damage are reproduced in Appendix J of AS 2187.2-2006 as Table J4.4.2.1 and Figure J4.4.2.1. For reinforced or framed structures, the limiting ppv is 50 mm/s for $f =$ 4 Hz and above. For unreinforced or light framed structures, the limiting ppv is 15 mm/s for $f = 4$ Hz, increasing to 20 mm/s for $f = 15$ Hz and then to 50 mm/s for $f = 40$ Hz and above. For frequencies below 4 Hz, a limiting zero-to-peak displacement of 0.6 mm is specified for all building types.

Hiller and Crabb (2000) reported that the range of vibration frequencies most commonly encountered from construction works is 8-80 Hz. Therefore, in the absence of data on frequency, a conservative value of $f = 8$ Hz may be used to determine vibration limits for building damage as per the above.

German Standard DIN 4150-3 also considers various frequency of vibration to define the acceptable limits for residential buildings, commercial/ industrial buildings and high sensitivity structures. It also provides different vibration limits at foundation level and building floor levels with the consideration of the direction of vibration. For residential buildings, limiting ppv is 5 mm/s for the vibration frequency between 1 Hz and 10 Hz, and larger ppv limits up to 15 mm/ s and 20 mm/s are allowed for frequencies up to 50 Hz and 100 Hz, respectively at foundation level. For commercial/industrial buildings, limiting ppv is 20 mm/s for the vibration frequency between 1 Hz and 10

Hz, and larger ppv limits up to 40 mm/ s and 50 mm/s are allowed for frequencies up to 50 Hz and 100 Hz, respectively at foundation level. A lower limit has been proposed for sensitive buildings. The limiting ppv is 3 mm/s for the vibration frequency between 1 Hz and 10 Hz, and larger ppv limits up to 8 mm/ s and 10 mm/s are allowed for frequencies up to 50 Hz and 100 Hz, respectively at foundation level for sensitive buildings.

9.4 Suggested limits

Based on DEC guideline and BS 7385.2-1993, peak particle velocity limits have been determined for construction induced vibrations experienced in residential and commercial settings, which are covered in Table 6 and Table 7 respectively. The residential limits should be applied in R1, R2, R3 and R4 residential areas as per the NSW government's planning zones. In all other areas the commercial limits could be applied.

Table 6 Peak particle velocity (ppv) limits for construction induced vibrations in residential settings

Time Period	Preferred Value (mm/s)	Maximum Value (mm/s)
Continuous vibration		
7am - 5pm	0.28	0.56
5pm - 10pm	0.24	0.48
10pm - 7am	0.2	0.4
Intermittent vibration [1]		
7am - 5pm	2.5	5
5pm - 10pm	1.6	3.2
10pm - 7am	0.8	1.6
Impulsive vibration		
7am - 5pm	8.6	17
5pm - 10pm	5.7	11
10pm - 7am	2.8	6

[1] Considers equal operational and rest time, with continuous operation to be no more than 2 hours.

Table 7 Peak particle velocity (ppv) limits for construction induced vibrations in commercial settings

Time Period	Preferred Value (mm/s)	Maximum Value (mm/s)
Continuous vibration		
All times	0.56	1.1
Intermittent vibration [1]		
All times	4.9	9.8
Impulsive vibration		
All times	18 [2]	36 [2]

[1] Considers equal operational and rest time, with continuous operation to be no more than 2 hours.

[2] 17 mm/s for unreinforced or light framed structures. Can be increased if the vibration frequency is greater than 8 Hz.

Most of the limits in Table 6 and Table 7 relate to human comfort, and have been selected according to the above-referenced DEC guideline with the following exceptions:

- An additional time period of 5pm - 10pm has been defined for residential settings, with limits set halfway in between those for the 7am - 5pm and 10pm - 7am time periods. This has been done to ensure residents do not experience as much vibration during the evening as they would during the daytime.
- Peak particle velocities have been specified for intermittent vibrations, as opposed to the vibration dose values recommended in the DEC guideline. This has been done to simplify interpretation and allow direct comparison

with the limits for continuous and impulsive vibrations. The above-specified ppv values for intermittent vibration have been calculated as approximately one quarter of the way between the limits for continuous and impulsive vibrations. Based on experience with previous projects, it is suggested that the intermittent vibration limits be applied in circumstances where the operational time (i.e. the time when vibrations are being emitted) is followed by a rest period of equal length where no vibrations are emitted. The time of continuous operation should not be any more than 2 hours, which is typical for many construction activities. Alternatively, limits of vibration dose values specified in DEC guideline shall be adopted for intermittent vibrations.

- The peak particle velocity for impulsive vibrations in commercial settings should be limited to 17 mm/s for unreinforced or light framed structures. This is in consideration of building damage, conservatively assuming a vibration frequency of 8 Hz as per Section 9.3.2. This limit can be increased in accordance with BS 7385.2-1993 if it can be demonstrated that the vibration frequency is greater than 8 Hz. However, the preferred and maximum limits of 18 mm/s and 36 mm/s respectively for human comfort should also be adhered to.

Reference may be made to the DEC guideline for examples of continuous, intermittent and impulsive vibration. Many construction activities, including vibratory rolling, jack hammering and pile driving may be classified as intermittent, with repeated occurrences over a long period that are separated by breaks. Vibrations from a single blasting event or dropping of heavy equipment may be classified as impulsive. Machinery that operates continuously throughout the day such as generators and pumps are examples of sources that produce continuous vibration.

The preferred values of vibration limits in Table 6 and Table 7 are proposed as possible vibration limits to be adopted for future developments. In addition, time of intermittent operations should be limited to less than 2 hours for each episode.

Where it is not possible to meet the suggested limits above, vibration values up to the maximum limits may be acceptable provided that detailed assessment of the impact of vibration including proposed monitoring regime is provided and agreed with stakeholders. Further detail is provided in the DEC guideline.

Although the suggested limits have been presented in Table 6 and Table 7, the vibration caused by a construction activity depends on several factors such as construction methodology, plants and equipment and ground conditions. The impacts of vibration to neighbouring properties also depend on several factors such as setting (commercial/residential), sensitivity and type of building, frequency of vibration, direction of vibration, time of activity in a day, duration, etc. Therefore, German Standard DIN 4150-3 may be considered most appropriate for defining the limits for building damage in many cases. The selection of construction equipment and methodology should be such that vibration is limited to acceptable levels. Applicant should submit a statement/report from qualified personnel such as Geotechnical Engineers or Acoustic Consultants that the vibration would be compliance with relevant vibration standards, guidelines and legislation. The selection of vibration limits should consider both human comfort and structural damage. Assessment on acceptable vibration levels should be based on the proposed construction activities and plants. The statement/report should specify methods for reducing vibrations within acceptable levels when the proposed construction activity or plant is likely to cause vibration greater than the acceptable limits.

9.5 Monitoring program

The vibration limits proposed by the applicant's consultant should be imposed at the boundary of the property where construction work is taking place. With vibrations attenuating at distance from their source, this will ensure that the magnitude of vibrations transmitted outside the property is less than or equal to the imposed limits at the property boundary. It is then recommended that the following measures be put in place as part of a program for monitoring vibrations during construction activities:

1. An implementation plan including a vibration monitoring program and contingency plan should be submitted by the applicant. The plan should include the locations of vibration monitoring sensors, trigger levels for anticipated vibration types and buildings in the neighbourhood and frequency of monitoring.
2. As a minimum, vibration monitoring sensors should be installed and monitored at the boundary where there are adjacent properties.

3. The trigger levels for the vibration monitoring should be set with the consultation with Structural Engineer following completion of the pre-construction dilapidation surveys of the adjacent buildings, and review of geotechnical conditions and construction methodology.
4. Should vibration limits be exceeded at any time during construction, the construction activity causing vibration should cease until the measures to limit the vibration to below the trigger levels are implemented.
5. At the end of construction, remove vibration monitors and carry out post construction dilapidation surveys of the properties specified above.
6. Comparison of the pre and post construction dilapidation surveys, as well as reference to vibration monitoring data, will allow for identification of defects that were likely caused by vibration from construction activities.

Vibration sensitive structures should be identified by the developer in consultation with the residence of surrounding properties during pre-construction dilapidation survey. Below are some of the criteria that can be used to identify vibration sensitive buildings:

- Buildings with history of structural damage or performance issues due to vibrations
- Unreinforced structures
- Buildings that have been designed to minimise the impact of vibrations to ensure the safety, integrity, and functionality of the building or the equipment within it. Some examples include laboratories, hospitals, data centres, etc.

9.6 Settlement assessment

As well as disrupting human comfort and directly causing damage to buildings, there is the potential for construction induced vibration to indirectly cause building damage by inducing soil settlement under building foundations. This is particularly the case for loose sandy soils, where vibrations can lead to densification which in turn results in significant settlement. It is known that the marine sand identified within the geological units for the Rose Bay area in Section 4.2 is loose at shallow depth. In light of this, assessment of potential settlement within a loose sand layer due to construction induced vibrations has been carried out. This was based on the following:

1. The upper limit of 50 mm/s ppv from Section 9.3.2 for building damage was considered.
2. A representative shear wave velocity (v_s) of 65 m/s and corrected 'N' value ($N_{1(60)}$) of 10 relating to standard penetration tests was adopted for loose sand.
3. Based on 1 and 2, the cyclic shear strain (γ_{cyc}) resulting from the vibration was calculated as 7.7 x 10^{-4}.
4. Based on 2 and 3, the method proposed by Tokimatsu and Seed (1987) was used to calculate the volumetric strain due to densification, for the case where the sand is above the groundwater table. Assuming one dimensional settlement conditions, the volumetric strain is equal to the vertical strain, which is the settlement as a fraction of the soil thickness. The calculated vertical strain was less than 10^{-4}, meaning that for every 1 m of loose sand, less than 0.1 mm of settlement is predicted.
5. Based on 2 and 3, the method proposed by Ishihara and Yoshimine (1992) was used to calculate the volumetric strain due to densification, for the case where the sand is below the groundwater table. The calculated strain was 3.6 x 10^{-4}, meaning that for every 1 m of loose sand, 0.36 mm of settlement is predicted.

The results obtained above indicate that for every 1 m of loose sand, less than 0.4 mm of settlement is predicted regardless of whether the sand is located above or below the groundwater table. This proves to be the case even though a high ppv of 50 mm/s was considered. Since the overall thickness of loose sand in the Rose Bay area is expected to be less than 10 m, the expected settlement caused by densification should be less than 4 mm. This magnitude of settlement should not cause any building damage. It is therefore expected that settlement resulting from densification of loose sand caused by construction induced vibration should not be a significant issue.

10. Environmental impacts of dewatering

Assessment of the environmental impacts of the dewatering is not the primary focus of this report. However, the following environmental impacts are likely and should be managed appropriately as per relevant environmental guidelines, policies and management plans.

10.1 Groundwater dependent ecosystem

A groundwater dependent ecosystem (GDE) is an ecosystem which has its species composition and natural ecological processes determined by groundwater. That is, GDEs are natural ecosystems that require access to groundwater to meet all or some of their water requirements so as to maintain their communities of plants and animals, ecological processes and ecosystem services. If the availability of groundwater to GDEs is reduced, or if the quality is allowed to deteriorate, these ecosystems are impacted.

Dewatering may affect the ecosystems that depend on the subsurface presence of groundwater. Terrestrial vegetation such as trees and woodlands may be supported either seasonally or permanently by groundwater. These may comprise shallow or deep rooted communities that use groundwater to meet some or all of their water requirements. Animals may depend upon such vegetation and therefore indirectly depend upon groundwater. Groundwater quality generally needs to be high to sustain vegetation growth.

A review of regional mapping (BoM GDE Atlas) was undertaken as a preliminary means of identifying potential GDEs at a broad scale. Aquatic GDEs were not identified in the study area. Terrestrial GDEs were identified outside of the study area in Nielson Park, Vaucluse (north east).

While broad scale mapping did not identify GDEs within the study area, it is possible that some of the trees within the Rose Bay area intercept the water table due to the shallow depth to groundwater. However, no information is currently available on the environmental water requirements of these trees and whether or not some of these are sourced from groundwater.

10.2 Acid generating materials

Acid sulfate soils are soils, sediments, unconsolidated geological material or disturbed consolidated rock mass that contain elevated concentrations of the metal sulfide. It occurs principally in the form of pyrite (iron sulfide). These soils can be rich in organics and were formed in low oxygen or anaerobic depositional environments.

The soils are stable when undisturbed or located below the water table. However, when oxygen is introduced, the sulfides oxidise to sulfate, with resultant soils having low pH and potentially high concentrations of the heavy metals.

Dewatering can result in oxidisation of potential acid sulfate soils (PASS) and the mobilisation of pH and heavy metals into the environment where they can potentially impact deep-rooted vegetation, aquatic flora and fauna. It can also be aggressive to reactive materials (such as concrete, steel) of foundations, underground structures (such as piles, pipes, basements) or buried services in contact with groundwater. Further, it can also result in the discharge of acid groundwater to receiving surface water systems.

A review of regional mapping (SEED NSW Government) has been undertaken, which is presented in Figure 26. This suggests that the bulk of the study area has a low probability of acid sulfate soils.

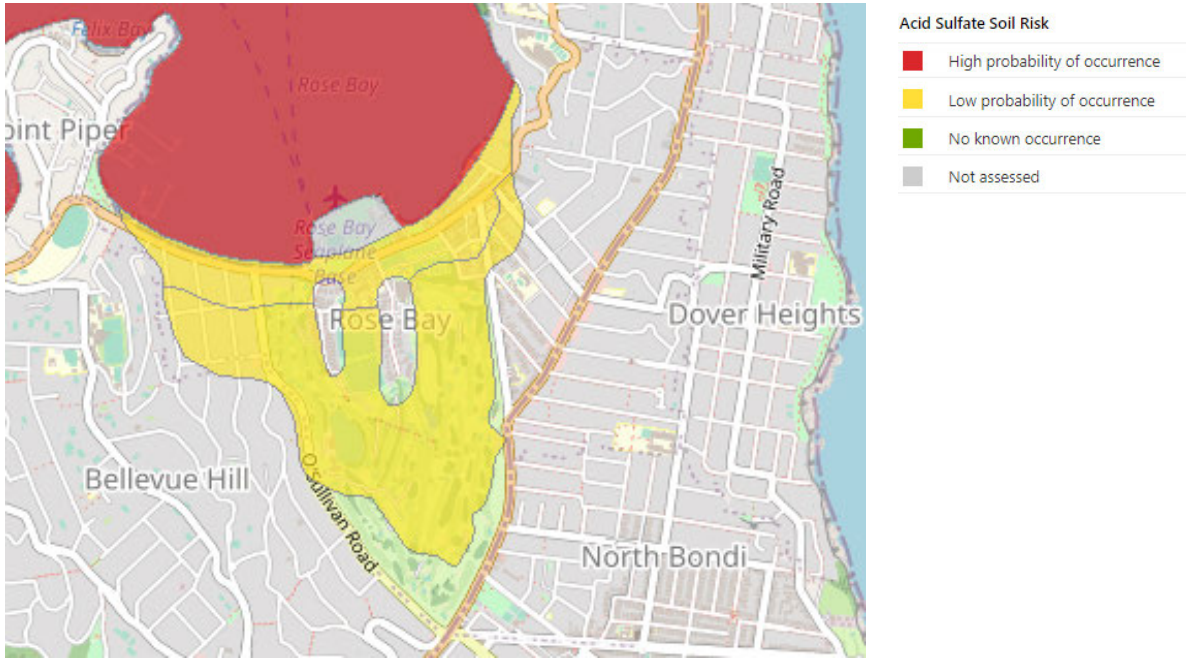


Figure 26 Study area acid sulfate soil risk (after SEED NSW)

11. Summary

There is high potential for future developments to interact with groundwater due to the shallow water table in the low-lying Rose Bay area. The nature of interaction may be short term, during construction when the water table is lowered to enable dry excavations, or long term when the basements are constructed below the water table and alter the natural flow regime. The short-term dewatering impact has been assessed to be significant in areas of Rose Bay due to the presence of peat and deep sand deposition. However, the long-term impact is assessed to be insignificant for a typical residential or commercial development due to relatively wide open areas would mean insignificant impediment to groundwater flow.

By referring to the Settlement Index Plots, excessive dewatering if uncontrolled can potentially result in substantial amount of drawdown which can induce a total settlement in the order of up to 200 mm. Relatively high magnitude of total settlement and spatial variability in ground conditions are expected to increase the differential settlement. It should be noted that some structures, particularly old buildings and buried pipes, are sensitive to differential settlement. Consequently, an allowable settlement limit of 15 mm has been proposed for the purpose of this study based on the relevant Australian Standard AS2870-2011 and widely referred literature on the topic of building damage (Burland et al., 2002). The corresponding dewatering drawdown to cause 15 mm settlement varies between 0.3 m and greater than 2 m for area defined as Settlement Zone A (red).

Imposing a drawdown limit to an acceptable value of 0.3 m is expected to assist in limiting the settlement and differential settlement to values related to 'aesthetic' damage category. The risk of settlement impact to the structures is still present if the assessed groundwater drawdown due to uncontrolled dewatering exceeds 0.3 m in some areas. The developed settlement zones can be used to highlight various areas and their sensitivity of settlement response to various drawdown depths.

For practical and constructability purposes, a drawdown which is greater than the acceptable limit may be required to allow for a dry condition in a multi-level basement construction. In this case, additional control measures should be put in place such as the reinjection of groundwater, controlled provision of full depth cut-off system or base seal capable of resisting uplift pressure. Alternatively, a review of this limit can be considered on a case-by-case basis by undertaking additional site investigations and impact assessment for the affected structures.

The landform and geological conditions on part of the hillsides east and west of the golf course area indicates landslides or slope instability are possible where a deep sand profile overlies bedrock. Rock fall and erosion hazards have also been identified in parts of the study area. Therefore, these risks must be managed by proper risk assessment and analysis as required. The requirements for assessment of these hazards should be considered in development control plans.

Vibration limits with respect to human comfort have been suggested in accordance with the methods described in Department of Environment and Conservation (DEC, 2006) NSW. These limits are based on British Standards BS 6472-1992. Vibration limits with respect to building damage have been suggested in accordance with BS 7385.2-1993. However, the German Standard DIN 4150-3 includes guidelines for residential buildings together with criteria for both commercial/ industrial buildings and high sensitivity structures and may be considered more appropriate in most cases. Due to various factors affecting the vibration criteria, it is suggested that the applicant's consultant should assess the acceptable vibration limits based on the considerations of a number of factors such as construction equipment and activities, setting (commercial/residential), sensitivity and type of building, frequency of vibration, direction of vibration, time of activity in a day, duration, etc,. Vibration monitoring as well as pre and post construction dilapidation surveys should be carried out at the boundary with adjacent properties of a construction site. Settlement resulting from densification of loose sand due to vibration should also be considered, but was assessed to be limited generally, and is not likely to contribute to significant building damage.

Another impact of dewatering includes potential generation of acid sulfate soils which would have environmental impacts and durability concerns to the underground structures or buried structural components such as footings.

Further, impact on the groundwater dependent ecosystems also needs to be considered and assessed when construction dewatering is proposed.

GHD understands the appropriate limits and control measures mentioned above will need to be documented in a Development Control Plan. It is expected that the outcomes of this Geotechnical and Hydrogeological Study can be used as inputs to the formulation of this plan.

Appendices

Appendix A

List of Geotechnical Reports provided by Council

Reference	Development addesses associated with Geotechnical Reports
1	13 Gilliver Avenue, VAUCLUSE
2	718 New South Head Road, rose bay
3	18 Drumalbyn Road, BELLEVUE HILL
4	653 New South Head Road, rose bay
5	80 Beresford Road, BELLEVUE HILL
6	12 Tivoli Avenue, ROSE BAY
7	84 Birriga Road, BELLEVUE HILL
8	86 Birriga Road, BELLEVUE HILL
9	88 Birriga Road, BELLEVUE HILL
10	3 Bunyula Road, BELLEVUE HILL
11	22 Beresford Road, ROSE BAY
12	109 O'Sullivan Road, BELLEVUE HILL
13	49 Beresford Road, BELLEVUE HILL
14	51 Drumalbyn Road, BELLEVUE HILL
15	92 Drumalbyn Road, BELLEVUE HILL
16	2 Beresford Road, ROSE BAY
17	9 Dumaresq Road, ROSE BAY
18	2 Clairvaux Road, VAUCLUSE
19	9 Cranbrook Lane, BELLEVUE HILL
20	74 Balfour Road, BELLEVUE HILL
21	1 Ashgate Avenue, VAUCLUSE
22	6A Hillside Avenue, VAUCLUSE
23	127 Victoria Road, BELLEVUE HILL
24	71 Drumalbyn Road, BELLEVUE HILL
25	75 Drumalbyn Road, BELLEVUE HILL
26	77 Drumalbyn Road, BELLEVUE HILL
27	4 Black Street, VAUCLUSE
28	73 Drumalbyn Road, BELLEVUE HILL
29	58 Cranbrook Road, BELLEVUE HILL
30	28 Beresford Road, ROSE BAY
31	79 Drumalbyn Road, BELLEVUE HILL
32	6 Conway Avenue, ROSE BAY
33	90 Victoria Road, BELLEVUE HILL
34	90B Victoria Road, BELLEVUE HILL
35	76A Beresford Road, BELLEVUE HILL
36	149 O'Sullivan Road, BELLEVUE HILL
37	34 Drumalbyn Road, BELLEVUE HILL
38	107 Victoria Road, BELLEVUE HILL
39	53-55 Drumalbyn Road, BELLEVUE HILL
40	18 Boronia Road, BELLEVUE HILL
41	165 O'Sullivan Road, BELLEVUE HILL
42	8 Mitchell Road, ROSE BAY
43	36 Beresford Road, ROSE BAY
44	212-214 Old South Head Road, bellevue hill
45	130 Victoria Road, BELLEVUE HILL
46	246 Old South Head Road, bellevue hill
47	11 Spencer Street, ROSE BAY
48	13 Spencer Street, ROSE BAY
49	5-7 Spencer Street, ROSE BAY
50	9 Spencer Street, ROSE BAY

51	35 Dudley Road, ROSE BAY
52	27 Blaxland Road, BELLEVUE HILL
53	702-704 New South Head Road, rose bay
54	9 Beresford Crescent, BELLEVUE HILL
55	38 Bundarra Road, BELLEVUE HILL
56	15 Clairvaux Road, VAUCLUSE
57	28 Towns Road, VAUCLUSE
58	52 Cranbrook Road, BELLEVUE HILL
59	780-786 New South Head Road, rose bay
60	167 O'Sullivan Road, BELLEVUE HILL
61	5 Collins Avenue, ROSE BAY
62	195 O'Sullivan Road, BELLEVUE HILL
63	197 O'Sullivan Road, BELLEVUE HILL
64	199 O'Sullivan Road, BELLEVUE HILL
65	201 O'Sullivan Road, BELLEVUE HILL
66	203 O'Sullivan Road, BELLEVUE HILL
67	2 Dumaresq Road, ROSE BAY
68	117 O'Sullivan Road, BELLEVUE HILL
69	31 Salisbury Road, ROSE BAY
70	38 Newcastle Street, ROSE BAY
71	40 Newcastle Street, ROSE BAY
72	30 Newcastle Street, ROSE BAY
73	32 Newcastle Street, ROSE BAY
74	76 Boronia Road, BELLEVUE HILL
75	8 Conway Avenue, ROSE BAY
76	165 Victoria Road, BELLEVUE HILL
77	30 Kent Road, ROSE BAY
78	149 Victoria Road, BELLEVUE HILL
79	9 Carlisle Street, ROSE BAY
80	45 Benelong Crescent, BELLEVUE HILL
81	8 Hillside Avenue, VAUCLUSE
82	9 Hillside Avenue, VAUCLUSE
83	66 Wilberforce Avenue, ROSE BAY
84	68 Wilberforce Avenue, ROSE BAY
85	41 Salisbury Road, ROSE BAY
86	20 Boronia Road, BELLEVUE HILL
87	17-19 Cranbrook Road, BELLEVUE HILL
88	690 Old South Head Road, rose bay
89	67 Cranbrook Road, BELLEVUE HILL
90	7 Nulla Street, VAUCLUSE
91	8-10 Norwich Road, ROSE BAY
92	29-53 Victoria Road, BELLEVUE HILL
93	4 Bayview Hill Road, ROSE bay
94	6 Bayview Hill Road, ROSE bay
95	54 Cranbrook Road, BELLEVUE HILL
96	53 Beresford Road, BELLEVUE HILL
97	41 Birriga Road, BELLEVUE HILL
98	80 Bundarra Road, BELLEVUE HILL
99	13 Dalley Avenue, VAUCLUSE
100	24 Bundarra Road, BELLEVUE HILL
101	56 Bundarra Road, BELLEVUE HILL

102	37 Newcastle Street, ROSE BAY
103	22 Chamberlain Avenue, ROSE BAY
104	3 Gilliver Avenue, VAUCLUSE
105	6 Richmond Road, ROSE BAY
106	8 Richmond Road, ROSE BAY
107	164 Victoria Road, BELLEVUE HILL
108	21 Riddell Street, BELLEVUE HILL
109	23 Riddell Street, BELLEVUE HILL
110	36 Kent Road, ROSE BAY
111	7 Carlisle Street, ROSE BAY
112	13 Bayview Hill Road, ROSE bay
113	20 Dalley Avenue, VAUCLUSE
114	26 Boronia Road, BELLEVUE HILL
115	68 Salisbury Road, BELLEVUE HILL
116	30 Albemarle Avenue, ROSE BAY
117	18 Rawson Road, ROSE BAY
118	7 Rawson Road, ROSE BAY
119	123 Victoria Road, BELLEVUE HILL
120	1 Carlisle Street, ROSE BAY
121	24A Dover Lane, ROSE BAY
122	3 Carlisle Street, ROSE BAY
123	34 Kent Road, ROSE BAY
124	76 Drumalbyn Road, BELLEVUE HILL
125	105 O'Sullivan Road, BELLEVUE HILL
126	37 Dudley Road, ROSE BAY
127	23 Victoria Road, BELLEVUE HILL
128	10A Tivoli Avenue, ROSE BAY
129	518A Old South Head Road, rose bay
130	100C Victoria Road, BELLEVUE HILL
131	28 Kent Road, ROSE BAY
132	75-77 O'Sullivan Road, ROSE BAY
133	20 Dover Road, ROSE BAY
134	2A Bayview Hill road, ROSE bay
135	37 Bundarra Road, BELLEVUE HILL
136	47 Bundarra Road, BELLEVUE HILL
137	31 Newcastle Street, ROSE BAY
138	33-35 Newcastle Street, ROSE BAY
139	58-60 Newcastle Street, ROSE BAY
140	33-37 Carlisle Street, ROSE BAY
141	35 Carlisle Street, ROSE BAY
142	37 Carlisle Street, ROSE BAY
143	58 Bundarra Road, BELLEVUE HILL
144	20 Clairvaux Road, VAUCLUSE
145	36 Chamberlain Avenue, ROSE BAY
146	584 Old South Head Road, rose bay
147	893 New South Head Road, rose bay
148	532-536 Old South Head Road, rose bay
149	12 Kent Road, ROSE BAY
150	673 New South Head Road, rose bay
151	252 Old South Head Road, rose bay
152	27 Kent Road, ROSE BAY

153	22 Spencer Street, ROSE BAY
154	9 Bundarra Road, BELLEVUE HILL
155	4 Rupertswood Avenue, BELLEVUE HILL
156	21-23 Cranbrook Road, BELLEVUE HILL
157	69 Latimer Road, BELLEVUE HILL
158	11 Cranbrook Road, BELLEVUE HILL
159	10 March Street, BELLEVUE HILL
160	37 Chamberlain Avenue, ROSE BAY
161	29 Chamberlain Avenue, ROSE BAY
162	93 Balfour Road, BELLEVUE HILL
163	18 Clairvaux Road, VAUCLUSE
164	20 Rawson Road, ROSE BAY
165	21 Bundarra Road, BELLEVUE HILL
166	92 Victoria Road, BELLEVUE HILL
167	181 Victoria Road, BELLEVUE HILL
168	148 Victoria Road, BELLEVUE HILL
169	520-536 Old South Head Road, rose bay
170	56 Beresford Road, ROSE BAY
171	49 Drumalbyn Road, BELLEVUE HILL
172	12 Conway Avenue, ROSE BAY
173	14 Conway Avenue, ROSE BAY
174	29 New South Head Road, rose bay
175	49-51 Spencer Street, ROSE BAY
176	67 Latimer Road, BELLEVUE HILL
177	20A Benelong Crescent, BELLEVUE HILL
178	1 Churchill Road, ROSE BAY
179	236 Old South Head Road, bellevue hill
180	81A Drumalbyn Road, BELLEVUE HILL
181	47 Birriga Road, BELLEVUE HILL
182	119 Victoria Road, BELLEVUE HILL
183	15 Towns Road, VAUCLUSE
184	588 Old South Head Road, rose bay
185	252 Old South Head Road, bellevue hill
186	881 New South Head Road, rose bay
187	4 Latimer Road, BELLEVUE HILL
188	78 Bundarra Road, BELLEVUE HILL
189	2 Vaucluse Road, VAUCLUSE
190	268 Old South Head Road, bellevue hill
191	152 Victoria Road, BELLEVUE HILL
192	23 Chamberlain Avenue, ROSE BAY
193	1 Rawson Road, ROSE BAY
194	208-210 Old South Head Road, bellevue hill
195	7 Banksia Road, BELLEVUE HILL
196	29 New South Head Road, vaucluse
197	18B Benelong Crescent, BELLEVUE HILL
198	554 Old South Head Road, rose bay
199	12 Boronia Road, BELLEVUE HILL
200	52 Drumalbyn Road, BELLEVUE HILL
201	691 New South Head Road, rose bay
202	54 Newcastle Street, ROSE BAY
203	3 Aston Gardens, BELLEVUE HILL

204	40 Cranbrook Road, BELLEVUE HILL
205	254 Old South Head Road, bellevue hill
206	256 Old South Head Road, bellevue hill
207	4 Drumalbyn Road, BELLEVUE HILL
208	27 Salisbury Road, ROSE BAY
209	9 Dudley Road, ROSE BAY
210	34A Cranbrook Road, BELLEVUE HILL
211	42 Chamberlain Avenue, ROSE BAY
212	746 New South Head Road, rose bay
213	883 New South Head Road, rose bay
214	137 Victoria Road, BELLEVUE HILL
215	26 Bunyula Road, BELLEVUE HILL
216	25 Cranbrook Road, BELLEVUE HILL
217	638-646 New South Head Road, rose bay
218	635 New South Head Road, bellevue hill

Appendix B

Proposed changes to DCP and DA Guidelines

Report

24 May 2024

To	Jim Stefan	**Contact No.**	0414 980 723
Copy to	Tom O'Hanlon, Emilio Andari	**Email**	jim@stefanconsulting.com.au
From	Kim Chan, Velautham Jeyakanthan	**Project No.**	12588469
Project Name	Rose Bay - Hydrogeological and Geotechnical Impacts		
Subject	Proposed Modifications to DCP and DA Guidelines _ Rev 3		

Dear Jim

1. Introduction

GHD Pty Ltd (GHD) has carried out the Geotechnical and Hydrogeological Study for Rose Bay following the engagement by Woollahra Municipal Council (Council) in 2022. The study included the assessment of the potential impacts of the groundwater lowering alteration as a result of dewatering for future developments to the existing properties in the Rose Bay region. As part of the study, preliminary assessment of landform stability and impacts of construction induced vibration have also been carried out. Outcomes of the assessment have been included in the report Rose Bay - Hydrogeological and Geotechnical Impacts dated 7 September 2023.

The above study was conducted in 3 stages. Upon the completion of the above study, GHD was requested to proceed with the subsequent Stage 4 work which involved the following:

- Review of Council's planning framework and guidelines to determine whether or not the controls and guidelines, which are currently in place are adequate:
    - to mitigate the potential impacts such as settlement and stability caused by the excavation and lowering of groundwater table on the existing structures.
    - to limit construction induced vibration to acceptable levels.
- Recommend any changes to planning documents where required.

The following documents were reviewed as part of the Stage 4 works:

- Woollahra Development Control Plan (DCP) 2015
    - Chapter E2 – Stormwater and Flood Risk Management, focusing on section E.2.2.10 Groundwater (hydrogeology)
    - Chapter D6 - Rose Bay Centre focusing on Section D.6.6.8
- Development Application (DA) Guide
    - Main document; and,
    - Attachment 6 – Geotechnical and Hydrogeological Reports

This letter report presents the description and rational for the proposed modifications. The draft changes proposed on the abovementioned documents are also presented as the attachments of this report for Council's review and

consideration. The proposed changes have been discussed and agreed with Council in the meeting between representatives from GHD and Council on 12 February 2024 and in subsequent email communications.

2. Proposed Modifications to Planning Framework and Guidelines

2.1 Overview

Based on our review and feedback from Council's engineers during our presentation to the Council on 13 July 2023 and subsequent email communications, we consider that a number of modifications are warranted on the planning documents mentioned in Section 1 administered by Council. The proposed draft changes on the DCP 2015 and DA Guidelines are specifically denoted in Appendices A, B, C and D. GHD proposed these changes on the basis of outcomes of our Stage 3 assessment. The previously proposed changes to the council documents as part of the study for Double Bay were also considered. In proposing the modifications, GHD has considered the following functionality of these documents based on information given in Council's website including the hierarchy of development rules (Figure 1 below):

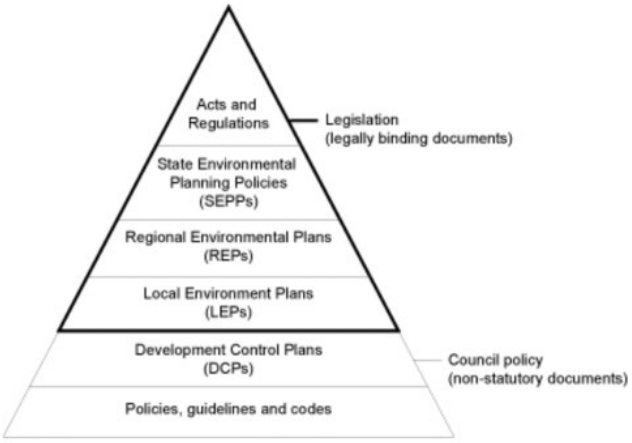


Figure 1 Hierarchy of Development Rules (source: Woollahra Municipal Council website)

- DCP 2015 is the document used by Council in the assessment and determination of Development Applications. A DCP operates with the Council's LEP and contains detailed planning provisions.
- DA Guideline provides guidelines for the preparation of DA submission.

The outcome of previous assessments (including Stage 3 assessment) has been incorporated in our review and assessment. Our review has not been carried out from a legal perspective. However, GHD will be able to assist Council in the finalisation of the documents by providing input from the engineering perspective. The description of the proposed modifications along with the rationales are given in the following sections based on the order shown in the hierarchy of development rules.

2.2 Proposed Changes to Development Control Plan (DCP)

The proposed modifications in the DCP consist of new controls or the revisions of existing content or control which are relevant to the impact of groundwater drawdown and land stability within the Rose Bay area and vibration limits applicable in general for the entire council area. These are detailed in Table 1 below. The rationale for each

proposed modification is also given. The party preparing and submitting the Development Application is denoted as “applicant”.

Table 1 Details of Proposed Modifications in DCP and Rationales

Item No.	Section in DCP	Description of Proposed Modifications (proposed changes in ***bold and italics***) in the order of appearance in DCP	Rationale for Changes
1	Chapter E2: Title	Change the title "Stormwater and Flood Risk Management" to "Stormwater***, Flood and Geotechnical*** Risk Management" or similar.	The title of the DCP Chapter E2 currently does not include any reference to geotechnical or hydrogeological risks. We envisage that there is a potential risk that an applicant may overlook or skip geotechnical or hydrogeological risks when the requirement for Stormwater and Flood Risk is less relevant or not relevant to a particular development. Therefore, we would suggest the title to include some reference to the geotechnical or hydrogeological risks.
2	Chapter E2: Section E2.2.10; Page 19	Change the sub-title "Groundwater (hydrogeology)" to "Groundwater (hydrogeology) ***and Geotechnical Impacts***"	This section of the DCP does not only includes groundwater related impacts but also other geotechnical impacts such as vibration induced settlement, instability of rock cliffs/faces influenced by excavation, filling or other loading such as footings of structures or construction plants (some of these are proposed changes to be included in DCP – see next item below)
3	Chapter E2: Section E2.2.10; page 20	Revise the last paragraph in page 20 with the inclusion shown as follows: "Typically, adverse geotechnical impacts may include vibration induce~~s~~***d damages and/or*** settlements from construction methods and equipment***, instability of slopes, rock cliffs/faces influenced by excavation, filling or other loading such as footings of structures or construction plants*** and inadequate support of adjacent land during and after construction. Typically, adverse hydrogeological impacts may include settlement induced by changes in the groundwater level and seepage problems."	These changes are proposed to include other geotechnical impacts that need to be considered based on the following: ▪ Geological, topographical, and geo-morphological conditions within the hillside of the study area in the west and east of the golf course indicate that a landslide or slope instability could be possible, particularly during extreme rainfall events when the sand is saturated and disturbed by construction excavation or loading. Tension cracks, which are often a sign of distress indicating ground movement, have also been observed during our site visits. ▪ Review of the geotechnical reports provided by the Council and observations from the site visits indicates a number of properties with exposed rock cliffs or walls/faces.

Item No.	Section in DCP	Description of Proposed Modifications (proposed changes in ***bold and italics***) in the order of appearance in DCP	Rationale for Changes
4	*Chapter E2: Section E2.2.10; page 22*	Under the sub-heading Control and Requirements, add the following new control: ***"Construction equipment and methodology shall be selected such that vibration is limited to acceptable levels. Applicant shall submit a statement/report from qualified personal such as Geotechnical Engineer or Acoustic Consultant that the vibration would be compliance with relevant vibration standards, guidelines and legislation. The selection of vibration limits shall consider both human comfort and structural damage. As a minimum, the vibration limits for human comfort shall comply with Assessing Vibration - a technical guideline by Department of Environment and Conservation NSW (DEC), 2006 and the vibration limits for structural damage shall comply with German Standard DIN 4150-3 - Vibrations in buildings - Part 3: Effects on structures. Assessment on expected vibration levels shall be based on the proposed construction activities and plants. The statement/report shall specify methods for reducing vibrations within acceptable levels when the proposed construction activity or plant is likely to cause vibration greater than acceptable limits..***	This new control is to implement the requirements on acceptable vibration levels. These levels have been proposed following the review of the publications listed below and considered both human comfort and building damage: • AS ISO 2631.2-2014 Mechanical vibration and shock – Evaluation of human exposure to whole-body vibration. Part 2: Vibration in buildings (1 Hz to 80 Hz). • AS 2187.2-2006 Explosives – Storage and use. Part 2: Use of explosives. • Assessing Vibration: A technical guideline, Department of Environment and Conservation NSW (February 2006). • German standard DIN 4150-3 - Vibrations in buildings - Part 3: Effects on structures. Reference to *Assessing Vibration: A technical guideline, Department of Environment and Conservation NSW (February 2006) is made to human comfort level as this document is the most relevant applicable statutory guideline.* For building damage, reference is made to German standard DIN 4150-3 - Vibrations in buildings - Part 3: Effects on structures for the following reasons: • Available Australian standard AS 2187.2-2006 is primarily focused on vibration caused by explosives. • AS 2187.2-2006 Appendix J refers to British Standard BS 7385.2-1993 and the United States Bureau of Mines (USBM) report RI 8507. The limits in USBM RI 8507 were developed with respect to vibrations resulting specifically from surface mine blasting, whereas those in BS 7385.2 relate to building damage resulting from ground-borne vibration more generally. The limits from BS 7385.2 are

Item No.	Section in DCP	Description of Proposed Modifications (proposed changes in ***bold and italics***) in the order of appearance in DCP	Rationale for Changes
			generally applicable when considering the range of vibration sources that could be present on construction sites. However, it does not provide a limit for acceptable vibration limit for sensitive structures. • German standard DIN 4150-3 includes guidelines for residential buildings together with criteria for both commercial/ industrial buildings and high sensitivity structures. The guidelines provide for increased levels of vibration (i.e., higher ppv) as the wave frequency increases and is considered more robust compared to Australian or British Standards for building damage. • Note this control is named as Cxx in the attached mark-up, however, Council may assign appropriate number and re-number subsequent controls.
5	Chapter E2: Section E2.2.10; after page 22	Under the sub-heading Control and Requirements, add the following new control: ***"An implementation plan including a vibration monitoring program and contingency plan shall be submitted by the applicant. The plan shall include the locations of vibration monitoring sensors, trigger levels for anticipated vibration types and buildings in the neighbourhood and frequency of monitoring. As a minimum, vibration monitoring sensors shall be installed and monitored at adjacent properties. The trigger level for the vibration monitoring shall be set with the consultation with Structural Engineer following completion of the pre-construction dilapidation surveys of the adjacent buildings, and review of geotechnical conditions and construction methodology. Should vibration limits be exceeded at***	This new control is to implement the vibration monitoring requirements appropriate for a construction site with considerations of ground conditions, neighbouring buildings and construction methodology. . Note this control is named as Cyy in the attached mark-up, however, Council may assign appropriate number and re-number subsequent controls.

Item No.	Section in DCP	Description of Proposed Modifications (proposed changes in ***bold and italics***) in the order of appearance in DCP	Rationale for Changes
		any time during construction, the construction activity causing vibration shall be ceased until the measures to limit the vibration to below the trigger levels are implemented. At the end of construction, post construction dilapidation survey of the adjacent properties shall be carried out and compared with pre-construction dilapidation survey for identification of defects (if any) that were likely caused by vibration from construction activities.."	
6	Chapter E2: Section E2.2.10; after page 23	Add the following new control relevant to Rose Bay: ***"Land in the Rose Bay settlement area*** ***In addition to the general controls in this section, the following applies to the land in the Rose Bay settlement area, as shown below.*** ***FIGURE 2 Rose Bay settlement area*** ***[Council to include appropriate figure showing Rose Bay settlement area]*** ***Temporary changes to the groundwater level, due to construction, must not exceed 0.3 m from the average monitored pre-construction groundwater level."***	This control is proposed based on the assessment presented in Stage 3 report which concludes a drawdown of about 300 mm could induce a settlement of 15 mm in some locations within the Rose Bay area. The allowable settlement of 15 mm was recommended in our Stage 3 report on the basis of the equivalence of Class S site as defined in AS2870-2011. This allowable settlement was proposed to limit the risk of any damage relating to no worse than a typical "aesthetic" damage to buildings. Because the groundwater drawdown caused by dewatering at a given site could extend over a long distance, the minimum drawdown of 300 mm has been recommended for assessed settlement zones A and B the Rose Bay area. The following points should be highlighted in relation to this new control: • The proposed 300 mm groundwater drawdown limit has taken into consideration the critical scenario when the baseline level obtained from pre-construction monitoring coincides with the historic low groundwater level, whereby the additional lowering of 300 mm brings the groundwater to below the lowest level which has occurred in the past. • To limit the settlement of any recently constructed buildings (or old buildings with newly rendered walls) to less than 15 mm, the proposed drawdown limit is considered to be

Item No.	Section in DCP	Description of Proposed Modifications (proposed changes in ***bold and italics***) in the order of appearance in DCP	Rationale for Changes
			suitably applied even when the current water level is within the historical range of groundwater fluctuation. • Owing to the sandy ground conditions within the Rose Bay area, the lowering of groundwater caused by dewatering at a given construction site is likely to extend over a long distance away from the dewatering source. Therefore, even the 0.3 m limit was identified for Zone A, it is prudent to adopt the 300 mm drawdown limit for Zones A and B of the Rose Bay area in order to limit the influences on housings within the settlement susceptible areas where the compressible peat layers were observed to be extensive. As presented in our Stage 3 report, it is highlighted that a number of design measures may be available to limit the groundwater drawdown whilst allowing for the dewatering. These measures include the provision of groundwater recharge/reinjection wells, cut-off walls, etc. These design measures, if introduced, should be assessed and presented in the reports lodged as part of the DA submission.
7	Chapter E2: Section E2.2.10; after page 23	***Change the existing control C8 for Double Bay by deleting the words as shown below.*** "Temporary changes to the groundwater level, due to construction, must not exceed 0.2 m from the average monitored pre-construction groundwater level ~~***unless calculations using the results of specific field testing, support a greater change and demonstrate that the change will not induce settlement greater than the characteristic surface movement of a Class S site as defined in Table 2.3 of Australian Standard AS2870-2011."***~~	Owing to the peat and sandy ground conditions within the Double Bay area, the lowering of groundwater caused by dewatering at a given construction site is likely to extend over a long distance away from the dewatering source. Therefore, not knowing the ground and groundwater conditions within the nearby properties, the applicant may not be able to assess the drawdown impact on the adjacent properties.

Item No.	Section in DCP	Description of Proposed Modifications (proposed changes in ***bold and italics***) in the order of appearance in DCP	Rationale for Changes
8	Chapter D6: Section D6.6.8; page 61	Delete the text in this section under the heading "Geotechnology and hydrogeology" and make reference to DCP similar to Double Bay as shown below. ***"Repealed by Woollahra DCP 2015 (Amendment No xxx) on [date xxx.]. Refer to Chapter E2 Stormwater and Flood Risk Management of Woollahra DCP 2015."*** .	We note that our proposed changes for Double Bay were mostly to the specific DCP chapter for Double Bay - *Chapter D5 Double Bay Centre - Section D5.6.7*. However, we understand that most of these proposed changes have been elevated to DCP Chapter E2, and the conditions/information under Chapter D5 Double Bay Centre - Section D5.6.7. was repealed by Woollahra DCP 2015 (Amendment 18) on 6 December 2021 and reference was made to Chapter E2. To be consistent with the approach adopted for Double Bay, we propose a similar approach with an additional control added to Chapter E2.2.10 for Rose Bay as stated in Item 6 above. This proposed change is for maintaining consistency between the documents and also to avoid discrepancies if DCP controls are modified. It is noted that there is one control in Chapter D6: Section D6.6.8 which is: *"C1: Excavation below 1m is accompanied by a geotechnical report and a structural report to demonstrate that the works will not have any adverse effect on the neighbouring structures."* The existing controls C1 and C4 in Chapter E2.2.10 covers the above. Note the proposed changes to Chapter D6: Section D6.6.8 should occur simultaneously with the proposed changes to Chapter E2.2.10 to ensure consistency and continuity.

2.3 Proposed Changes to DA Guidelines

The modifications to the DA guidelines are generally proposed to maintain consistency with the existing controls and proposed changes in DCP. These are detailed in below. The rationale for each proposed modification is also given.

Table 2 Details of Proposed Modifications in DA Guidelines and Rationales

Item No.	Section in DA Guide	Description of Proposed Modifications (proposed changes in ***bold and italics***) in the order of appearance in DA Guide	Rationale for Changes
1	DA Guide (Main Document); Section 2.4; Page 12	Under Section 2.4, sub-title "Plans", the following additional bullet point is proposed. ***"Vibration and settlement monitoring locations nominated by qualified engineer, if applicable"***	We propose to include this point to make sure the applicant has assessed and provide the details of vibration and settlement monitoring locations.
2	DA Guide (Main Document); Section 2.4; Page 12	Under Section 2.4, sub-title "Elevations", the following modification is proposed to the existing bullet point. "Extent of excavation or filling of the site to *AHD* ***including any existing structures/foundations within the influence zone, i.e., zone within 45 degrees from the base of excavation***"	We propose to include this point to make sure that any existing structures/foundations within the excavation influence zone is identified. This will help council identify and ensure the application addresses any potential impacts to the structures appropriately.
3	DA Guide (Main Document); Section 3; Additional Documents; Page 16	The following inclusion/modification is proposed for the line item indicating the requirement for "Geotechnical and Hydrogeological Report" under the column "When Required" in the table. • Include an additional bullet point on when the report is required. ***"Comprise below ground structure (For the purpose of the DA guidelines, below ground structures means excavation to a depth greater than 300mm below the existing groundwater level, excavations within 1.5 m of the boundary, or otherwise greater than 1.0 m in depth)"*** • Modify the existing first bullet point as shown in below.	The inclusion of additional bullet point is proposed to be consistent with the requirement of DCP which states "Geotechnical and Hydrogeological Report" is required when a "below ground structure" is proposed. The definition of "below ground structure" as proposed in the DCP is any excavation which is deeper than 1 m deep and assumed to have a potential to intersect the groundwater, unless proven otherwise by using site specific information. However, we note that Attachment 6 of DA guide defines the "below ground structure" more specifically as excavation to a depth greater than 300mm below the existing groundwater level, excavations within 900mm of the boundary, or otherwise greater than 1.0m in depth." Therefore, the proposed modification includes the definition specified in DA Guide Attachment 6. In addition, the distance to the excavation from the property boundary have been amended to 1.5m, which is currently only applied to Paddington HCA, as agreed in the meeting on 12 February 2024.

Item No.	Section in DA Guide	Description of Proposed Modifications (proposed changes in ***bold and italics***) in the order of appearance in DA Guide	Rationale for Changes
		"Disturb support of neighbouring property ~~***(excavation within 1.5 metres of the site boundary for excavation depths over a metre in Paddington HCS and two metres elsewhere, any excavation at the toe of a retaining wall, etc.)***~~" • Modify the second bullet point as shown below. "Require excavation***/construction*** machinery which may create adverse vibrations or cause settlement"	Modification to the existing bullet point to delete the excavation levels mentioned within the bracket is proposed because the inclusion of the additional point as above will supersede the excavation levels mentioned within the brackets. The reason for the proposed change to the second bullet point to include "/*construction*" is that there may be scenarios where ground borne vibrations are produced by construction activities not involving excavation. Some examples are: • Pile driving • Dynamic compaction/ densification • Vibratory compaction
4	DA Guide; Attachment 6 - Geotechnical and Hydrogeological Reports; Page 1, Paragraphs 2 and 3.	Modify the Paragraphs 2 and 3 by deleting the texts as shown below. "If your development proposal ~~***is on land to which Chapter D5 Double Bay Centre and Chapter C1 Paddington Heritage Conservation Area of the Woollahra Development Control Plan 2015 applies and***~~ includes below ground structures, you must submit geotechnical and hydrogeological reports which contain the information set out in these guidelines. For the purpose of these guidelines, below ground structures means excavation to a depth greater than 300mm below the existing groundwater level, for excavations within 900mm of the boundary, or otherwise greater than 1.0m in depth. ~~***A geotechnical and hydrogeological report may also be required in the areas of high watertable such as Rushcutters Bay, Rose Bay, Watsons Bay as well as other sites requiring excavation***~~."	According to current DCP Section E2.2.10 Condition 4, our understanding is that DA Guide Attachment 6 - Geotechnical and Hydrogeological Reports is applicable LGA wide where below ground structure is proposed. However, it implies that the information set out in the current DA Guide Attachment 6 are for Chapter D5 Double Bay Centre and Chapter C1 Paddington Heritage Conservation Area only. Areas of high water table such as Rushcutters Bay, Rose Bay, Watsons Bay as well as other sites requiring excavation may require a geotechnical and hydrogeological report only. We propose the reference to the suburbs (Double Bay Centre, Paddington Heritage Conservation Area and others) be deleted so that these guidelines are applicable LGA wide when a below ground structure is proposed. Additional text within Introduction section is proposed to reinforce the requirements of the report as requested by Council.

Item No.	Section in DA Guide	Description of Proposed Modifications (proposed changes in ***bold and italics***) in the order of appearance in DA Guide	Rationale for Changes
		Insert the below text within Introduction section. "The geotechnical and hydrogeological report shall comprise, but not limited to, • Geotechnical investigation • Groundwater monitoring results • Interpreted subsurface and hydrogeological conditions. • Settlement assessment • Stability assessment • Recommendations on geotechnical design parameters • Recommended shoring methods and retaining walls (where applicable) • Recommendations on foundation design • Recommendation on excavation methods • Vibration assessment • Recommendations on settlement, groundwater and vibration monitoring. Further details are discussed in the subsequent sections on this DA guidelines".	
5	DA Guide; Attachment 6 - Geotechnical and Hydrogeological	Modify the sentence about the investigation in paragraph 2 as shown below.	The proposed changes are to correct some inconsistencies noted in the sentence.

Item No.	Section in DA Guide	Description of Proposed Modifications (proposed changes in ***bold and italics***) in the order of appearance in DA Guide	Rationale for Changes
	Reports; Page 4, Paragraphs 2.	"~~***that***~~ ***The*** investigations ***have to be*** ~~***been***~~ carried out to determine the design parameters appropriate to the development and site"	
6	DA Guide; Attachment 6 - Geotechnical and Hydrogeological Reports; Page 5, Bullet points 3 to 6 under Hydrogeology.	Add the below point after second bullet point under the title Hydrogeology in page 5 to limit the settlement within Double Bay and Rose Bay settlement areas. ***"that temporary changes to the groundwater level, during construction, for Double Bay and Rose Bay settlement areas will be kept within the limits specified in DCP Chapter E2 Section E2.2.10"*** Modify bullet point 3 as below: • that temporary changes to the groundwater level, during construction, will be kept within the historical range of natural groundwater fluctuations ***in other areas of LGA outside Double Bay and Rose Bay settlement areas defined DCP Chapter E2 Section E2.2.10***. Where data is limited or unavailable, reports must demonstrate that changes in the level of the natural water table, due to construction, will not exceed ~~0.3m~~ ***the below limits*** unless calculations using the results of the site specific field testing, supporting a greater change can be provided and can demonstrate no adverse impact to surrounding properties and infrastructure. ***- 0.2 m within Rushcutters Bay and Watsons Bay*** ***- 0.3 m LGA wide except Double Bay and Rose Bay settlement areas, Rushcutters Bay and Watsons Bay*** Delete Bullet points 4 to 6 under the title Hydrogeology in page 5 and replace with the points as shown below.	We propose to delete these limits and make reference to DCP chapter for Double Bay and Rose Bay settlement areas for the following reasons: • The drawdown limits of 0.1m to 0.3m defined for various scenarios appear to be applicable for Double Bay/ Paddington Heritage Conservation Area, possibly based on assessment done prior to the Double Bay assessment carried out by GHD in 2020. In the document prepared by GHD for Double Bay on "Proposed Modifications to LEP, DCP and DA Guidelines" dated 30 September 2020, GHD has proposed the majority of existing content under the sub-section "Hydrogeology" to be removed as they have been proposed for insertion in the DCP. We understand that DCP chapters have been updated following the submission of the above GHD document, however, it appears that Attachment 6 of DA Guide has not been updated with the previous recommendation. • Our understanding is that Attachment 6 of DA Guide is applicable LGA wide with the proposed changes in line with DCP Chapter E2.2.10. The proposed drawdown limits of 0.2 m for Double Bay and 0.3 m for Rose Bay may be too stringent for the rest of the LGA without any site-specific analysis. However, from our brief review of geological maps of the LGA, we note that there are other areas identified as comprising peat materials within Woollahra Council such as Rushcutters Bay and Watsons Bay. While GHD has not reviewed the geotechnical information in detail and hence has not assessed the potential settlement induced by groundwater drawdown, applying a drawdown limit of 200

Item No.	Section in DA Guide	Description of Proposed Modifications (proposed changes in ***bold and italics***) in the order of appearance in DA Guide	Rationale for Changes
		~~•—.~~ ~~• *that in areas where the construction affects existing development within a shadow zone of an earlier construction, temporary changes in the level of the water table during construction will not exceed 0.15m, unless calculations using the results of the site specific field testing, supporting a greater change are provided and demonstrate no adverse impact to surrounding properties and infrastructure. The temporary shadow zone during dewatering should be taken as an area within 20m of the earlier construction, unless site specific calculations can demonstrate that a different lateral extent should be adopted.*~~ ~~• *that where data is limited or unavailable, the permanent change in the level of the natural watertable due to the carrying out of the development will not exceed 0.2m unless calculations using the results of the site specific field testing, supporting a greater change can be provided and can demonstrate no adverse impact to surrounding property and infrastructure.*~~ • ~~*that in areas where the construction affects existing development within a shadow zone of an earlier construction, the permanent change in the water table due to the carrying out of the development will not exceed 0.1m. The permanent shadow zone of an earlier construction with full penetrating cut off walls but without appropriate subsurface drainage*~~	mm for Rushcutters Bay and Watsons Bay may be considered reasonable assuming the extent and properties of the peat and hydrogeological conditions are similar to those at Double Bay. While the groundwater drawdown limits for Double Bay and Rose Bay settlement areas to be adhered as per DCP Chapter E2 Section E2.2.10, applying a 200 mm draw down limits for Rushcutters Bay and Watsons Bay and 300 mm drawdown limit within other areas of LGA, can be considered reasonable unless calculations using the results of the site specific field testing, supporting a greater change can be provided and can demonstrate no adverse impact to surrounding properties and infrastructure.. • The existing Bullet Point 2 under the "Hydrogeology" section covers the requirement for consideration of groundwater related impact for the rest of the LGA. This is repeated below for completeness: "*that there will be no adverse impact on surrounding property and infrastructure as a result of changes in local hydrogeology (behaviour of groundwater) created by the method of construction. This includes the short-term effects resulting from construction practices, including the method and rate of dewatering and the long-term effects resulting from the support and retention of property and infrastructure after construction has been completed*".

Item No.	Section in DA Guide	Description of Proposed Modifications (proposed changes in ***bold and italics***) in the order of appearance in DA Guide	Rationale for Changes
		~~***should be taken as a distance equal to one building width along the groundwater flow path both in front and behind the earlier construction, unless site specific calculations can demonstrate that a different lateral extent should be adopted.***~~ •	
7	DA Guide; Attachment 6 - Geotechnical and Hydrogeological Reports; Page 6, Bullet point 1 under "Vibration".	Modify the sentence about the compliance to vibration in Bullet point 1 under "Vibration" as shown below. "demonstrate that there will be no adverse impact on the surrounding properties and infrastructure as a result of vibration created by the method of construction used for the development. As a minimum, reports must demonstrate compliance with the ~~***requirements of AS2187.2 Appendix J***~~ ***vibration limits for human comfort as required by Assessing Vibration - a technical guideline by Department of Environment and Conservation NSW (DEC), 2006 and the vibration limits for structural damage as required by German Standard DIN 4150-3 - Vibrations in buildings - Part 3: Effects on structures."***.	This proposed modification is to be consistence with the changes proposed to DCP Chapter E2.2.10 to include vibration limits and monitoring requirements.
8	DA Guide; Attachment 6 - Geotechnical and Hydrogeological Reports; Page 7, Bullet point 3 under "Monitoring Program".	Modify the sentence about the vibration monitoring in Bullet point 3 under "Monitoring Program" as shown in ***bold and italic*** below. "vibration in accordance with ~~***AS 2187.2 Appendix J, including acceptable velocity of vibration***~~ ***applicable standards, guidelines and legislations***".	This proposed modification is to be consistence with the changes proposed to DCP Chapter E2.2.10 to include vibration limits and monitoring requirements.

3. Limitations

This report: has been prepared by GHD for Woollahra Municipal Council and may only be used and relied on by Woollahra Municipal Council for the purpose agreed between GHD and Woollahra Municipal Council as set out in the proposal dated 02 August 2022 (ref:12588469).

GHD otherwise disclaims responsibility to any person other than Woollahra Municipal Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions and any recommendations in this report are based on the assessment presented in GHD report Rose Bay - Hydrogeological and Geotechnical Impacts dated 7 September 2023 and any assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

Appendix A

Proposed Modification to the DCP Chapter E2

Chapter E2
Stormwater and Flood Risk Management

Consider alternative title "Stormwater, Flood and Geotechnical Risk Management"

Part E ▸ General Controls for All Development

CHAPTER E2 APPROVED ON 27 APRIL 2015

AND COMMENCED ON 23 MAY 2015

Last amended on 6 December 2021

Chapter E2
Stormwater and Flood Risk Management

Contents

E2.1 Introduction

This chapter outlines provisions related to two key interrelated components:

- the management of stormwater drainage collected on and discharged from new developments; and
- the minimisation of flood related risks to person and property associated with the development and use of land.

In preparing an application for a development, both components must be considered.

E2.1.1 Land and development to which this chapter applies

Stormwater drainage

This chapter applies to all land within the Woollahra Municipality.

Flood risk management

The flood risk management component of this chapter applies to all land within the Woollahra Municipality that is within a "flood risk precinct".

E2.1.2 Development types to which this chapter applies

This chapter applies to all development that requires consent.

This includes complying development under the NSW General Housing Code, and complying development for secondary dwellings under the *State Environmental Planning Policy (Affordable Rental Housing) 2009*.

E2.1.3 Objectives

The objectives of this chapter are:

O1 To encourage ecologically sustainable stormwater management and the use of water sensitive urban design.

O2 To maintain existing natural drainage patterns.

O3 To ensure that adequate provision has been made for the disposal of stormwater from land proposed to be developed.

O4 To ensure the controlled release of stormwater to public stormwater systems without adversely impacting on adjoining or downstream properties.

O5 To protect Sydney Harbour and its waterways from stormwater pollution.

O6 To minimise flood risk and damage to people and property by setting appropriate development controls.

O7 To ensure that flood levels are not increased by development.

E2.1.4 Definitions

The definitions in Appendix 1 of this chapter define words and expressions for the purpose of this chapter.

These definitions apply in addition to the definitions in Part A Chapter A3 of the DCP, and any other terms referred to in Australian Rainfall and Runoff (Institution of Engineers, Australia, 1987), the Floodplain Management Manual (New South Wales Government, January 2011), the *Environmental Planning and Assessment Act 1979* (EP&&Act) or the Woollahra Local Environmental Plan 2014 (LEP).

E2.2 Stormwater drainage management controls

E2.2.1 Introduction

In assessing development applications for stormwater drainage management, Council will consider each of the matters listed below and each matter must be addressed by the applicant. The response to these matters, plus any other relevant statutory and policy matters, will be considered by Council when assessing the acceptability of the development.

For each matter, specific objectives are given together with the controls to achieve those objectives. Alternative ways to achieve the stated objectives will be considered when, in the opinion of Council, the outcome is better in terms of the impact on the public domain or adjacent properties than strict compliance with the stated controls.

High quality submissions greatly aid the assessment process and it is recommended that information regarding the matters below be prepared by a suitably qualified practitioner.

Stormwater drainage management is generally achieved through the provision of a stormwater drainage concept plan, which should address the following management measures (where applicable):

- water sensitive urban design;
- stormwater treatment;
- on site detention (OSD) of stormwater;
- connection to Council's drainage systems;
- diversion of Council's drainage;
- structures over or near drainage lines and easements;
- connection to Council's parks, reserves, bushland and natural waterways; connection to Sydney Harbour; and connection to Sydney Water channels;
- low level properties and easements;
- groundwater (or hydrogeology);
- absorption systems;
- pump and sump systems;
- charged or siphonic systems; and
- activities on a public road.

Information regarding these matters does not necessarily have to be of a standard and level of detail that is construction ready. In most cases a concept plan only is required at DA stage, with the detailed stormwater drainage design and specifications required prior to the issue of a Construction Certificate. The exception to this is stormwater works impacting on easements, where detailed stormwater drainage design and specifications are required at the DA stage.

E2.2.2 Water sensitive urban design

Objectives

O1 To ensure development is designed, constructed and maintained so as to minimise impacts on the natural water cycle.

O2 To reduce peak stormwater flows and total stormwater runoff volume.

O3 To utilise water resources more efficiently.

O4 To reduce the flood risk in urban areas.

O5 To reduce erosion of waterways, slopes and banks.

O6 To control stormwater pollution and improve water quality in Sydney Harbour, waterways and drainage systems.

Controls

Pervious surfaces

C1 In areas with suitable ground conditions, the use of pervious surfaces is encouraged.

Rainwater tanks

C2 The use of rainwater tanks for non-potable water uses is encouraged.

C3 Rainwater tanks only collect roof water.

C4 Rainwater tanks are connected to all external non-potable water uses including landscaping. Tanks may be connected to internal non-potable water uses including toilet flushing and washing machines.

C5 Where OSD is required onsite (see Section E2.2.4), overflow from rainwater tanks is directed to the OSD system.

C6 Where OSD is not required onsite, overflow from rainwater tanks is directed to Council's drainage network.

C7 Rainwater tanks are located to minimise their visual impact. Above-ground rainwater tanks are located behind the building line and suitably screened. Slimline rainwater tanks at the side of buildings or under hardstand areas such as driveways are preferred.

Note:

- Rainwater tanks must be installed by a licenced plumber in accordance with AS3500 National Plumbing and Drainage Code, HB230 Rainwater Tank Design and Installation Handbook, other relevant codes and the manufacturer's specifications
- A positive covenant will be required for maintenance of rainwater tanks.

Greywater reuse

C8 The reuse of domestic greywater for non-potable water uses is encouraged (e.g. water discharged from washing machines).

Notes:

- A report on the appropriate treatment to allow for the safe reuse of domestic greywater must be prepared by a suitably qualified practitioner and the design must be in accordance with appropriate industry standards.
- Industry standards include HB 326 Urban Greywater Installation Handbook and the guidelines prepared by the NSW Department of Primary Industries (Office of Water), the NSW Department of Health and the Federal Department of Sustainability, Environment, Water, Population and Communities.
- A positive covenant will be required for maintenance of systems to reuse domestic greywater.

Green roofs

C9 The use of green roofs is encouraged.

Note:

- Green roofs must be designed by a suitably qualified practitioner and in accordance with appropriate industry standards.
- Industry standards include the Building Code of Australia and the City of Sydney Council Green Roof Resource Manual guidelines.
- A positive covenant will be required for maintenance of green roofs.

E2.2.3 Stormwater treatment

Objectives

O1 To minimise the discharge of pollutants (litter, sediment, suspended solids, nutrients, oil, grease and toxants) from paved and other impermeable surfaces into Sydney Harbour, waterways and drainage systems.

Controls

Stormwater treatment

C1 Stormwater treatment is required for:

a) all properties with connections to Sydney Harbour, waterways and open watercourses;

b) all new commercial developments and residential flat buildings; and

c) all major alterations and additions to commercial developments and residential flat buildings.

C2 The stormwater treatment system, such as a gross pollutant trap (GPT), meets the specifications outlined in the water quality targets below (see control C7 below).

C3 All stormwater treatment systems are located wholly on private property.

Note: A positive covenant will be required for maintenance of the stormwater treatment system.

Rain gardens

C4 Rain gardens are required for:

a) new developments where the total site area is more than 500m^2;

b) developments involving alterations and additions where the additional gross impervious area is greater than 40m^5 and the total site area is more than 500m^2; and

c) developments where the car park has four or more above ground parking spaces.

C5 Rain gardens are sized as follows:

a) 10m^2 per 1000m^2 of site area for sites between 500m^2 and 2,000m^2; and

b) for sites greater than 2,000m^2, the size of the required rain garden is to be determined by a study completed by a suitably qualified practitioner.

C6 Council may consider a reduction in the size of the required rain garden if the applicant provides a detailed study by a suitably qualified practitioner. The study is to demonstrate that an integrated approach to water sensitive urban design has been undertaken and that the development meets Council's water quality targets. As a consequence, Council may require the OSD minimum site storage requirements to be increased to 25m^3 per 1,000m^2. See Section 2.2.4 below for OSD requirements.

Notes:

- Rain gardens are to be designed by a suitably qualified practitioner and must be designed in accordance with appropriate industry standards.
- Industry standards include the Monash University's Facility for Advancing Water Biofiltration Adoption Guidelines and the NSW Government's Catchment Management Authority Water Sensitive Urban Design Program.
- A positive covenant will be required for maintenance of the rain garden.

Water quality targets

C7 Water quality measures are installed that meet the following environmental targets for stormwater runoff leaving the site:

a) 90% removal of gross pollutants (> 5mm);

b) 85% removal of total suspended solids;

c) 65% removal of total phosphorous; and

d) 45% removal of total nitrogen.

C8 For developments creating high levels of pollutants, pollution modelling may be required.

Note:

- Pollution modelling may be undertaken with programs such as MUSIC - the Model for Urban Stormwater Improvement Conceptualisation.
- Discharge from car wash down bays, fire sprinkler test waters, trade wastes and wastes from air conditioning cooling towers are to be treated to Sydney Water's requirements and discharged to the sewer.

E2.2.4 On site detention (OSD) of stormwater

Objectives

O1 To reduce and mitigate the peak stormwater flow from a developed site and allow the controlled release of stormwater to the public stormwater system.

O2 To reduce flood risk in urban areas.

Controls

Where this applies

C1 OSD is required for:

a) new developments where the total site area is more than 500m²; and

b) developments involving alterations and additions where the additional gross impervious area is greater than 40m• and the total site area is more than 500m².

C2 Properties, regardless of the development type, located within Council's OSD exemption area are not required to install OSD.

Note: The map of Council's OSD exemption area is available on Council's website.

Requirements

C3 OSD storage is designed in accordance with the storage/discharge relationships as shown in the table below.

OSD requirements per 1,000m² of the total site area		
Permissible site discharge (l/s)	Minimum site storage requirements (m³)	ARI (year)
24	4	1 in 2
34	20	1 in 100

Note: The above OSD requirements are based on a simplified design approach which has been prepared using preliminary permissible site discharge and site storage requirement values. This simplified design approach will provide benefits to developers by reducing the cost of detailed engineering calculations, remove ambiguity in design approaches and assumptions, provide a simple geometric approach and allow Council to easily review designs with the intent of reducing development assessment times.

C4 Council may consider independent assessment for on-site detention requirements. The applicant is to submit to Council an OSD assessment report including all modelling and design calculations. Any alternative methodology must be prepared by a suitably qualified practitioner.

C5 Where possible, the drainage system is designed to direct runoff from the entire site to the OSD system.

C6 Where OSD is required for alterations and additions, OSD is provided for the entire site, not only the area of new works.

C7 All OSD systems drain by gravity to Council's drainage system.

C8 An overland flow path, to convey water to the street in the event of a blockage or failure of the OSD outlet, is provided and is clearly identified in the design.

C9 All OSD systems have a discharge limiter which is an appropriately sized short length of reduced diameter pipe or a non-removable orifice plate. The discharge limiter is enclosed by a rustproof screen or wire cage to protect against blockage.

OSD location

C10 OSD storage is located as close as possible to the lowest point of the site and if possible at the property frontage so that any surcharge will overflow to the street.

C11 Separate OSD is provided for each Torrens title dwelling.

C12 For strata and subdivided properties, the OSD requirements outlined in controls C1 and C3 above apply to the property as a whole. OSD is generally located in common areas for strata title or community title subdivision.

C13 The OSD structure is not established across property boundaries.

Above ground storage

C14 The OSD system is visually unobtrusive and sympathetic with the development. It must not cause hazard or inconvenience to pedestrian or vehicle access.

C15 A minimum 20% of the OSD storage requirement is incorporated as below ground storage.

C16 OSD storage in landscaped areas requires an extra 20% volume to compensate for vegetation growth.

C17 Pedestrian access paths are maintained above the 1 in 100 ARI operating level for any non-enclosed storage. Ponded water depths do not exceed 200mm in parking/ driveway areas, and 300mm in courtyards/grass/landscape areas.

C18 Adequate subsoil drainage is provided in the above ground OSD storage to retain the amenity of the area after a rainfall event.

Below ground storage

C19 The structural design of the OSD storage is certified by a suitably qualified practitioner including the following design issues:

a) all structures in the zone of influence of the excavation are checked for structural adequacy;

b) buoyancy of the OSD storage is taken into consideration; and

c) the OSD structure is designed to all relevant Australian Standards and industry standards; and

d) A minimum slope of 1% is provided on the floor of the OSD storage.

Note: Industry standards include AS 2865 Safe Working in a Confined Space and any Work Cover requirements.

Maintenance

C20 The OSD system provides for easy access for inspection and maintenance. Generally, grated access points are preferred.

C21 A silt/ litter arrestor pit is located before the OSD storage and fitted with screens that can be easily removed for routine maintenance. The screen is of expanded steel mesh (e.g. Maximesh or similar). To assist in shedding debris, the screen is positioned no less than 45° to the horizontal. Pits are a minimum size of 0.6m x 0.6m.

Note: A positive covenant will be required for the maintenance of the OSD system.

Alternatives to OSD requirements

C22 A rainwater tank may be installed as an alternative to all or part of the OSD requirements for any development type. The capacity of the rainwater tank is 1.5 times the OSD volume requirements. See Section E2.2.2 for rainwater tank requirements.

C23 A green roof may be installed as an alternative to part of the OSD requirements for any development type. The OSD requirements may be reduced by 50% if a roof garden is provided on-site. The roof garden covers at least 50% of the development's total roof area. See Section E2.2.2 for green roof requirements.

Note: Where there are discrepancies between the volume of OSD storage required in this chapter and the volume of OSD storage required in BASIX, the total storage requirements is the higher of the two volumes.

E2.2.5 Connection to Council's drainage systems

Objectives

O1 To maintain existing natural drainage patterns and to not move water from one catchment to another.

O2 To minimise erosion and allow for sediment control.

O3 To avoid the flooding of properties.

O4 To protect existing Council drainage assets.

O5 To discharge stormwater at the lowest point feasible within the same catchment.

Controls

General

C1 Concept plans for the on-site stormwater system showing the location of major elements of the proposed system are provided.

C2 Full details of the proposed connection to Council's drainage system are provided.

C3 Where an overland flow system is not available, the drainage system is designed to cater to a minimum 1 in 100 ARI event.

C4 Where an overland flow system is available, the drainage system is designed to cater to a minimum 1 in 20 ARI event; and the drainage system, in combination with the overland flow system, is designed to cater to a minimum 1 in 100 ARI event.

C5 All stormwater discharge to Council's drainage system is gravity fed (for low level properties see also Section E2.2.9).

C6 Stormwater discharge to the sewer is not permitted.

C7 The potential for failure of components of the stormwater drainage system (e.g. blockage or structural damage) is considered and provision made for the safe conveyance of flows should failure occur.

C8 Private drainage is installed in accordance with the appropriate industry standards.

C9 All works within the road reserve or Council owned property comply with Council's "Specification for Road Works, Drainage and Miscellaneous Works".

C10 Pumps for the disposal of stormwater runoff are not be permitted except in the circumstances set out in Section E2.2.12.

Note:

- Where works, including stormwater works, are within a public roadway (including the footpath and nature strip areas), approval is subject to a separate application under Section 138 of the *Roads Act 1993*.

- All construction costs associated with connection of the private stormwater discharge to Council's drainage system must be met by the applicant. The location of Council's drainage infrastructure is available by contacting Council's Drainage Engineer. The applicant is responsible for investigating and confirming the presence and suitability of Council's drainage system for connection. The applicant is responsible for investigating and confirming the presence of services and utilities within the road reserve (e.g. electricity, gas and water).
- Private drainage industry standards include AS3500 National Plumbing and Drainage Code, other relevant codes and the manufacturer's specifications.

Connection to Council's below ground drainage

Where this applies

C11 In general, the stormwater drainage discharge from development sites is connected to Council's below ground drainage system.

C12 Where there is no Council drainage system located adjacent to the site, the applicant must extend Council's drainage system to the site in order to permit the below ground connection.

Requirements

C13 The connection from the development site to Council's below ground drainage system is a direct route and is generally laid perpendicular to the line of the kerb and gutter.

C14 Stormwater drainage lines are located under the kerb and gutter where possible.

C15 All connection pits are constructed in accordance with the appropriate industry standards.

C16 No portion of the connection pipe intrudes into Council's pipe.

C17 All stormwater pipes within the road carriageway are designed and installed to meet Council's specifications.

C18 A standard Council double grated gully pit with 1.8m kerb lintel is constructed over the new line where it intersects with the private stormwater line. A capped pipe stub is provided to enable future extension of the line upstream.

Notes:

- Connection pit industry standards include AS3500 National Plumbing and Drainage Code, other relevant codes and the manufacturer's specifications.
- A closed circuit television (CCTV) inspection of any new connection must be carried out and submitted to Council with a works-as-executed plan.
- All stormwater pipes within the road carriageway must be at a minimum Class 2, 375mm diameter and have bedding to standard HS3, in accordance with AS3725 Loads on Buried Concrete Pipes. Rubber ring joints are required.

Exemptions

C19 An exemption from the requirement to discharge directly into Council's below ground drainage system may be considered where the required extension of Council's system is excessive. This exemption will be considered on a merit based assessment and factors to be considered include the magnitude of the development, extent of required works and the suitability of an alternative option.

Connection to Council's kerb and gutter

Where this applies

C20 Only dwelling houses and developments involving alterations and additions, where the additional gross impervious area is less than 40m^2, may discharge stormwater to the kerb and gutter.

Requirements

C21 The connection from the development site to Council's kerb and gutter is a direct route.

C22 A maximum discharge rate of 20 l/s is permitted.

C23 A maximum of one stormwater outlet per property is permitted.

C24 Drainage conduits, across footpath areas that are discharging to the kerb, are designed and installed to meet Council's specifications.

C25 Where the existing kerb is sandstone, the drainage discharge point is cored. The kerb is reinstated to match the existing form (e.g. bullnose, brick and sandstone).

Note: Drainage conduits, across footpath areas that are discharging to the kerb, must be 125mm x 75mm galvanised box or 65mm to 100mm sewer grade PVC pipes.
A kerb adaptor must be provided for 80mm and 100mm PVC pipes.

Subsoil drainage

C26 All below ground structures with habitable or non-habitable floor spaces are fully tanked and do not require permanent dewatering.

C27 All below ground structures are designed and installed in accordance with Council's Guide for preparing Geotechnical and Hydrogeological Reports.

C28 Subsoil drainage does not discharged to Council's stormwater network, including stormwater pipes, pits and/or kerb and gutter.

E2.2.6 Diversion of Council's drainage

Objectives

O1 There is to be no adverse impact on upstream or downstream properties.

O2 There is to be no adverse impact on Council's drainage system.

Controls

C1 If an applicant proposes to divert Council's drainage the application is accompanied by a report, prepared by a suitably qualified practitioner, on the impacts of the diversion.

C2 Where an overland flow system is not available, the diverted drainage system is designed to cater to a minimum 1 in 100 ARI event.

C3 Where an overland flow system is available, the diverted drainage system is designed to cater to a minimum 1 in 20 ARI event; and the drainage system, in combination with the overland flow system, is designed to cater to a minimum 1 in 100 ARI event.

C4 If Council's existing drainage system is diverted onto private land, an easement is created in favour of Council (see Section E2.2.9).

Notes:

- A dilapidation report including a CCTV inspection of all drainage lines being impacted or diverted must be submitted with the construction certificate application. If the existing drainage line is in poor condition the drainage line is to be renewed and/ or refurbished.
- The location of the diverted drainage system must be fully accessible for future maintenance.

E2.2.7 Structures over or near drainage lines and easements

Objectives

O1 To provide for future maintenance activities on drainage lines.

O2 To provide and maintain adequate overland flow paths.

Controls

C1 Generally, new buildings, structures and overhanging structures are not permitted over existing or proposed drainage lines and easements.

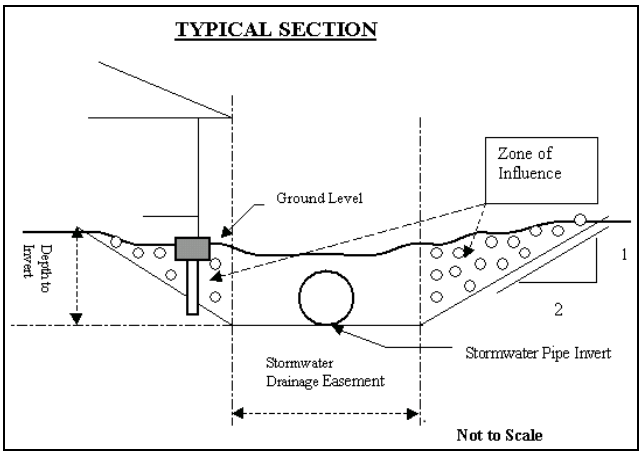
C2 All structural foundations adjoining an easement or drainage line have a minimum depth lower than the invert of the adjacent drainage line. Additional depth is required for foundations adjoining natural water courses. All foundations are designed by a suitably qualified practitioner.

C3 Overland flow paths are maintained over drainage lines and easements. Driveways and landscaped areas may be located on overland flow paths.

Note:

- Applications must include plans and details relating to structures near a Council drainage line or easement.
- A dilapidation report including a CCTV inspection of all drainage lines within 3m of any development structure must be submitted with the construction certificate application. If the existing drainage line is in poor condition the drainage line is to be renewed and/or refurbished.
- The applicant is to submit details on the proposed construction methodology to ensure that Council's drainage system is protected and supported during any works.

FIGURE 1 Typical section showing the zone of influence



E2.2.8 Connection to Council's parks, reserves, bushland and natural waterways; Sydney Harbour; and Sydney Water channels

Objectives

O1 To manage, conserve and protect Council parks, reserves, bushland and natural waterways.

O2 To maintain existing natural drainage patterns.

O3 To minimise erosion of waterways, slopes and banks.

O4 To control stormwater pollution and improve water quality in streams and groundwater.

Controls

General

C1 Stormwater discharge to a natural watercourse or Council below ground drainage line within a Council park, reserve or bushland may be permitted subject to a merits based assessment of the proposal by Council's Open Space and Trees Department.

C2 An environmental impact assessment is submitted addressing the impact on the park, reserve or bushland during and after construction, environmental sensitivity, erosion potential and weed invasion potential.

C3 Stormwater pipes and other structures are not visible on public land. Outlet structures are designed to blend in with the surrounds and should be constructed of natural materials, such as rock.

Note: Access through Council's park land and/ or storage of material on Council park land during construction will not be permitted unless prior written approval has been obtained from Council's Open Space and Trees Department.

Discharge directly to Sydney Harbour

C4 Written approval from the Waterways Authority to discharge stormwater into Sydney Harbour is required.

Note: The applicant must seek this approval. The stormwater system must be designed in accordance with this DCP and any requirements of the Waterways Authority.

Discharge to Sydney Water channels

C5 Written approval from Sydney Water to discharge stormwater from the subject property directly into Sydney Water drainage channels is required.

Note: The applicant must seek this approval. The stormwater system must be designed in accordance with this DCP and any requirements of Sydney Water.

E2.2.9 Low level properties and easements

Objectives

O1 To maintain existing natural drainage patterns.

O2 To ensure drainage discharge associated with new developments is gravity fed and does not require pumps to function.

O3 To avoid nuisance and flooding.

O4 To provide effective overland flow paths.

O5 To protect existing Council drainage assets.

O6 To discharge stormwater at the lowest point feasible within the same catchment.

Controls

Requirements

C1 Drainage discharge to Council's stormwater system is gravity fed. This may require the creation of an easement through the downstream property to discharge stormwater from the subject property.

C2 Where an overland flow system is not available, the drainage system is designed to cater to a minimum 1 in 100 ARI event.

C3 Where an overland flow system is available, the drainage system is designed to cater to a minimum 1 in 20 ARI event; and the drainage system, in combination with the overland flow system, is designed to cater to a minimum 1 in 100 ARI event.

Easements

C4 Where easement consent is granted:

a) The easement is created on the certificate of title for all impacted properties.

b) The private drainage easement is of sufficient width to allow the required pipe to be installed and maintained.

> Note: Any costs associated with investigating or establishing the easement are the responsibility of the applicant.
>
> The applicant is responsible for negotiating with the downstream property owner to obtain a private drainage easement. It is not Council's role or within Council's jurisdiction to adjudicate on amounts of compensation. It is recommended that independent legal advice be sought.

Possible options available to acquire a private drainage easement include:

- by direct negotiation
- Section 88K of the *Conveyancing Act 1919*
- Section 40 of the *Land and Environment Court Act 1979*

The applicant must make a reasonable attempt to provide a gravity feed system to drain the site. The applicant must make formal approaches to all possible downstream property owners.

The applicant must attach a copy of the formal consent from the owner(s) of the intervening downstream property(s) with the development application.

The applicants must also engage a registered surveyor to prepare a plan of survey and the application for the easement must be lodged with the Land Titles Office with any necessary fees. Woollahra Council must be annotated as the Prescribed Authority on the Section 88K Instrument. A copy of the lodgement details must be provided to Council prior to operation of any development consent or activity application.

The requirement to obtain an easement may be waived if:

- written documentary evidence of refusal to permit an easement by the downstream owner has been provided to Council; and
- written documentary evidence of all reasonable attempts undertaken by the applicant to obtain an easement through the downstream property; and/or
- evidence is provided of any physical constraint that precludes a route for a downstream system.

For larger developments or developments in areas with known drainage problems, Council may require the applicant to pursue the acquisition of a downstream easement through the Land and Environment Court.

If an easement is not obtainable, it may be possible to connect to Council's below ground stormwater system if the Council system is extended to the site. See Section 2.2.5 above for requirements.

Easement alternatives

C5 Easement alternatives will be considered only where the development involves alterations and additions to a dwelling house; and where the development increases the impervious area of the site by less than 40m².

C6 The following easement alternatives may be considered in the following circumstances:

a) Where all roof drainage is drained to a rain tank designed to hold a volume of water and the tank only overflows once a year, on average. The minimum acceptable tank size is 60m² per 1,000m² of site area.
Note: The applicant must submit full water balance calculations prepared by a suitably qualified practitioner.

b) Where an absorption dispersal system downstream of the rain tank and any paved areas is provided, and the absorption system is designed for a 20 year ARI storm. The rain tank is to be assumed to be full. See Section E2.2.11 for absorption system requirements.

c) Where the area is unsuitable for an absorption system, 20% extra storage volume is provided in the rain tank and a pump system may be installed. See Section E2.2.12 for pump system requirements.

Note: Council may reduce the storage requirements in heritage conservation areas if space is limited. This will be assessed on the merits of the application.

Relationship to other properties

C7 Where surface runoff from adjoining properties currently flows onto the subject site, such flows are catered for within the development. Obstructions that cause damming and backwater effects on upstream properties will not be permitted.

C8 Surface runoff from the subject site is not concentrated onto downstream properties.

Existing Council stormwater

C9 Council will require the creation of an easement to its benefit over existing Council stormwater pipes, boxes or channels on private land.

E2.2.10 Groundwater (hydrogeology) and Geotechnical Impacts

Introduction

Council will require geotechnical and hydrogeological reports for development applications which include below ground structures.

Any proposed development with below ground structures must consider the sub-surface conditions and the effects of construction on surrounding properties. In addition, those which are likely to extend below the level of seasonal fluctuations in the groundwater table, must also consider the effect of any changes induced in the sub-surface water levels and the groundwater flow patterns on surrounding properties. Unless site specific information exists to the contrary,

excavations deeper than 1m must be assumed to have this potential to intersect the groundwater level and shall be considered as below ground structures.

Council's principal objective is to ensure that earthworks and associated groundwater dewatering, during and after construction, will not have any adverse impacts on:

- Environmental functions and processes
- Neighbouring uses
- Cultural and heritage items
- Any features of the surrounding land and infrastructure that could be impacted by geotechnical and hydrogeological changes.

Typically, adverse geotechnical impacts may include vibration induced settlements from construction methods and equipment and inadequate support of adjacent land during and after construction. Typically, adverse hydrogeological impacts may include settlement induced by changes in the groundwater level and seepage problems.

d damages and/or

, instability of slopes, rock cliffs/faces influenced by excavation, filling or other loading such as footings of structures or construction plants

Objectives

O1 To ensure that earthworks and associated ground water dewatering, during and after construction, will not have any adverse impacts on:

- Environmental functions and processes
- Neighbouring uses
- Cultural and heritage items
- Any features of the surrounding land and infrastructure that could be impacted by geotechnical and hydrogeological changes.

O2 To maintain the existing groundwater level, both during and after construction.

O3 To minimise changes in groundwater level to protect surrounding property and infrastructure from damage.

O4 Buildings must be designed and constructed with appropriate support and retention systems to ensure that:

a) There will be no ground settlement or movement, during and after construction, sufficient to cause an adverse impact on surrounding properties and infrastructure.

b) Vibration during construction is minimised or eliminated to ensure no adverse impact on surrounding properties and infrastructure.

c) The risk of damage to adjacent existing property and infrastructure by the new development will be reduced to a level no greater than that from an event with an "unlikely" likelihood of occurrence and "minor" consequence.

Note: "adverse impact" means any damage caused to the improvements on adjoining properties by the demolition, excavation or construction on the development site.

Controls

General controls that apply to the entire LGA.

C1 Unless site specific information exists to the contrary, excavations deeper than 1m are assumed to have a potential impact on groundwater.

Note: Where the groundwater level is high, any proposed development with below-ground structures must consider the sub-surface conditions and the impacts of construction on surrounding properties.

Below-ground structures which are likely to extend below the level of seasonal fluctuations in the groundwater table, must also consider the impact of any changes induced in the sub-surface water levels and the groundwater flow patterns on surrounding properties.

Requirements

C2 All below-ground structures are fully tanked. These type of structures must not collect and dispose of subsoil/seepage to kerb and gutter.

C3 Groundwater does not discharged to Council's stormwater network, including stormwater pipes, pits and/or kerb and gutter.

Notes:

All below-ground works must also comply with the requirements of the NSW Department of Primary Industries Office of Water.

The design statement must confirm that the design of the below-ground structure has been undertaken in accordance with the relevant Australian Standards where applicable.

C4 Development applications which include below ground structures must include the following documents:

a) Structural report

b) Geotechnical and hydrogeological reports

c) Design statement and supporting drawings that show the design measures proposed to minimise risks and to ensure that no adverse impacts will occur.

Note: Council may identify other circumstances where these reports are required. All reports must be prepared in accordance with Council's guidelines. Council may also require the preparation and submission of a pre-commencement dilapidation report for properties neighbouring the development.

C5 A qualified and experienced geotechnical and/or hydrogeological engineer must prepare the reports.

The reports must include a site-specific risk assessment matrix with appropriate definitions for qualitative measures of likelihood and consequences for assessing the risk of damage to existing developments by the new development.

C6 Where groundwater is present and dewatering is likely to occur on the site, the requirements of Council's DA Guide under the 'Investigations' section must be implemented.

C7 Any geotechnical and hydrogeological reports must contain an Implementation Plan, including a Monitoring Program, Contingency Plan and Construction Methodology.

Note: All reports and requirements must be prepared in accordance with Council's DA Guide. Geotechnical reports must be prepared by an appropriately qualified Geotechnical Engineer who is NER registered with a minimum of 10 years practice in the geotechnical field in the last 15 years.

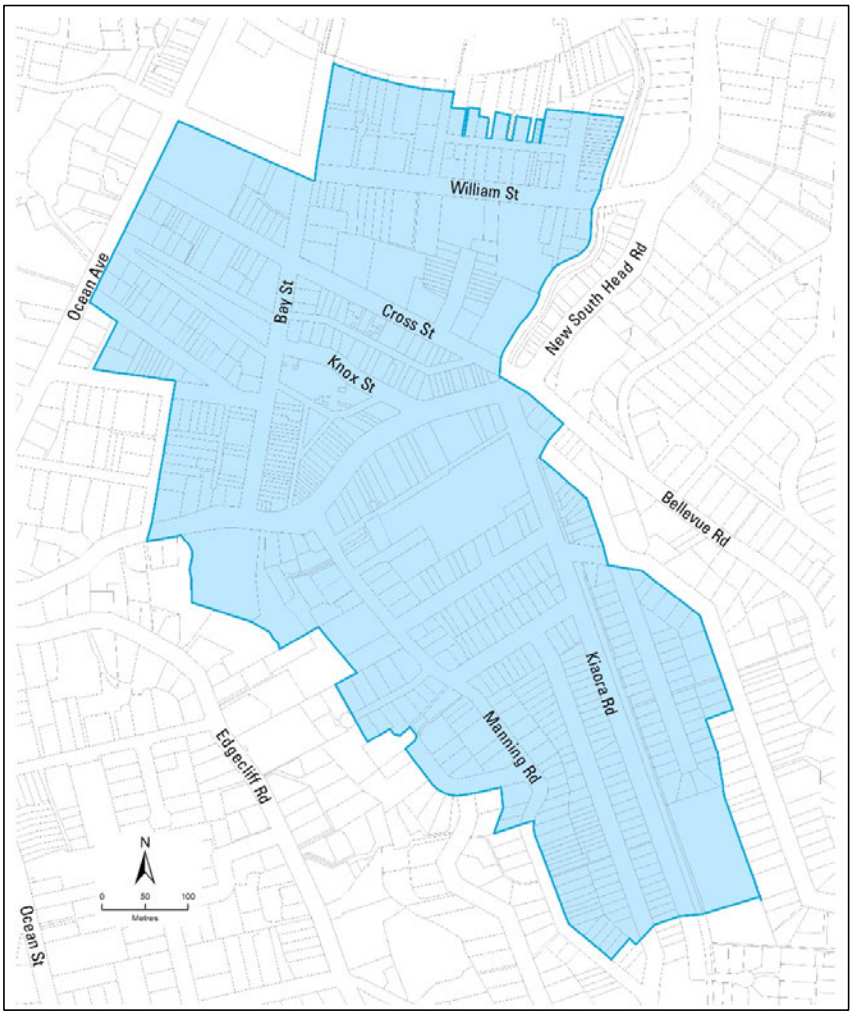
Cxx. Construction equipment and methodology shall be selected such that vibration is limited to acceptable levels. Applicant shall submit a statement/report from qualified personal such as Geotechnical Engineer or Acoustic Consultant that the vibration would be compliance with relevant vibration standards, guidelines and legislation. As a minimum, the vibration limits for human comfort shall comply with *Assessing Vibration - a technical guideline* by Department of Environment and Conservation NSW (DEC), 2006 and the vibration limits for structural damage shall comply with German standard *DIN 4150-3 - Vibrations in buildings - Part 3: Effects on structures.* Assessment on expected vibration levels shall be based on the proposed construction activities and plants. The statement/report shall specify methods for reducing vibrations within acceptable levels when the proposed construction activity or plant is likely to cause vibration greater than acceptable limit.

Cyy. An implementation plan including a vibration monitoring program and contingency plan shall be submitted by the applicant. The plan shall include the locations of vibration monitoring sensors, trigger levels for anticipated vibration types and buildings in the neighbourhood and frequency of monitoring. As a minimum, vibration monitoring sensors shall be installed and monitored at adjacent properties. The trigger level for the vibration monitoring shall be set with the consultation with Structural Engineer following completion of the pre-construction dilapidation surveys of the adjacent building, and review geotechnical conditions and construction methodology. Should vibration limits be exceeded at any time during construction, the construction activity causing vibration shall be ceased until the measures to limit the vibration are implemented. At the end of construction, post construction dilapidation survey of the adjacent properties shall be carry out and compared with pre-construction dilapidation survey for identification of defects (if any) that were likely caused by vibration from construction activities.

Land in the Double Bay settlement area

In addition to the general controls in this section, the following applies to the land in the Double Bay settlement area, as shown below.

FIGURE 1 Double Bay settlement area



C8 Temporary changes to the groundwater level, due to construction, must not exceed 0.2 m from the average monitored pre-construction groundwater level ~~unless calculations using the results of specific field testing, support a greater change and demonstrate that the change will not induce settlement greater than the characteristic surface movement of a Class 5 site as defined in Table 2.3 of Australian Standard AS2870 2011.~~

Land in the Rose Bay settlement area
In addition to the general controls in this section, the following applies to the land in the Rose Bay settlement area, as shown below.

FIGURE 2 Rose Bay settlement area

(Council include appropriate figure showing Rose Bay settlement area Zones A and B)

Czz. Temporary changes to the groundwater level, due to construction, must not exceed 0.3 m from the average monitored pre-construction groundwater level ~~unless calculations using the results of specific field testing, support a greater change and demonstrate that the change will not induce settlement greater than the characteristic surface movement of a Class S site as defined in Table 2.3 of Australian Standard AS2870-2011.~~

E2.2.11 Absorption systems

Objectives

O1 To ensure development is designed, constructed and maintained so as to minimise impacts on the natural water cycle.

O2 To reduce peak stormwater flows and total stormwater runoff volume.

O3 To reduce the flood risk in urban areas.

O4 To minimise stormwater impacts on downstream properties.

Controls

Where this applies

C1 Absorption systems may only be utilised where it is not possible to discharge drainage to Council's stormwater system by gravity.

C2 Absorption systems will not be considered if easements, inter-allotment drains or drainage reserves are available to provide gravity feed access to Council's stormwater system.

Requirements

C3 Absorption systems are designed to adequately contain the difference between inflow and outflow rates, depending on the permeability of the soil.

C4 Generally the minimum soil depth to rock is 1.5m. However, in harbourside locations, a lesser value may be accepted. This will be assessed on the merits of the application.

C5 Properties seeking to install an absorption system also install a rainwater tank in accordance with Section 2.2.2. The rainwater tank is at least $6m^3$ per $100m^2$ of impervious area across the site. The purpose of the rainwater tank is to reduce the quantity of water going to the absorption system.

C6 The design addresses the impact of increased subsoil flow on properties downstream of the absorption trench, and details of the impact of the absorption pit on the downstream catchment are submitted.

C7 Approval will not be provided where the nominal absorption rate is less than 0.1 litres/m^2/s strata of impermeable or low permeability material are present, or where the water table is less than 2m from the base of the pit.

Notes: Applications for an absorption system must be accompanied by a concept plan showing the location, dimensions and levels of the proposed system. Applications for absorption systems must be prepared by a suitably qualified practitioner and comply with Council's Guide for preparing Geotechnical and Hydrogeological Reports.

Applications for an absorption system must be accompanied by a Geotechnical Report to accurately determine the following soil characteristics: the soil type/s to a depth of at least 2m, the nominal absorption rate, the depth to an identification of any strata through the soil and the depth of the water table. The soil characteristics must be determined using appropriate field tests.

E2.2.12 Pump and sump systems

Objectives

O1 To mitigate the impacts of pumping water to areas that would normally not receive discharge.

O2 To avoid the flooding of properties.

O3 To protect existing Council drainage assets.

Controls

Where this applies

C1 Pump and sump systems will only be considered where the development involves alterations and additions to a dwelling house, and where the development increases the impervious area of the site by less than 40m^2.

C2 The pump and sump system may only be utilised for the development additions. That is, a pump and sump system may not be retrofitted to the component or sections of the building which are existing.

Requirements

C3 The collection system for the pump and sump arrangement is designed in accordance with the design criteria for gravity drainage in this chapter.

C4 The pump and sump system are designed by a suitably qualified practitioner and designed and installed in accordance with the appropriate industry standards.

C5 Properties seeking to install a pump and sump system also install a rainwater tank in accordance with Section E2.2.2. The rainwater tank is at least 6m^3 per 100m^2 of impervious area across the site. The purpose of the rainwater tank is to reduce the quantity of water going to the pump and sump system.

C6 The tank has an automatic pump which meets the following requirements:

a) The pump may only commence pumping a minimum of 1 hour after rain has ceased.

b) The pump may only operate when the rainwater tank is over 50% full.

c) The pump may only pump out the top 50% of the rainwater tank (the remaining water is to be available for reuse).

d) At a minimum, the pump out system must consist of dual alternating pumps and be connected to an uninterrupted power supply.

C7 Discharge from the site does not exceed the permissible site discharge as outlined in Section 2.2.4 control C3.

C8 In the event of the failure of both pumps, an overland flow path and/or surcharge and pondage area is identified and provided.

C9 Discharge from the system passes through a stilling pit, located within the site boundary. Discharge to Council's underground stormwater system is via a concrete pipe with a minimum diameter of 375mm and a new stormwater junction pit located in the public road.

C10 The pump and sump system is protected from backflow from Council's drainage system.

C11 All electrical fittings and supply are 500mm above the maximum water level and/or any overland flow paths.

Location

C12 Pressured pipes are only permitted on the applicant's property. Council will not approve the use of pressurised pipe systems within the road reserve or Council owned property.

Note: Industry standards include AS3500 National Plumbing and Drainage Code, other relevant codes and the manufacturer's specifications.

A positive covenant will be required for the maintenance of the pump and sump system.

E2.2.13 Charged or siphonic systems

Objectives

O1 To protect existing Council drainage assets.

Controls

Where this applies

C1 Non-mechanical pressurised (charged or siphonic) systems will only be considered where it is not possible to discharge drainage to Council's stormwater system by gravity.

Requirements

C2 The charged or siphonic system is designed by a suitably qualified practitioner and designed and installed in accordance with the appropriate industry standards.

C3 In general, the discharge from charged or siphonic systems are connected to Council's below ground drainage system.

C4 Only dwelling houses and developments involving alterations and additions, where the additional gross impervious area is less than 40^{m2}, may discharge from the charged or siphonic systems to the kerb and gutter.

C5 Discharge from the system passes through a stilling pit, located within the site boundary.

C6 The system is protected from backflow from Council's drainage system.
Note: Industry standards include AS3500 National Plumbing and Drainage Code, other relevant codes and the manufacturer's specifications.

E2.2.14 Activities on a public road

Objective

O1 To protect Council's road assets.

O2 To ensure works carried out on Council's road and stormwater assets meet Council's required standard.

Controls

C1 All works, including stormwater works, within a public roadway are in accordance with Council's "Specification for Road Works, Drainage and Miscellaneous Works".

Note: Where works, including stormwater works, are within a public roadway (including the footpath and nature strip areas), approval is subject to a separate application under Section 138 of the *Roads Act 1993*. The nominated principal certifying authority cannot legally give approval for works under Section 138 of the Roads Act. Approval must be granted by Council.

E2.3 Flood risk management controls

E2.3.1 Introduction

In assessing development applications for flood risk management within "flood risk precincts", Council will consider each of the matters listed below and each matter must be addressed by the applicant. The response to these matters, plus any other relevant statutory and policy matters, will be considered by Council when assessing the acceptability of the development.

For each matter, specific objectives are given together with the controls to achieve those objectives. Alternative ways to achieve the stated objectives, will be considered when, in the opinion of Council, the outcome is better in terms of the impact on the public domain or adjacent properties than strict compliance with the stated controls.

The flood risk planning controls reflect the recommendations of the Woollahra Coastal Zone Management Plan, and the Floodplain Risk Management Plans for Double Bay, Rose Bay and Rushcutters Bay and the Updated Flood Study for Watsons Bay, prepared in accordance with the State Government Flood Prone Lands Policy and the Floodplain Development Manual.

E2.3.2 Information available from Council

Council will make available information on flooding, coastal inundation and the Council drainage system, where it is available, on the express understanding that Council is not liable for the accuracy of the information or the consequences of it being used.

There are four main floodplains within the Woollahra Municipality:

- Rushcutters Bay
- Double Bay
- Rose Bay
- Watsons Bay.

Each of the floodplains can be classified based on different levels of potential flood risk. Flood information, including flood levels as derived from significant historical flood events, is available on each of these floodplain areas. This information may be found on Council's website.

A Woollahra Coastal Zone Management Plan Stage 1 report has been prepared for the Woollahra Municipality. Estuary Planning Levels have been developed for those properties subject to coastal inundation.

The applicant must confirm the accuracy of information by inspection, survey and/or study. Where existing flood or coastal inundation information is not available but flooding and/or coastal inundation is considered by Council to be a potential issue, a site specific study may be required.

E2.3.3 Flood planning levels

Flood planning levels (FPLs) set the floor level height for development in areas which are subject to flooding. The FPLs vary depending on the relative flood risk and the proposed development type.

FPLs consist of the following:

- a flood level which has been determined from a flood study (see Section E2.3.2); plus
- a freeboard that compensates for uncertainties in the estimation of flood levels across the floodplain.

Foreshore developments subject to coastal inundation

Foreshore developments subject to coastal inundation must give consideration to two factors:

- flood planning levels (FPLs); and
- estuary planning levels (EPLs).

EPLs consist of the following:

- a still water level which has been determined from a coastal inundation study (see Section E2.3.2); plus
- a local wind and wave setup height which has been determined from a coastal inundation study (see Section E2.3.2); plus
- a wave run-up/overtopping height which has been determined from a coastal inundation study (see Section E2.3.2); plus
- a sea level rise factor; plus
- a freeboard that compensates for uncertainties in the estimation of coastal inundation levels across the coastal zone.

Note: The NSW Chief Scientist has advised that the sea level rise benchmarks (measured as an increase above 1990 mean sea levels) of 40cm by 2050 and 90cm by 2100 are adequate in light of evolving understanding of the complex issues surrounding future sea levels.

All EPLs should be based on the 2100 benchmark.

Objectives

O1 To minimise risk to people and property.

O2 To reduce the long term risks associated with coastal inundation, elevated sea levels and/or waves overtopping foreshore defences.

O3 To maintain Council's streetscape objectives in existing commercial and heritage areas.

Controls

C1 All new developments and major alterations and additions have their floor levels set at the required FPL and EPL as stipulated in the following table:

Development type	Flood (and estuary) planning level
Habitable floor areas	100 Year ARI flood level plus 0.5m freeboard
Non-habitable floor areas	100 Year ARI flood level plus 0.3m freeboard
Habitable floor areas for foreshore developments subject to coastal inundation	The highest RL, calculated from the following: ▸ 100 Year ARI flood level plus 0.5m freeboard; or ▸ still water level plus 100 Year ARI wave run-up plus 0.3m freeboard
Ground level, open car parking spaces	20 Year ARI flood level plus 0.3m freeboard
Enclosed car parking spaces, three or fewer vehicles	20 Year ARI flood level plus 0.3m freeboard
Enclosed car parking spaces, more than three vehicles	100 Year ARI flood level plus 0.3m freeboard

C2 For alterations and/or additions (only) developments, where it is not practical to meet the above habitable, non-habitable and car parking floor levels due to compatibility with the height of adjacent buildings, or compatibility with the floor level of existing buildings, a lower floor level may be considered, based on the individual merits.

A lower floor level will only be permitted where the habitable floor area increases by 40m² or less. In these circumstances, the floor level is to be as high as practical, and no lower than the existing floor level. This concession will be made no more than once for any given property. Subsequent development applications will be required to meet the FPLs and EPLs as outlined in C1.

C3 To achieve the required FPL and/or EPL for car parking, Council may allow the use of mechanical barriers such as flood gates. Where a mechanical barrier is permitted:

a) a 0.5m freeboard is provided

b) the mechanical barrier is located wholly on private property

c) the mechanical barrier may require the provision of an on-site queuing area (see Chapter E1 Parking and Access for further details)

d) the mechanical barrier is designed such that, by default, it is in the "closed" position. That is, it opens only to allow vehicles to enter and exit the site.

Note: The mechanical barrier must be designed and installed by a suitably qualified practitioner. A positive covenant will be required for maintenance of the mechanical barrier.

C4 Filling of the site, where acceptable to Council, may change the flood and/or coastal inundation risk for the subject land. The FPL and/or EPL controls is based on the new flood and/or coastal inundation risk as determined by the new site levels.

Special consideration

C5 All FPLs and EPLs represent the minimum standard required for the development type. An applicant may seek to lower the minimum FPL and/or EPL. Such requests will be assessed on their merits. A Flood Risk Management Report and/or a Coastal Inundation Assessment, prepared by a suitably qualified practitioner, will be required.

> Note:
>
> A Flood Risk Management Report and/or Coastal Inundation Assessment must be prepared by a suitably qualified practitioner and at a minimum it should include the following:
>
> - acknowledgement that the proposed development seeks to lower the minimum standard FPL and/or EPL required by Council's Stormwater Drainage and Flood Risk Management Development Control Plan;
> - proposed risk management measures to minimise the impact of flooding and/or coastal inundation;
> - demonstration that the risk management measures will not adversely affect other properties;
> - an Emergency Management Plan that includes an evacuation strategy.

C6 For ground level shop fronts in commercial and mixed-use developments, a lower the FPL and/or EPL may be considered to allow the development to match into existing longitudinal street levels, to optimise retail potential and/or to provide acceptable access for persons with disabilities. Such requests will be assessed on their merits. Driveway and footpath gradients must comply with Council's specifications.

C7 For heritage conservation properties, a lower FPL and/or EPL may be considered, for the heritage component of the building only, to remain sympathetic with the heritage values of the property. In general, any alterations and additions will be required to meet the FPL and/or EPL as outlined in conditions C1, C2, C3 and C4. Such requests will be assessed on their merits.

E2.3.4 Flood controls

Objectives

O1 To minimise risk to people and property.

O2 To ensure that development does not cause flood levels to rise or exacerbate flooding on the surrounding floodplain.

O3 To ensure existing overland flow paths are maintained and to ensure new structures do not obstruct the free flow of floodwaters.

O4 To increase flood hazard awareness.

O5 To reduce the long term risks associated with tidal inundation, elevated sea levels and/or waves overtopping foreshore defences.

O6 To maintain Council's streetscape objectives in existing commercial and heritage areas.

Controls

General controls which apply to all developments

Note: A plan must accompany the application and provide information on any earthworks or filling of land (with suitable contour intervals) and the location of existing and proposed fences, retaining walls and/or any other barriers.

General

C1 All structures have flood compatible building components below the 100 Year ARI level plus 0.5m freeboard.

C2 All electrical equipment (e.g. air conditioners and pool pumps) is located or protected to above the 100 Year ARI level plus 0.5m freeboard.

C3 All storage areas such as shelving are above the 100 Year ARI level plus 0.5m freeboard.

C4 The structure is built to withstand the forces of floodwater, debris and buoyancy up to and including the 100 Year ARI level plus 0.5m freeboard.

C5 Reliable evacuation access for pedestrians is provided from the lowest habitable floor area to a refuge area above the PMF level and designed to withstand PMF water forces.

C6 Suitable flood protection (e.g. a crest up before descent on an access driveway) is provided within the subject site. Council will not generally allow alteration to existing levels on the public road or its property to achieve flood protection.

Note: The Building Code of Australia 2013 has requirements relating to minimum construction standards for specified building classifications in flood hazard areas. Reference should be made to the Code for further information.

Fencing

C7 Fencing is constructed in a manner which does not change the nature or level of flood waters in the area. Fencing is of a permeable/open type design, however, existing solid fences may be replaced by new solid fences.

C8 Fencing is adequately constructed so as to withstand the forces of floodwaters.

C9 The flood impact of the development is considered to ensure that the development will not increase flood effects elsewhere. Where a significant change in use of the site is proposed, a flood impact assessment is required.

Overland flow paths

C10 All overland flow paths are free of structures which prevent the free passage of overland flow.

C11 All overland flow paths are designed to convey the 1 in 100 ARI event.

C12 All existing overland flow paths are maintained and the hydraulic capacity of the openings between buildings is maintained.

C13 Overland flow paths are provided on all properties that have upstream contributing catchments of 1,000m5 or greater.

C14 All overland flow paths are designed to a low hazard classification if possible.

C15 Overland flow paths are designed such that they do not increase velocity or concentrate water on any adjacent property.

C16 In overland flow paths, fencing is generally not be permissible. However, in low and medium flood risk precincts permeable/open type fences may be approved where it can be demonstrated that there will be no adverse impact on flooding to the subject land or surrounding properties.

C17 Any structure located in an overland flow path is designed to be structurally sound in all flood events. A flood study may be required. Structures are designed by a suitably qualified practitioner.

C18 If an overland flow path is not achievable, a 1 in100 ARI drainage system may be accepted as an alternative.

C19 Overland flow paths are grass turfed.

C20 In (sandy) areas with high risk erosion potential, overland flow paths are designed to limit velocity and/or protect against scour.

Note: Provisional hazard classifications are defined in Appendix L of the Floodplain Development Manual.

Time limit consents

C21 Where an applicant cannot increase EPLs to take into account the sea level rise planning benchmarks, Council may consider imposing time-limited consent to provide the potential to remove, replace or adapt development in the future. The consent will require the development to cease and all structures to be demolished and removed and the site to be reinstated to a sustainable landscaped form unless a further consent is obtained allowing for the continuation of the development in its originally approved or modified form. Council will consider the appropriateness of such developments on the merits of individual applications.

Note: It is likely that Council would impose a condition which identifies an appropriate and specific trigger which would require the removal of the development. For example, if the sea level were to reach a specified height or the erosion of an escarpment receding to a specified distance from the property boundary.

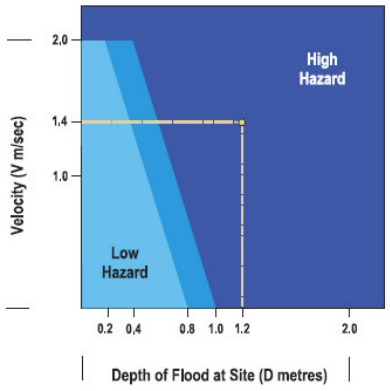
High flood risk precincts

Note: The high flood risk precinct is where high flood damages, potential risk to life and/or evacuation problems would be anticipated or where development would significantly or adversely alter flood behaviour. Development in this precinct requires detailed risk management strategies and careful design to reduce the risk to life and property to an acceptable level.

The High FRP would generally be reflected by the following criteria:

- all areas where high hazard conditions occur during a 100 year ARI flood (using the provisional hazard categories published in Appendix L of the Floodplain Development Manual);
- all locations where safe evacuation routes cannot be provided by the natural topography, necessitating the need for refuge areas to be provided; and
- all floodways.

FIGURE 2 Provisional hydraulic hazard categories
Source: Floodplain Development Manual



Notes:

The degree of hazard may be either:

- Reduced by establishment of an effective flood evacuation procedure;
- Increased if evacuation difficulties exist.

In the transition zone highlight by the median colour, the degree of hazard is dependant on site conditions and the nature of the proposed development.

Example:

If the depth of flood water is **1.2m** and the velocity of floodwater is 1.**4m/sec** then the provisional hazard is **high**.

C22 Properties within a high flood risk precinct are unsuitable for all development (except alterations and additions (only) developments) unless a Flood Risk Management Report has been prepared, by a suitably qualified practitioner, outlining appropriate risk management measures.

C23 Buildings or structures constructed in high flood risk precincts are designed to withstand the PMF event.

C24 No new fencing of any type is permitted in high flood risk precincts unless it can be demonstrated, by a suitably qualified practitioner, that there will be no adverse impact on flooding to the subject land or surrounding properties.

Medium flood risk precincts

Note: The medium risk precinct includes all land that is inundated by the 100 year ARI flood that is not classified as high risk. Areas on the edge of the identified 100 year ARI floodplain where the topography provides low hazard rated excavation routes (using the provisional hazard criteria published in Appendix L of the Floodplain Development Manual) would generally be classified as medium risk.

C25 Properties within a medium flood risk precinct are generally unsuitable for critical and sensitive use development. Such developments will be considered on their merits, taking into account any proposed risk management measures.

C26 In medium flood risk precincts, impervious and continuous fencing is not permissible unless it can be demonstrated that there will be no adverse impact on flooding to the subject land or surrounding land.

Low flood risk precincts

Note: In the low flood risk precinct the likelihood of damages, occurring from flooding, is low. This area can be identified as land within the floodplain that is above the 100 year ARI flood but below the extent of the PMF.

C27 For critical and sensitive developments in low flood risk precincts, all habitable and non-habitable floor levels are no lower than the PMF flood level.

C28 For critical and sensitive developments in low flood risk precincts, all structures have flood compatible building components below the PMF flood level.

C29 For critical and sensitive developments in low flood risk precincts, the applicant is to demonstrate that any structure can withstand the forces of floodwater, debris and buoyancy up to and including the PMF flood level.

Other flood prone properties

Note: There are four main floodplains within the Woollahra Municipality: Rushcutters Bay, Double Bay, Rose Bay and Watsons Bay. A property may be flood prone if it is outside of the identified four floodplains, but subject to overland flows due to one of the following characteristics:

- the property is on the low side of the road and/ or the boundary levels are below the level of Council's kerb;
- the property is lower than surrounding properties;
- the property is in a natural low point, gully or depression; or
- the property is adjacent to or contains a flow path, open channel, watercourse or drainage line.

A property may also be flood prone if it is outside of the identified four floodplains, but subject to one of the following characteristics:

- the property fronts Sydney Harbour with any part of the land below RL 3.35m AHD;
- the development includes underground habitable areas; or
- the development includes a low level driveway or an underground car park.

C30 Where a property is outside of the four flood plains, but identified as flood prone, a site specific assessment is required. A flood analysis may be requested to determine the level of flood risk and to allow the setting of FPLs.

Note: A Flood Risk Management Report prepared, by a suitably qualified practitioner, outlining appropriate risk management measures may be required.

Appendix 1 – Definitions

The definitions in this appendix define words and expressions for the purpose of this chapter.

Other terms may be defined in other parts of the DCP, the Woollahra LEP 2014, and other publications including the NSW Government's Floodplain Management Manual: The Management of Flood Liable Land.

absorption system	an excavation that has been filled with material or prefabricated void units that are conducive to the drainage of stormwater and which are designed to drain vertically or side-ways, into adjacent sub-surface in-situ void or fill material.
alterations and additions (only) developments	applies to the following developments: ▸ residential development where the proposed development is an addition and/or alteration to an existing dwelling of not more than 40m² or 10% (whichever is the lesser) of the habitable floor area which existed at the date of commencement of this DCP; ▸ development other than residential where the proposed development is an addition to existing buildings of not more than additional 100m² or 10% (whichever is the lesser) of the floor area which existed at the date of commencement of this DCP (whichever is the lesser).
charged or siphonic systems	use the height of the building to create a pressurised stormwater system. This allows the system to draw water out of the gutters at higher velocities and flow rates. The drainage line permanently holds water.
coastal inundation	is the storm-related flooding of coastal lands by ocean waters due to elevated still water levels (storm surge) and wave run-up.
commercial and mixed-use development	applies to all properties zoned Neighbourhood Centre, Local Centre, Mixed Use in Woollahra LEP 2014.

critical and sensitive developments	applies to the following types of developments: Emergency services facilities; public administration building that may provide an important contribution to the notification or evacuation of the community during flood events (e.g. SES Headquarters and Police Stations); hospitals; community facility; telecommunications facility; institutions; educational establishments; child care facilities; liquid fuel depot; public utility undertaking (including electricity generating works; sewerage treatment plant; sewerage system; telecommunications facility; utility installations and water treatment facility) which are essential to evacuation during periods of flood or if affected would unreasonably affect the ability of the community to return to normal activities after flood events; residential care facility; school and seniors housing.
developments creating high levels of pollutants	may include, but is not limited to the following: service stations; motor repair shops; panel beaters; miscellaneous automotive; marinas; boatsheds; marine repairs; shipbuilders; commercial slipways; miscellaneous retailers and manufacturers involving chemicals, solvents, hazardous waste and containers; miscellaneous retailers and manufacturers involving garden and building materials; vehicle depots; and car parks.
enclosed car parking	car parking which is potentially subject to rapid inundation, which consequently increases danger to human life and property damage (such as basement of bunded car parking areas). The following criteria apply for the purposes of determining what is enclosed car parking: ▸ flooding of surrounding areas may raise water levels above the perimeter which encloses the car park (normally the entrance), resulting in rapid inundation of the car park to depths greater than 0.8m, and ▸ drainage of accumulated water in the car park has an outflow discharge capacity significantly less than the potential inflow capacity.
Epoch	for determining design flood levels refers to a year in the future for which flood level probabilities are calculated. For example, the notation 100 Year ARI 2050 refers to the 100 year ARI flood level (or 1% AEP flood level) at the Year 2050 Epoch. This is a prediction made now (based on the best available information) of the flood level which has a 1% probability of occurring or being exceeded in 2050. Similarly, the Year 2100 Epoch refers to the flood level which has a 1% probability of occurring or being exceeded in 2100.
flood evacuation strategy	the proposed strategy for the evacuation of flood prone areas.

flood risk precincts (FRPs)	are a categorisation of a site's flood risk for land-use planning purposes. All property within a floodplain falls into one of three classifications: low, medium or high.
foreshore developments	includes all properties with any part of their land below RL 3.35m AHD.
foreshore inundation	the inundation of land occurring when water from Sydney Harbour overflows the natural or human-made foreshore boundary. All properties with any part of their land below RL 3.35m AHD may be impacted by foreshore inundation.
freeboard	a factor of safety typically used in relation to the setting of flood planning levels. It compensates for uncertainties in the estimation of flood levels across the floodplain, such as wave action, localised hydraulic behaviour and impacts that are specific event related, such as levee and embankment settlement, and other effects such as sea level rise.
green roofs	a roof system, with a dual function. It designed to promote the growth of various forms of vegetation on the top of buildings. It is also designed to support various forms of renewable energy and water collection technology to assist in supplying power and water to the occupants of the building.
habitable floor area	as defined in the Floodplain Development Manual: The Management of Flood Liable Land.
local overland flooding	as defined in the Floodplain Development Manual: The Management of Flood Liable Land. Note: All properties containing a Council owned pipe and/ or a drainage easement are subject to local overland flooding. All properties with low level driveways, footpaths or where their boundary levels are below the level of Council's kerb are subject to local overland flooding.
low level property	any property where the property falls away from the road reserve. That is, the grade or level of the land generally falls from the front to rear boundary. Stormwater from the property generally falls towards a neighbour's property at the side or rear (rather than to Council's road).

mainstream flooding	as defined in the Floodplain Development Manual: The Management of Flood Liable Land. Note: Properties that are situated adjacent to an open or covered channel or watercourse may be impacted by mainstream flooding.
major alterations and additions	applies to the following developments: ▶ residential development where the proposed development is an addition and/or alteration to an existing dwelling of more than an additional 40m² or 10% (whichever is the lesser) of the habitable floor area which existed at the date of commencement of this DCP; ▶ development other than residential where the proposed development is an addition to existing buildings of more than an additional 100m² or 10% (whichever is the lesser) of the floor area which existed at the date of commencement of this DCP (whichever is the lesser).
on-site detention systems	holding ponds that temporarily store stormwater to control and reduce downstream flow rates. They are designed to retard stormwater during intense rainfall and to empty once the peak of the storm has passed.
overland flow paths	above ground drainage paths that form a critical part of the drainage system. They convey stormwater when the stormwater volume is greater than the designed pipe systems capacity.
pervious surface	a paving system that allows water to infiltrate through pores in the pavement and is stored in voids until it can percolate through the natural ground. Pervious surfaces include, but are not limited to, porous asphalt, porous concrete and modular pavers.
pump and sump systems	a pump that is used to remove water that has accumulated in a sump basin, often in underground areas such as car parks. The sump pump is used to send water away from the house.
rain garden	a planted depression that captures rainwater runoff from impervious urban areas such as car parks. The rain garden serves two main purposes. It reduces stormwater runoff through absorption into the ground and transpiration. Secondly, the plants grown within the rain gardens capture pollutants and reduce the amount of pollution which is then released to Council's stormwater system.
refuge area	an area of land located above the PMF that provides reasonable shelter for the likely occupants of the development commensurate with the period of time that refuge is likely to be required in floods up to the PMF.

residential development	applies to all properties zoned Low Density Residential and Medium Density Residential in Woollahra LEP 2014.
site emergency response flood plan	a management plan that demonstrates the ability to safely evacuate persons and includes a strategy to move goods above the flood level within the available warning time. This Plan must be consistent with any relevant flood evacuation strategy, flood plan or similar plan.
stormwater	untreated rain water that runs off the land onto which it falls.
suitably qualified practitioner	a professional with the appropriate qualifications, experience and skills to undertake the task. All suitably qualified practitioners should have appropriate professional indemnity insurance.
wave run-up and overtopping	the process where a wave reaches the foreshore, and an "uprush" of water onto the foreshore will occur. The height of wave run-up is affected by the nature of the foreshore. In some instances a wave may propagate over the foreshore edge and further landward, which is called wave overtopping. Wave run-up cannot occur up a vertical seawall and in these cases the hazard is related exclusively to wave overtopping.

Appendix 2 – Design rainfall intensities

The following design rainfall intensities are to be used throughout the municipality.

Woollahra Council design rainfall intensities

Duration		Average recurrence interval						
		1 in 1	1 in 2	1 in 5	1 in 10	1 in 20	1 in 50	1 in 100
Minutes	Hours	Rainfall intensities in mm/hour						
5	0.083	104	133	167	187	213	246	271
6	0.100	98	125	157	175	199	231	254
7	0.117	92	118	148	166	189	219	241
8	0.133	88	112	141	158	180	209	231
9	0.150	84	107	135	151	173	201	222
10	0.167	80	102	130	146	166	193	214
11	0.183	77	99	125	140	161	187	207
12	0.200	74	95	121	136	156	181	201
13	0.217	72	92	117	132	151	176	195
14	0.233	69	89	114	128	147	171	190
15	0.250	67	86	111	124	143	167	185
16	0.267	65	84	108	121	139	162	180
17	0.283	64	82	105	118	136	159	176
18	0.300	62	80	102	115	133	155	172
19	0.317	60	78	100	113	130	152	168
20	0.333	59	76	98	110	127	148	165
21	0.350	57	74	95	108	124	145	162
22	0.367	56	72	93	106	122	143	159
23	0.383	55	71	91	104	119	140	156
24	0.400	54	69	90	101	117	137	153
25	0.417	53	68	88	100	115	135	150
26	0.433	52	67	86	98	113	132	147
27	0.450	51	65	85	96	111	130	145
28	0.467	50	64	83	94	109	128	143
29	0.483	49	63	82	93	107	126	140
30	0.500	48	62	80	91	105	124	138
31	0.517	47	61	79	90	104	122	136
32	0.533	46	60	78	88	102	120	134

Duration		Average recurrence interval						
		1 in 1	1 in 2	1 in 5	1 in 10	1 in 20	1 in 50	1 in 100
Minutes	Hours	Rainfall intensities in mm/hour						
33	0.550	46	59	77	87	101	118	132
34	0.567	45	58	75	86	99	117	130
35	0.583	44	57	74	84	98	115	128
36	0.600	43	56	73	83	96	113	126
37	0.617	43	55	72	82	95	112	125
38	0.633	42	55	71	81	94	110	123
39	0.650	42	54	70	80	92	109	121
40	0.667	41	53	69	79	91	107	120
41	0.683	40	52	68	78	90	106	118
42	0.700	40	52	67	77	89	105	117
43	0.717	39	51	67	76	88	103	115
44	0.733	39	50	66	75	87	102	114
45	0.750	38	50	65	74	86	101	113
46	0.767	38	49	64	73	85	100	111
47	0.783	37	48	63	72	84	99	110
48	0.800	37	48	63	71	83	97	109
49	0.817	37	47	62	70	82	96	108
50	0.833	36	47	61	70	81	95	106
51	0.850	36	46	60	69	80	94	105
52	0.867	35	46	60	68	79	93	104
53	0.883	35	45	59	67	78	92	103
54	0.900	35	45	59	67	77	91	102
55	0.917	34	44	58	66	77	90	101
56	0.933	34	44	57	65	76	89	100
57	0.950	33	43	57	65	75	89	99
58	0.967	33	43	56	64	74	88	98
59	0.983	33	42	56	63	74	87	97
60	1	32	42	55	63	73	86	96
90	1.5	25	33	43	49	57	67	75
120	2	21	27	36	41	47	56	63
180	3	16	21	27	31	36	43	48
240	4	13	17	22	26	30	35	39
300	5	11	15	19	22	26	30	34

Duration		Average recurrence interval						
		1 in 1	1 in 2	1 in 5	1 in 10	1 in 20	1 in 50	1 in 100
Minutes	Hours	Rainfall intensities in mm/hour						
360	6	10	13	17	19	23	27	30
720	12	6	8	11	12	14	17	19
1440	24	4	5	7	8	9	11	12
2880	48	3	3	4	5	6	7	8
4320	72	2	3	3	4	4	5	6

Probable maximum precipitation depth in mm

Duration		Catchment area		
Minutes	Hours	1km^2	2km^2	3km^2
15	0.25	170	160	160
30	0.5	250	240	230
60	1	360	350	340
90	1.5	460	450	440
120	2	540	530	520
180	3	660	640	630
360	6	870	850	830

Appendix B

Proposed Modification to the DCP Chapter D6 - Rose Bay Centre

Chapter D6
Rose Bay Centre

Part D ▸ Business Centres

CHAPTER D6 APPROVED ON 27 APRIL 2015

AND COMMENCED ON 23 MAY 2015

Last amended on 30 August 2021

Chapter D6 ▸ Rose Bay Centre

Contents

D6.1 Introduction

This is Chapter D6 of the Woollahra Development Control Plan 2015 (DCP), Part D Business Centres. It establishes detailed controls to guide future development in the Rose Bay Centre.

Rose Bay is a unique local centre which enjoys a privileged position adjacent Sydney Harbour at the foot of the South Head peninsula. The historical development of Rose Bay has focused the centre on New South Head Road. The consistent scale of buildings and the distinctive landscape quality evoke an appealing urban village character which is warmly valued by local residents and users of the centre.

D6.1.1 Land where this chapter applies

This chapter applies to the Rose Bay Centre, as identified in Figure 1.

FIGURE 1 Location plan

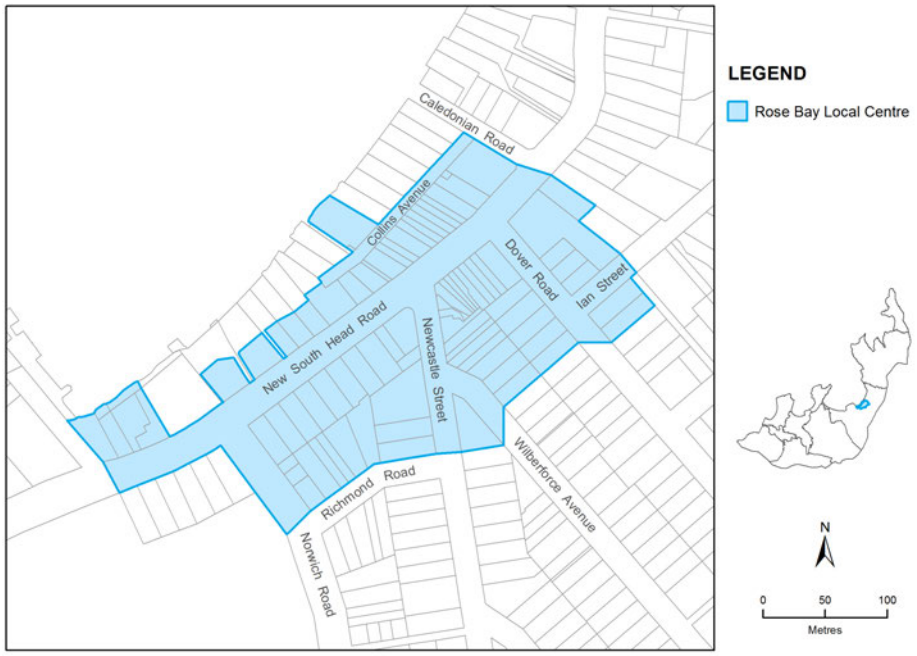
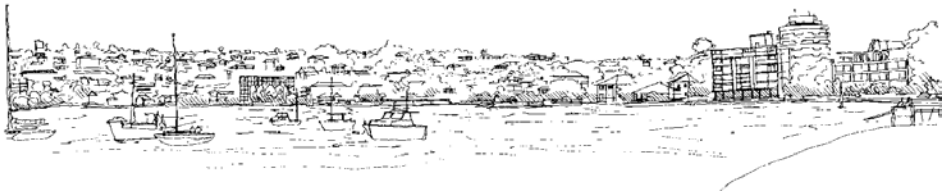


FIGURE 2 View of Rose Bay from the harbour



D6.1.2 Development to which this chapter applies

This chapter applies to development that requires development consent.

Generally this will be mixed use retail, business, office and /or residential development, but may also include permitted uses such as child care centres, community facilities, and other uses as permitted by Woollahra LEP 2014.

Development within the Rose Bay Centre should retain and enhance the village character of the centre.

D6.1.3 Objectives

The Rose Bay Centre should develop into a high quality medium density urban village with a balanced mix of retail, commercial, residential and leisure uses, which cater primarily for the needs of the local community.

The intention of this chapter is to strengthen and enrich the existing urban structure of the Rose Bay Centre as follows:

O1 To retain and enhance the village atmosphere of the Rose Bay Centre.

a) To encourage contiguous ground floor retail frontage to ensure liveliness of the centre;

b) To limit the width of street frontage of individual shops to preserve the 'small shop' character of the centre;

c) To promote a coherent building scale and high quality development;

d) To retain and improve the pedestrian environment by encouraging through block pedestrian connections at nominated locations, and requiring continuous awnings in nominated areas;

e) To enhance the way development contributes to a sense of place;

f) To improve vehicle parking and servicing in the centre and reduce vehicular and pedestrian conflicts;

g) To enhance the public domain of Rose Bay Centre by considering the Public Domain Improvement Plan and Streetscape Design Manual 1999; and

h) To encourage the provision of community services and facilities as part of site redevelopments.

O2 To improve the connections between the Rose Bay Centre and the harbour foreshore.

a) To encourage the creation of a public square between New South Head Road and Collins Avenue, opposite Percival Park;

b) To encourage the construction of pedestrian arcades as part of developments in nominated locations, to improve public access through to the foreshore; and

c) To maximise views to the water from the public domain.

O3 To create a memorable image for Rose Bay.

a) To create defined entrances to the centre;

b) To provide a stronger public domain focus to the centre; and

c) To provide direction and certainty of outcome in relation to build form to ensure:

- a coherent street scale;
- that new development meets the desired future character;
- a variety of building types; and
- a high level of amenity.

O4 To improve the Rose Bay Centre's public domain.

a) Improve the public domain of Rose Bay by using the Public Domain Improvement Program and the Streetscape Design Manual to inform changes;

b) Identify the location of and building envelopes surrounding a new public square in the centre, which support the use of bonus height and FSR controls in the Woollahra Local Environmental Plan 2014 (Woollahra LEP 2014);

c) To improve pedestrian amenity throughout the centre; and

d) To retain the important role that public transport plays in the Rose Bay Centre.

O5 To foster the diverse mix of uses in the Rose Bay Centre.

a) To retain and enhance the combination of retail, commercial, public and residential uses that characterise Rose Bay; and

b) To encourage a range of flexible accommodation to support the diverse mix of uses in the centre.

O6 To conserve and enhance the visual and environmental amenity of all buildings and places of significance in the centre.

a) To identify character buildings within the Rose Bay Centre; and

b) To ensure that alterations and additions to character buildings and heritage items are compatible in scale, form and material with these buildings and items, and adjoining developments.

O7 To improve traffic and parking management in the centre and reduce vehicle and pedestrian conflicts.

a) To identify parking and servicing arrangements for the centre.

O8 To introduce stormwater management measures to control localised flooding, stormwater quality and quantity, and improve the visual and environmental impact of stormwater drainage, particularly at the harbour foreshore.

a) To facilitate the creation of the Rose Bay Square between New South Head Road and the drainage reserve off Collins Avenue to mitigate against local flooding of the centre;

b) To improve the visual and environmental impact of existing stormwater outlets into Rose Bay; and

c) To coordinate overland flow management with public domain improvements.

O9 To enhance the diverse character of streets in the Rose Bay Centre.

a) To carry out public domain improvements to preserve and enhance the unique character of the individual streets in the centre; and

b) To provide specific design criteria for both public and private domain to allow for, and enhance the character of, individual streets.

D6.1.4 Relationship to other parts of the DCP

This chapter is to be read in conjunction with the other parts of the DCP that are relevant to the development proposal, including:

- Part E: General Controls for All Development – this part contains chapters on Parking and Access, Stormwater and Flood Risk Management, Tree Management, Contaminated Land, Waste Management, Sustainability, Signage and Adaptable Housing.
- Part F: Land Use Specific Controls – this part contains chapters on Child Care Centres, Educational Establishments, Licensed Premises and Telecommunications.

D6.1.5 How to use this chapter

This chapter is applicable to all development and redevelopment work on private land in the Rose Bay Centre.

The Rose Bay Public Domain Improvements Plan (1999) should also be used as a guide to works in the public domain, and includes details of street tree planting, footpaths, street furniture, and vehicular and pedestrian crossings.

This chapter of the DCP is structured as follows:

D6.1 Introduction

General information about this chapter, including why the chapter was prepared, its aims, and its relationship to other planning documents.

D6.2 Understanding the context

Provides a summary description of the existing urban context. For a more detailed analysis refer to the Rose Bay Centre Urban Design Study, upon which this chapter was based.

D6.3 Urban structure

Provides an understanding of the current urban structure of the centre, and identifies whether the site is located in the Core Area or a Transition Area. Objectives for the future character, form and function of the Rose Bay Centre are described here.

D6.4 Street character

Specifies the desired future character of the street(s) in which the site is located.

Using the built form controls

The development controls are derived from the Rose Bay Centre Urban Design Study. They respond to the objectives set out in Section 6.1.3 and the desired future character described in Section D6.4. Controls have been designed for each individual site in the Rose Bay Centre to optimise development, whilst taking into consideration the potential of adjoining properties and public spaces. This Urban Form Methodology provides a greater certainty of outcome for Council, community and site owners.

Built form controls in the Rose Bay Centre are expressed in:

- graphic form as *building envelopes* on the *control drawings*; and
- written and illustrated form as *development controls*.

These controls must be used in conjunction.

D6.5 Built form envelopes: Control drawings

The controls are in the form of building envelopes, which set the position of development on each site.

There are two control drawings for every site in the Rose Bay Centre showing:

- the ground floor level controls; and
- the upper floor level controls.

The control drawings are accompanied by a descriptive legend, and further explanation is provided in Section D6.6.

D6.6 Development objectives and controls

These explain in written and illustrated form the following four areas of building development:

1. **Use:** Refers to building use such as retail, commercial and residential.
2. **Urban character:** Includes building envelopes, setbacks, heritage, architectural resolution, roof design, awnings, public art, privacy, signage and advertising, and outdoor eating.

3. **Open space:** Includes landscaped area, above ground open space such as balconies and roof terraces, and front fences.
4. **Solar access:** Deals with provision of sunlight to the public and private domain.

Three dimensional images assist in the interpretation of the development guidelines and controls.

A special section deals with the application of bonuses as incentives to the provision of specific public benefits. Applicants seeking bonuses should also refer to the Rose Bay Public Domain Improvements Plan.

All applications will be determined on their individual merits. Applications which depart from any controls or seek concessions for provision of public services or facilities should address:

- why the specific guidelines or controls should be relaxed for the subject site;
- how the village atmosphere of the Rose Bay Centre will be maintained; and
- the urban design and economic benefits to the centre that will result from the proposal.

D6.2 Understanding the context

D6.2.1 Siting

The Rose Bay Centre is strategically located at the neck of the Eastern Suburbs peninsula, one block from the harbour, just north of the large park system and recreational area which occupies the lowest part of the Rose Bay basin.

Important distinguishing characteristics of the centre are its consistent low to medium scale buildings, exceptional landscape quality, and diverse mix of local services, residential apartments and commercial uses, which combine to produce a distinctive village character.

The centre straddles New South Head Road, around its intersections with Dover Road and Newcastle Street. These two streets play an important role as urban connectors, linking New South Head and Old South Head Roads.

D6.2.2 Historical development

The building stock in and around the centre represents a cross section of 20th century architecture of varying quality. Originally part of a series of large private land grants, Rose Bay's early urban development intensified with the extension of the tramline along New South Head Road after 1898.

Due to its key location at two intersections, the centre was able to develop along Newcastle Street and Dover Road. The estates were subdivided and resubdivided between 1900 and 1930 producing the small lots which characterise the centre today. Larger sites generally occur at the fringe of the commercial centre, the result of recent amalgamations.

St Mary Magdalene Church and tower, the Rose Bay Hotel on the corner of Dover Road, the former post office, the Royal Sydney Golf Course and five Norfolk Island pines in Vickery Avenue are the listed heritage items in the immediate vicinity. These buildings and trees contribute prominently to the area's character and help form the established image of Rose Bay. Character buildings that are of architectural merit and are important within the urban form and streetscape of the centre are identified in this chapter of the DCP.

D6.2.3 Built form

There are a surprising number of single storey and two storey buildings in the centre, given the statutory LEP maximum building height (14.1m). With few exceptions the four storey buildings are relatively new. There are two residential towers, developed in the 1960s and 1970s, of six and eight storeys between New South Head Road and the Harbour. The only other tall building element is the tower of St Mary Magdalene Church on New South Head Road.

D6.2.4 Public parks and facilities

There are two pocket parks, Pannerong Reserve and Percival Park, within the centre and two others, Tingira Reserve and Caledonian Road, on its periphery. All of these parks, with the exception of Pannerong Reserve, enjoy harbour frontage, but are underutilised due to their poor amenity and visibility from the centre. Opportunities exist for the improvement of existing pocket parks and creation of new squares, to provide accessible outdoor spaces in the centre where people can rest while shopping or to eat lunch.

There are numerous leisure facilities in the vicinity; however no community buildings exist in the centre.

D6.2.5 Access and circulation

There is a strong pedestrian ambience in the centre due to the relatively continuous street activity, compact layout and low to medium building scale. Improved footpaths and crossings would increase pedestrian amenity, and reduce the potential for pedestrian/traffic conflict which exists in some areas. Better pedestrian access to the harbour foreshore would benefit the centre.

The Parking Strategy contained within the Public Domain Improvements Plan should be used as a guide to improve parking management.

D6.3 Urban structure

Urban structure comprises the inter-relationship of topography and orientation, street layout, pattern of buildings, location of parks and public facilities, and any special natural or human made features, of a given area. The Rose Bay Centre is located in a valley close to the harbour foreshore, surrounded by gracious residential areas to the north and east, and an extensive system of recreational facilities to the south-west, encompassing parks, golf courses, tennis courts, and a sailing club.

The Rose Bay Centre has a strong urban village character, due in a large part to its neighbourhood scale, variety of retail and local service establishments, and friendly pedestrian ambience. Despite these attributes, the built form generally lacks cohesion due to the broad palette of materials used in buildings of different eras, and the varying architectural quality. A more distinctive building fabric has the potential to further consolidate the centre's presence.

The centre is contained within a few blocks, but currently lacks a focus. Some of the most exceptional features of the area, such as the proximity of the harbour and numerous pocket parks, have little presence in the centre. There is the potential to improve access between the existing foreshore parks and the beach, allowing continuous waterfront access from Lyne Park in the west to Dumaresq Reserve in the east. There is also tremendous opportunity to visually connect Pannerong Reserve in the centre and Percival Park on the foreshore, by creating a square at the end of Newcastle Street, to make a unique and memorable focus for Rose Bay.

This chapter identifies the Core Area, Transition Area and Entrances (see Figure 3 Urban structure) within the Rose Bay Centre. This classification reinforces the existing urban structure, and enhances its complexity, providing opportunities for different buildings types and uses, in various parts of the centre.

FIGURE 3 Urban structure

The Core lies between the intersections of New South Head Road with Dover Road and Newcastle Street, and reflects this historically significant route to Watsons Bay. It is the focus of retail activity, defined by buildings which abut the footpath and awnings above, which distinguish it from the surrounding leafy areas. Development in the Core should reinforce its more intense urban quality.

The Transition Areas lie outside the Core in the vicinity of the recreational areas and residential zones, and are an important buffer to these areas. They do not contain the same level of retail activity as the Core but provide residential and commercial uses. They are generally characterised by less continuous building frontage and a stronger landscape presence. The Transition Areas should provide a gradation in development intensity from the Core to the residential and recreational areas.

Entrances are the primary entry points to the centre along New South Head Road, Newcastle Street and Dover Road. Entrances should be more clearly defined to strengthen the centre's containment, enriching the contrast between this busy pedestrian area and its quieter environs.

D6.4 Street character

The street is the primary organising element of urban structure. The street edge is the place where the public and private domains meet. By defining a particular vision for each street, public domain improvements and private development can be coordinated to produce a desired outcome.

This section of the chapter describes the desired future character of each street in the Rose Bay Centre, based on a synthesis of the public domain objectives set out in Section 6.1.3. The Rose Bay Centre Public Domain Improvements Plan should be used as a guide to works in the public domain, such as street tree planting, footpath design, street furniture and traffic devices. Applicants should also seek advice from Council's Technical Services Division.

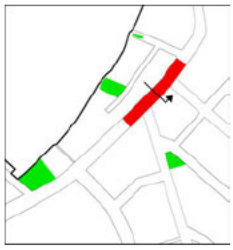
The following is provided for each street in the centre:

- street strategies, which briefly outline the urban design criteria for each street; and
- annotated street sections, which indicate the existing development context and illustrate the desired future character.

This information sets the context for development controls described in Section D6.5 and D6.6, and streetscape changes in the Public Domain Improvements Plan.

D6.4.1 New South Head Road

Core area



Strategy

- Identify and reinforce the core of the Rose Bay Centre, by encouraging retail activity, and enhancing its built edge urban quality.

North-western side

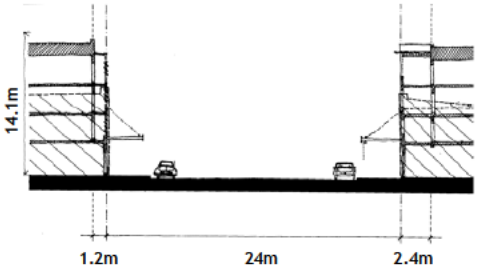
Parapets encouraged

Incorporate sound attenuation devices such as wintergardens

Continuous awnings

Build to the street alignment with glazed retail frontage at street level and commercial / residential above

No vehicular crossings - vehicular access permitted at the rear



South-eastern side

Build to the street alignment with masonry walls and loggias above street level

Commercial/residential uses above street level

Typical profile of existing buildings

Glazed retail frontage at street level

Transition area

Strategy

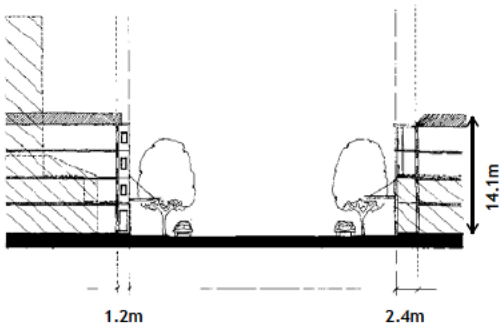
- Create a transition between the Rose Bay Centre core and the recreational/landscape area towards Lyne Park, with a portion of street defined by street trees and a discontinuous wall of buildings on the harbour side.

North-western side

Incorporate sound attenuation devices

Typical profile of existing buildings (dashed outline)

Minimise vehicular crossings



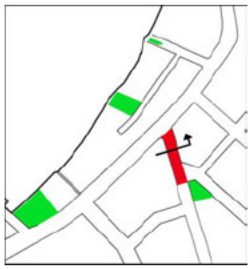
South-eastern side

A variety of roof forms is encouraged

Discontinuous awnings accommodate street tree planting and highlight building entries

D6.4.2 Newcastle Street

Core area



Strategy

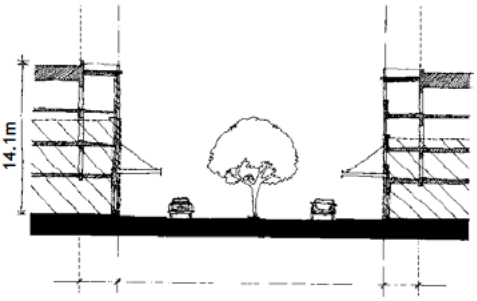
- Reinforce the built street frontage and establish a connection between Pannerong Reserve and the harbour by improving the landscape quality in Newcastle Street.

Western side

Parapets encouraged

Street trees in the median create an intimate scale of street

Build to the street alignment with glazed retail frontage at street level



Eastern side

Build to the street alignment with masonry walls and loggias above street level

Continuous awnings

Typical profile of existing buildings (dashed outline)

No vehicular crossings - vehicular access permitted at the rear

Transition area

Strategy

- Create a transition opposite Pannerong Reserve to denote the residential area from the centre.

Western side

A variety of roof forms is encouraged

Typical profile of existing buildings

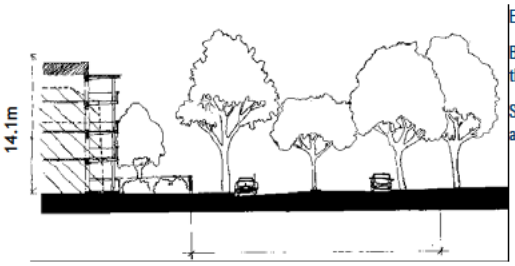
Commercial/residential uses above street level

Entry canopies allowed

Commercial uses at street level

Build to the existing building alignment with front gardens/courtyards at street level

Minimise vehicular crossings

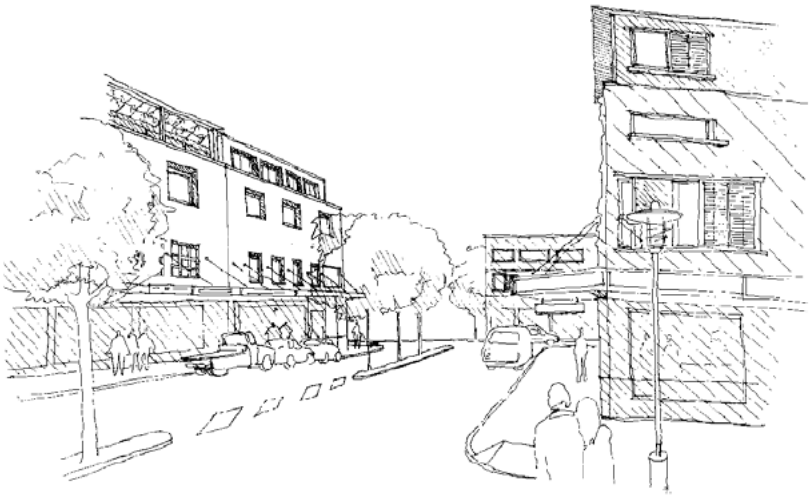


Eastern side

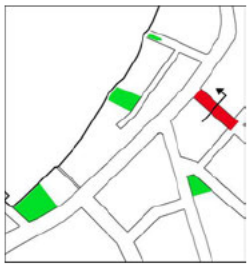
Buildings encouraged to overlook the Pannerong Reserve

Street trees in the median create an intimate scale of street

FIGURE 4 View down Newcastle Street to New South Head Road



D6.4.3 Dover Road



Strategy

- Create a distinctive framed urban shopping street, defined by retail frontage at street level, with buildings above set back on terraces above, to improve visibility to the Rose Bay Hotel.

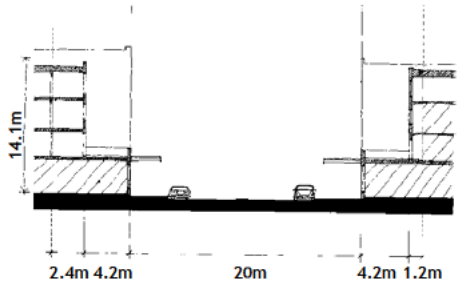
South-western side

Profile of the Rose Bay Hotel

Parapets encouraged

Build behind roof terraces above street level with masonry walls and loggias to enhance the amenity of development and increase the visibility of the Rose Bay Hotel

Continuous awnings



North-eastern side

Build to the street alignment with masonry walls and loggias above street level on the corner site only, to highlight the entrance to New South Head Road

Commercial/residential uses above street level

Build to the street alignment with glazed retail frontage at street level

No vehicular crossings – vehicular access permitted at the rear

D6.4.4 Wilberforce car park edge

Strategy

- Define the southern edge of the centre and provide pedestrian access through the existing car park site.

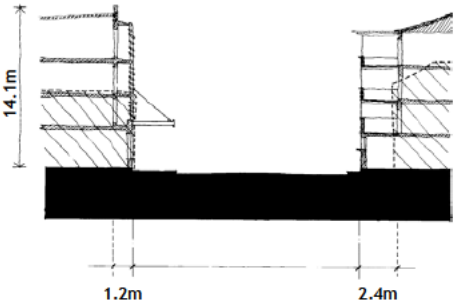
North-western side

Encourage parapets

Build to the street alignment with masonry walls and loggias above ground level

Build to the boundary alignment with glazed retail frontage at ground level

Typical profile of existing buildings



South-eastern side

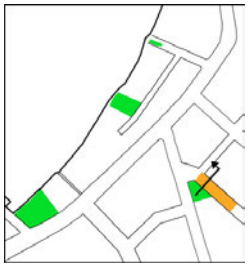
A variety of roof forms is encouraged

Commercial/residential uses above ground level

Build to the street alignment with walls, loggias and balconies which overlook the street

Commercial uses at ground level

D6.4.5 Wilberforce Avenue



Strategy

- Reconfigure the street alignment to provide a memorable termination to Wilberforce Avenue maintaining the public open space.

South-western side

Supplement the existing tree planting

Angled parking along Pannerong Reserve

North-eastern side

For residential zoned land refer to Part B of this DCP

Buildings encouraged to overlook Pannerong Reserve

Build to the street alignment in the commercial zone

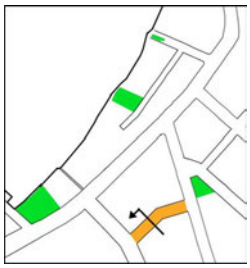
A variety of roof forms is encouraged

Commercial/residential uses above street level

Commercial uses at street level

Minimise vehicular crossings

D6.4.6 Richmond Road



Strategy

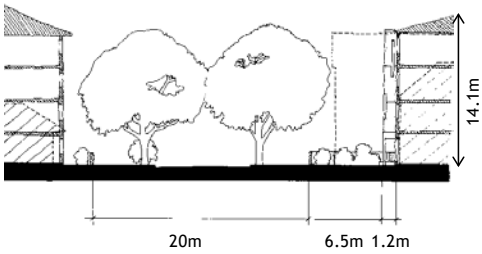
- Retain the unique character of this predominantly residential street on the periphery of the centre, defined by mature street trees and a discontinuous wall of buildings.

South-eastern side

Maintain the existing street trees

Typical profile of existing buildings

For residential zoned land refer to Part B of this DCP



North-western side

A variety of roof forms is encouraged

Encourage office and other non-retail commercial uses on the ground floor to provide a transition to nearby residential development.

Build walls with windows, loggias and balconies which overlook the street

Build to the existing building line with front gardens/courtyards at street level

Minimise vehicular crossings

Build to the street alignment at the intersection with Newcastle Street to reinforce the corner

D6.4.7 Norwich Road

Strategy

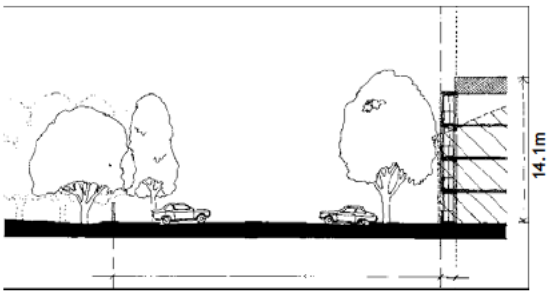
- Create a defined edge, in terms of both landscape and built form definition, between the centre and the recreational/landscape area in the vicinity of Lyne Park and the Royal Sydney Golf Course.

South-western side

Maintain the existing street trees

Supplement the existing street tree planting

New footpath



North-eastern side

Build to the street alignment with windows, loggias and balconies which overlook the street

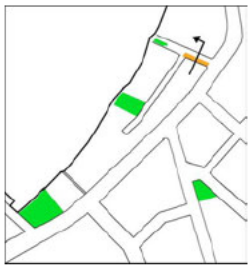
Commercial/residential uses above street level

Commercial uses at street level

Typical profile of existing buildings

Minimise vehicular crossings

D6.4.8 Caledonian Road



Strategy

- Retain the unique character of this landscaped residential street to the harbour.

South side

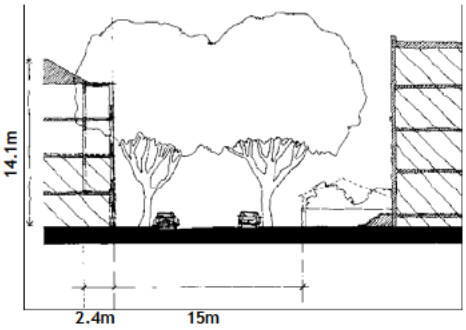
Maintain the existing street trees

Build to the street alignment with windows, loggias and balconies which overlook the street

Commercial/residential uses above street level

Access to street level retail frontage is not permitted

Minimise vehicular crossings



North side

Typical profile of existing buildings

For residential zoned land refer to Part B of this DCP

FIGURE 5 View down Caledonian Road looking towards the harbour

D6.4.9 Collins Avenue

Strategy

- Create a small urban street defined by private tree plantings, strong garden walls, and clearly defined entries on the harbour side, and a continuous and articulated wall of buildings on the south side.

South-eastern side

A variety of roof forms is encouraged

Build to the street alignment with walls, windows, loggias, balconies and terraces above street level

Protect privacy of residential neighbours opposite

Protect privacy of residential neighbours opposite

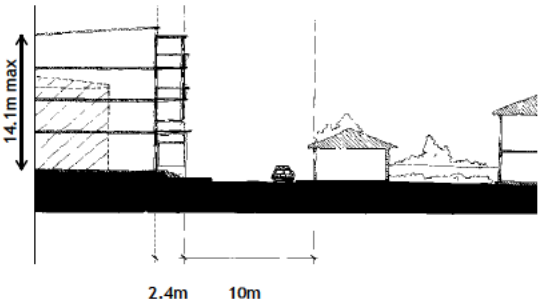
Typical profile of existing buildings

Commercial/residential uses above street level

Build to the street alignment with glazed retail frontage at street level

Widen existing footpath

Minimise vehicular crossings

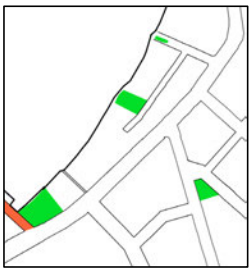


North-western side

For residential zoned land refer to Part B of this DCP

FIGURE 6 View down Collins Avenue from Caledonian Road

D6.4.10 Vickery Avenue



Strategy

- Strengthen the landscape quality of the street as an entry to Lyne Park with a strong visual connection to the harbour, and link to Tingira Reserve.

D6.5 Built form envelopes: control drawings

D6.5.1 Urban form methodology

This section contains control drawings which show building envelopes for every site in the Rose Bay Centre. The envelopes have been tailored to each site, taking into consideration its particular characteristics.

These include:

- its relationship to the public domain- whether it is located in the Core or a Transition Area, or adjacent to a public park or square;
- the desired future character of the street in which the site is situated;
- its size and orientation;
- the significance of existing buildings and landscape;
- its optimum development potential; and
- the potential of adjoining private properties.

This Urban Form Methodology defines a physical outcome for the centre, whilst encouraging innovative architectural design within the building envelopes given. It provides a greater certainty of outcome for Council, community and site owners.

Controls for the ground floor and upper floor levels differ. At street level the integration of retail and commercial uses, gardens areas, vehicular access and street awnings, are the primary needs to be considered. Upper floor level envelopes are designed to facilitate quality residential and commercial development. For this reason there are two control drawings for each urban block in the Rose Bay Centre, illustrating the ground floor and upper floor level envelopes for every site.

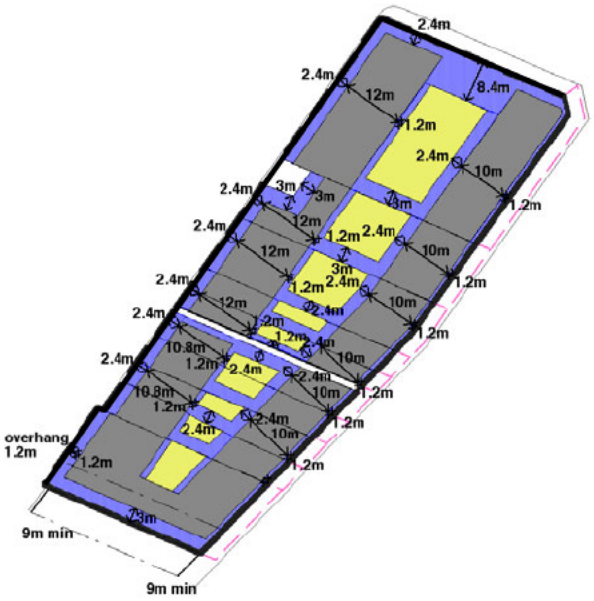
The control drawings in this section should be read in conjunction with Section D6.6 which provides further explanation of the envelopes, and introduces other relevant guidelines and controls.

D6.5.2 Explanatory legend

The control drawings incorporate the following graphic symbols:

D6.5.3 Rose Bay Centre urban form

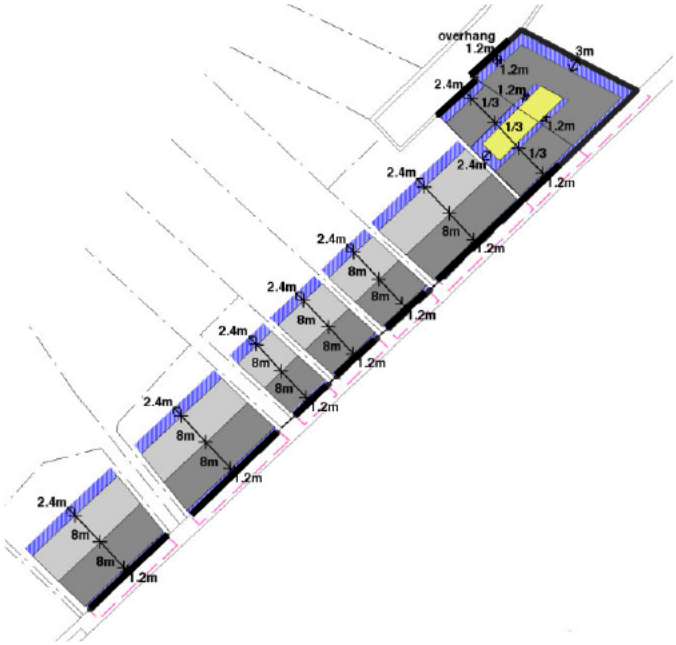
D6.5.4 Control drawing 1



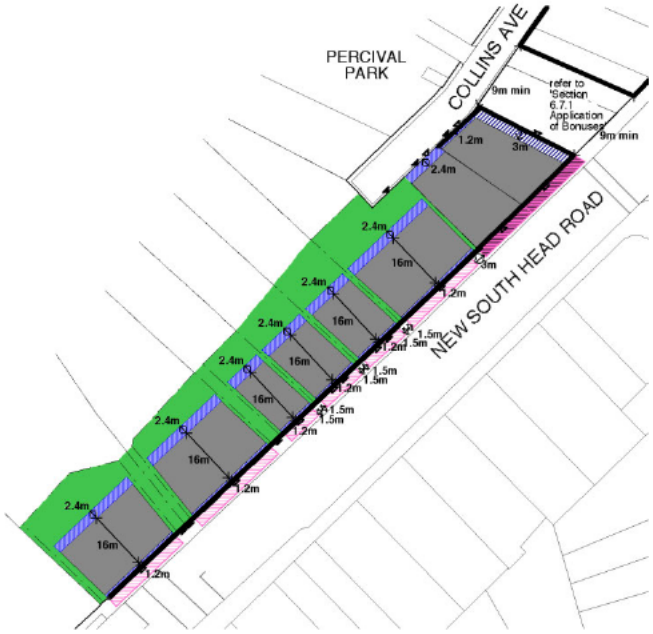
Upper floor level controls
New South Head Road (north) / Collins Avenue

Ground floor level controls

D6.5.5 Control drawing 2

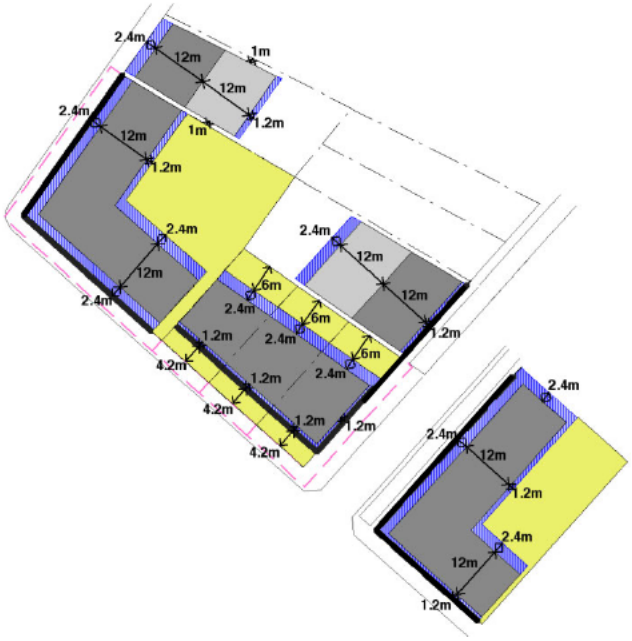


Upper floor level controls
New South Head Road (south) between Norwich Road and Newcastle Street



Ground floor level controls

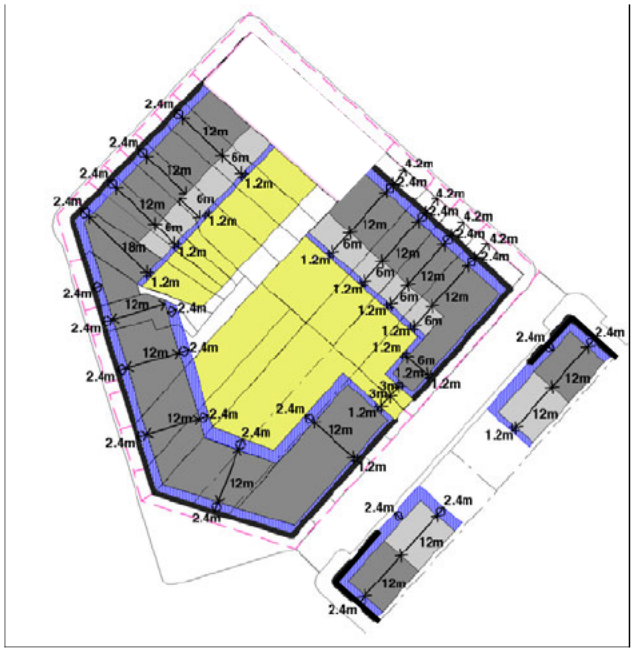
D6.5.6 Control drawing 3



Upper floor level controls
New South Head Road / Dover Road / Ian Street

Ground floor level controls

D6.5.7 Control drawing 4



Upper floor level controls
New South Head Road (south) / Dover Road / Newcastle Street Wilberforce car park edge

Ground floor level controls

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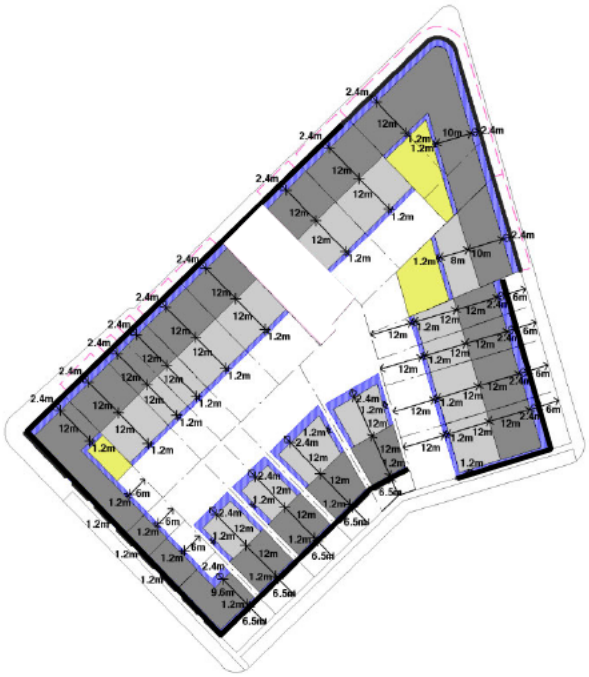
D6.5.8 Control drawing 5



Upper floor level controls
New South Head Road (south) / Dover Road / Newcastle Street

Ground floor level controls

D6.6 Built form: Development objectives and controls

D6.6.1 General format

This section contains the development controls for identified building and site elements in the Rose Bay Centre which constitute its built form. It provides further explanation of the control drawings contained in Section D6.5 and introduces new controls not described in those drawings.

The following format is used:

Introduction

For most policies there is an introduction which explains the need and importance of including that particular element.

Objectives

The objectives define Council's intention. They relate to the aims and objectives in Section D6.3 Urban structure, and the desired future character outlined in Section D6.4 Street character.

Controls

The controls establish the means of achieving the objectives. The controls in this chapter are site specific. This means they have been tailored to each site taking into consideration both the private built form and public spaces, to define a desired future outcome.

This section of the DCP must be read in conjunction with the control drawings which illustrate the site-specific controls. Diagrams are incorporated to assist interpretation.

Not all objectives and controls will be relevant to every development. The applicant must nominate any guidelines and controls which they considered irrelevant, and justify that opinion.

D6.6.2 Use

The distinctive mix of small scale shops, restaurants and local services in the Rose Bay Centre creates a friendly street environment, and caters well for the daily needs of the centre's users. Continuous ground level retail frontage offers the benefits of safety, commercial activity and street life. The provision of commercial uses and housing on upper levels makes a significant contribution to the village character, providing street surveillance and activity in the centre outside business hours.

Objectives

O1 Enhance the village character of the Rose Bay Centre by encouraging mixed use commercial and residential development.

O2 Create active street frontages in the Rose Bay Centre by locating retail, commercial and community uses at street level.

O3 Discourage large scale retail establishments, by limiting the frontage width of individual retail tenancies.

Controls

C1 Design for a mix of uses within buildings.

C2 Design adaptable and durable buildings, spaces and places.

C3 Design for retail, commercial and community uses at ground floor.

C4 Access to residential uses should not occupy more than 20% of a site's frontage.

C5 The maximum retail frontage for individual tenancies is 15m.

FIGURE 7 Building use

Retain the range and intensity of existing retail uses in Rose Bay by limiting the width of retail frontages

D6.6.3 Urban character

6.6.3.1 Building envelopes

The building envelope sets the position of the building on the site, and is described on the control drawings. Buildings in the Rose Bay Core are generally row buildings, with development concentrated to the street frontage. They have no side setbacks at the street frontage so clearly define the edges of the street. Buildings are massed away from the centre of blocks, encouraging solar access, natural ventilation and privacy.

Buildings in the Transition Areas are also concentrated towards the street and are built on or close to the street alignment, accommodating private gardens at the rear in many places. Contiguous front gardens in some areas such as Richmond Road make a significant contribution to the streetscape quality.

The building envelopes in Sections 6.5.2-6.5.8 have been designed to work in conjunction with the height and floor space ratio (FSR) controls in Woollahra LEP 2014.

Note: The maximum FSR for the centre is generally 2:1. The maximum height of buildings is generally 14.1m (4 storeys). Bonus height and FSR applies to 682-696 New South Head Road, subject to the provision of the Rose Bay Public Square (see Section 6.6.10.1).

Objectives

O1 Enhance the urban village character of the Rose Bay centre by encouraging a coherent street character with consistent building types built to, or parallel to the street alignment.

O2 Take advantage of the centre's unique assets by orientating buildings to address parks and the harbour where possible.

O3 Retain and promote the pattern of perimeter block development to ensure a high level of amenity to all new development.

O4 Create exterior garden and courtyard spaces.

O5 Accommodate commercial uses by allowing deep building footprints at the ground floor level only.

Controls

C1 Development may only occur within the building envelopes shown on the control drawings (see Sections 6.5.2-6.5.8).

C2 Well-designed buildings which achieve the maximum height are encouraged, to enhance the definition of the street edge.

C3 The maximum permissible building depth above ground level is 12m.

C4 A minimum floor to ceiling height of 2.7m for habitable spaces applies in the centre to provide quality internal environments and facilitate future adaptability of uses.

C5 The minimum floor to floor heights for the Rose Bay Centre comply with the table below.

Level	Use	Height
Ground floor	Retail[1]	4m
Levels 2	Commercial office or residential	3.4m
Levels 3-5	Residential	3.1m

[1] Applicants may choose to vary storey height using 3.7m height for ground floor and Level 2 to create double storey spaces with a combined floor to floor height of 7.4m.

FIGURE 8 Building envelope – Potential architectural resolution within a building envelope

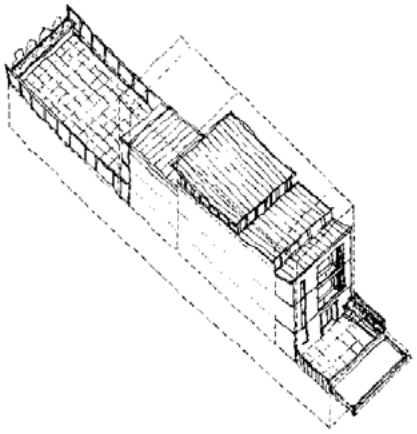
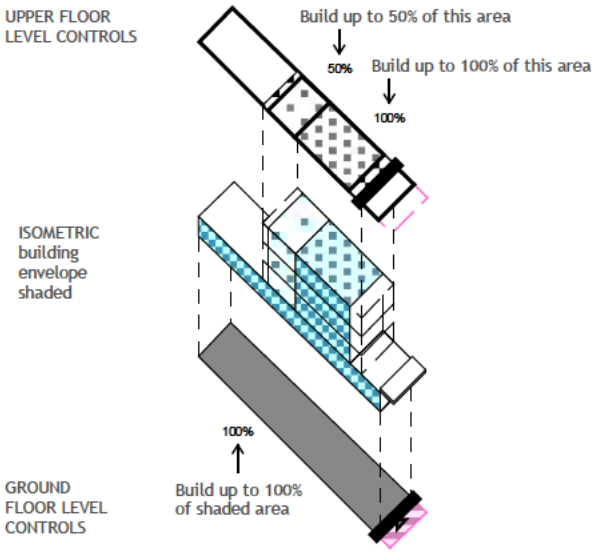


FIGURE 9 Three dimensional controls – Highlighting the building envelope



6.6.3.2 Setbacks

The dominant building type in the Core is the party wall building with zero front and side setbacks.

In Transition Areas the architectural typology is more varied and includes free-standing buildings with relatively small side setbacks. The prevalent building alignment is generally close to the street, accommodating small front gardens and entry porches in some places.

Corner buildings throughout the centre are built to both street alignments, providing strong corner definition.

Objectives

O1 Retain and enhance the predominant pattern of row buildings only in the Rose Bay Core, and row and free-standing buildings in the Transition Areas.

Controls

C1 Building alignment should comply with the building lines shown on the control drawings (see Sections 6.5.2-6.5.8)

C2 Primary door and window openings in living areas should be located towards the street and/or rear garden to protect privacy and encourage integrated private open spaces. Living areas with primary openings facing the side boundary should be avoided.

C3 The design of corner buildings should be considered in relation to street geometry, topography, sight lines and the design of skyline elements.

C4 Front setbacks are identified as building lines on the control drawings (see Sections 6.5.2-6.5.8). Front setbacks should:

a) define a coherent alignment to the public domain;

b) accentuate significant street corners; and

c) accommodate contiguous front gardens in identified areas.

C5 Side setbacks should:

a) protect privacy to adjoining buildings;

b) protect access to natural light and ventilation;

c) provide pedestrian access to the rear of buildings;

d) facilitate views from the public domain to the harbour where possible; and

e) allow stormwater to flow towards the harbour.

C6 Rear setbacks should:

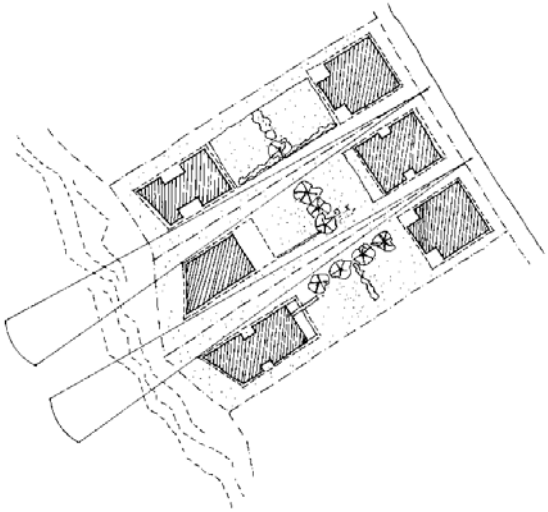
a) provide consolidated landscaped areas at the centre of blocks adjoining residential areas;

b) facilitate natural infiltration of stormwater;

c) protect privacy to adjoining buildings and gardens; and

d) facilitate solar access.

FIGURE 10 Side setbacks – Facilitate views from the public domain to the harbour



6.6.3.3 Building articulation

Building articulation refers to the three dimensional modelling of a building. The control drawings indicate the area for building articulation on a site by site basis (see Sections 6.5.2-6.5.8).

The Street Façade Articulation Zone (SFAZ) establishes the relationship between a building and the street, through the use of entry porches, loggias, balconies, bay windows and the like. Building facades can be articulated to create a strong street address, and enrich the character of the street. The Dover Road frontage of the Rose Bay Hotel in particular, is an excellent example of a well-articulated facade.

Building articulation should respond to environmental conditions such as orientation, noise, breezes, privacy and views, through the use of appropriate sun shading devices, noise barriers, privacy screens, and the careful location of balconies, terraces and loggias. At the rear of a building, articulation should enhance the relationship between the interior and the garden.

The building line determines the position of the facade wall. In certain areas of Rose Bay the building line has been setback from the street alignment. Compliance with this control is required to ensure that the façade aligns with the neighbours at the side boundary. The SFAZ is positioned behind this building line.

The SFAZ is occupied by two types of space:

- External:
  - open balconies;
  - void not occupied by built form; and
  - recessed balconies counted in proportion to the amount of the façade they are open to.
- Internal:
  - habitable rooms;
  - bay windows;
  - enclosed balconies; and
  - wintergardens.

Objectives

O1 Promote buildings of articulated design and massing, with building facades that contribute to the character of the street, and provide usable private external spaces.

O2 Encourage buildings to respond to environmental conditions, and promote energy efficient design principles.

O3 Utilise building articulation elements of appropriate scale to their use and context.

O4 Reinforce the development pattern of buildings on the street alignment in the Core.

O5 Reinforce the more open streetscape quality in the Transition Areas.

Controls

C1 To achieve high quality architectural resolution on frontages that address a street, the following percentages of internal and external space should be incorporated with the composition of the building for all floors above ground level.

Note: The use of a palette of articulation elements is recommended to achieve high quality architectural resolution.

Arrangement ONE - Street Façade Articulation of buildings in the Core area:

a) Buildings in the core area must provide 80% internal space and 20% external space in the SFAZ.

b) Where the control diagrams indicate that articulation on parts of the building envelope that are not in the SFAZ, the mix of internal and external space is discretionary.

Note: This variation requires that the majority of the SFAZ is expressed as solid producing a more building suited to the activity associated with the business core.

FIGURE 11 Street façade articulation in the Core Area – refer to Articulation Arrangement ONE

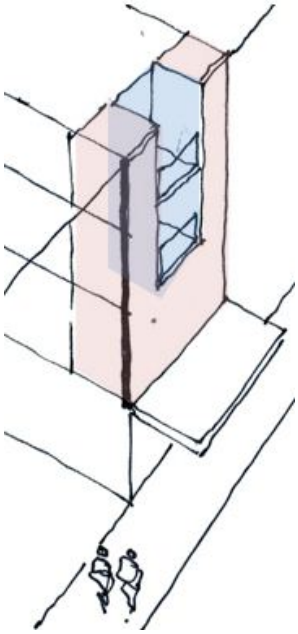
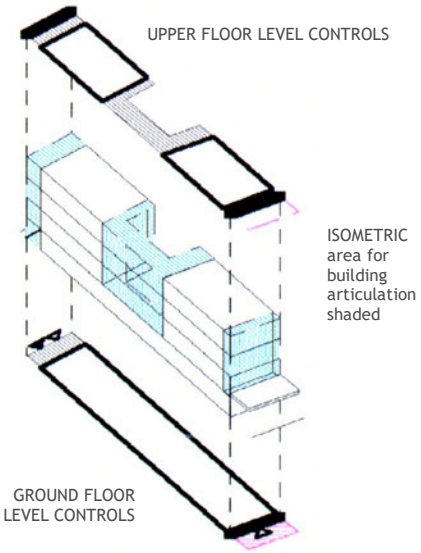


FIGURE 12 Three dimensional controls – Highlighting the area for building articulation in the Core



Arrangement TWO - Street Façade Articulation of buildings in the Transition Area:

a) Buildings in the Transition Area must provide 30% internal space and 70% external space in the SFAZ.

b) Buildings on New South Head Road should be designed to reduce amenity impacts from traffic noise. Bedrooms should be located away from noise sources.

c) Private open space elements such as balconies, should be predominantly north, east and west facing, and should be designed to ensure visual and acoustic privacy of occupants and neighbours.

d) Where the control diagrams indicate that articulation on parts of the building envelope that are not in the SFAZ, the mix of internal and external space is discretionary.

Note: This variation requires a far more open façade compared to the core with greater potential for larger residential balconies.

FIGURE 13 Street façade articultion in the Transition Area – refer to Articulation Arrangement TWO

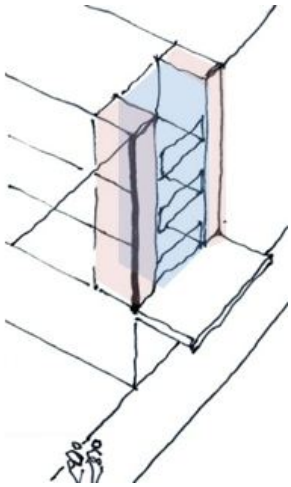
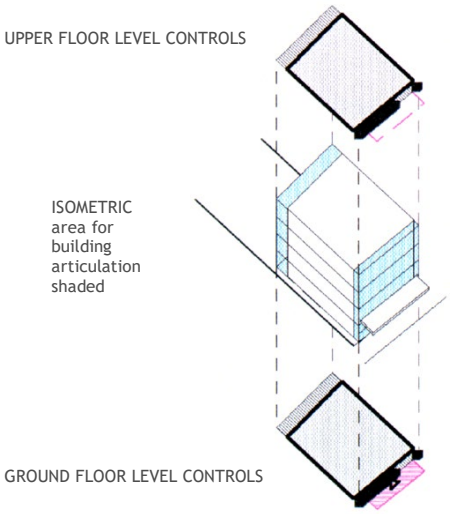


FIGURE 14 Three dimensional controls – Highlighting the area for building articulation in the Transition Area



6.6.3.4 Heritage and conservation

Council supports the conservation of the rich mixture of buildings, parks and places of special significance within the Municipality. Woollahra LEP 2014 contains various controls on the conservation of items and areas of environmental and heritage significance. The LEP also contains incentives for developments which include the conservation of heritage items.

The Rose Bay Hotel, the former Rose Bay Post Office and two pines in Vickery Avenue are the only listed heritage items in the Rose Bay Centre. The Rose Bay Centre Urban Design Study 1998 identified an additional five character buildings which are shown in Figure 16. These buildings have high streetscape value because of their strong architectural character and the way in which they address the street. There are no heritage conservation areas in the Rose Bay Centre.

The grove of paperbarks adjoining the west side of Norwich Road is heritage listed and included on the significant tree register. The paperbarks contribute to the streetscape of Norwich Road by providing a soft edge and afternoon shade. Other tree groves which make a contribution to the streetscape are the bushbox on Richmond Road and figs on Caledonian Road. These two groves are on both sides of the road and form a united canopy shading the road and footpaths.

Objectives

O1 Protect and enhance items of environmental and heritage significance and character buildings (see Figure 16 Character buildings).

O2 All new developments and works to existing developments are to be designed to be compatible with the heritage significance of listed heritage items and nominated character buildings.

Controls

C1 Development proposals on sites containing heritage items must retain heritage significance.

C2 Development proposals on sites containing character buildings or heritage items must demonstrate that the architectural and streetscape value of the building would be retained or enhanced by the proposal.

C3 Development to a character building or heritage item is to respect the building and complement and enhance the key characteristics of the building including:

a) street edge definition;

b) its material, detailing and character;

c) its holistic building character related to articulation, massing, and patterns and distribution of wall opening.

Note: Where a development involves a heritage item, a statement of heritage impact must be lodged with a development application. That statement must set out the heritage significance of the place and the effect the proposed works will have on the significance of the heritage item.

FIGURE 15 Rose Bay Hotel

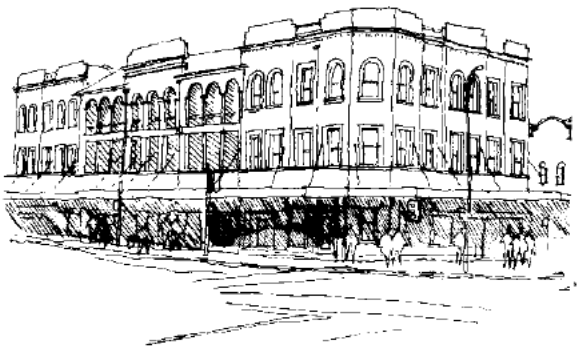


FIGURE 16 Character buildings

6.6.3.5 Architectural resolution

Buildings in the Rose Bay Centre represent a cross section of 20th century architecture, with no period predominating, and are of varied quality. High quality architectural resolution can help to define a local identity.

Objectives

O1 Promote high quality architectural design throughout the Rose Bay Centre to create a desirable living and working environment.

O2 Encourage a more coherent streetscape.

O3 Minimise the negative impacts of glare and reflectivity on adjoining public and private properties.

04 To ensure that development enhances the visual quality and identity of the centre through well considered design, high quality materials and facade colours that do not dominate the street.

Controls

C1 A clear street address to each building should be provided. Pedestrian entries should be well defined.

C2 Vehicular entries should be discrete and minimise conflicts with pedestrians.

C3 Materials which are compatible with the existing development context, such as red face brick and rendered masonry, should be encouraged in street facade design.

C4 The colour of the building facade is not intrusive or unreasonably dominant within the streetscape, and is compatible with the character of the centre. Exterior colours should be appropriate to the context, and should not draw undue attention to the building. The external painting of a building in bright colours, corporate colours or fluorescent colours should be avoided. Any individual business branding and identity in external painting and colour schemes is to be subordinate to the main colour schemes in the street. (Also refer to Part E of this DCP, Chapter E7 Signage, When external painting of a building constitutes a wall sign).

C5 New buildings and facades do not result in glare that causes discomfort or threatens safety of pedestrians or drivers.

Note: A reflectivity report that analyses the potential glare from the proposed new development on pedestrians or motorists may be required.

C6 Extensive areas of unprotected glazing are not permitted.

C7 Predominantly glazed shopfronts are to be provided to ground floor retail areas.

C8 Street corners are to be strengthened by massing and building articulation.

C9 Roller shutters to shopfronts are not permitted.

C10 The design of window and balcony openings should take into account the streetscape, heritage items, privacy, orientation and outlook.

C11 Blank party walls are to be avoided.

C12 Facades are to be richly articulated and should express the different levels of the building and/or its functions.

C13 Commercial space should be designed to permit maximum flexibility for future uses.

C14 All rooms above ground floor level, including kitchens and bathrooms, are to have windows/skylights wherever possible.

C15 The residential component of buildings must contain a variety of apartment sizes and layouts.

FIGURE 17 Facades – Richly articulated with deep modelling and shadows

6.6.3.6 Roof design

The Rose Bay Centre Core is characterised by a predominance of buildings with articulated parapets, which contribute to its urban quality.

Roof forms vary with building type and architectural style in the Transition Areas, and include hips, gables, flat roofs and parapets.

Objectives

O1 Promote design that contributes to the definition of the Core.

O2 Encourage roof design to create a distinctive silhouette to buildings.

Controls

C1 The use of parapets is encouraged in the Core.

C2 The profile and silhouette of parapets, eaves and roof top elements must be considered in roof design.

C3 Where pitched roofs are proposed, the angle of the pitch should be compatible with the existing development context.

C4 Roof design should minimise building bulk and overshadowing.

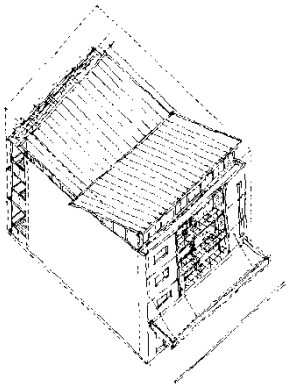
C5 Roof terraces are encouraged (see detailed provisions in Section 6.6.5.2 Above ground open space).

C6 Air conditioning plant and equipment must be concealed from the exterior and be within the building. When roof plant is proposed it must be integrated with the design of the roof and the composition of the building and not be readily visible from the public domain.

FIGURE 18 Roof design – Pitched roofs integrated with broken parapet lines in the Core

FIGURE 19 Roof design – Roof forms must be contained within the building envelope.

Varying roof forms including hips, gables, flat roofs and parapets are encouraged in the Transition Areas



6.6.3.7 Awnings

Relatively continuous awnings provide wet weather protection and shade to shoppers in the busy Core. Awnings in the Transition Areas are more varied and less continuous, and are often used to highlight building entrances.

Objectives

Core

O1 Retain and supplement the existing awnings to provide continuous and coherent awning cover along footpaths.

Transition Areas

O2 Retain and supplement the existing awnings to provide discontinuous awning cover along footpaths to accommodate new street tree planting.

Controls

Core

C1 Development must provide continuous awnings to street frontages as indicated on the control drawings. Awning design should be suspended steel box section type with a minimum soffit height of 3.2m. Awning height should provide continuity with adjoining properties.

C2 Canvas blinds along the outer edge of awnings may be used to provide sun shading to the east and west facades. These blinds must not carry signage or advertising.

Transition Areas

C3 Development must provide discontinuous awnings where indicated on the control drawings. These awnings should provide cover to building entrances.

C4 The provision of under awning lighting is encouraged. Under awning lighting may be recessed into the soffit of the awning or wall mounted on the building.

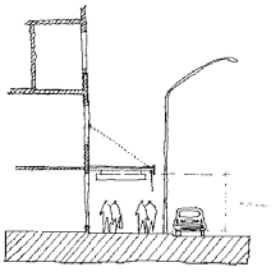


FIGURE 20 Awning design

Suspended steel box section type with a minimum soffit height of 3.2m

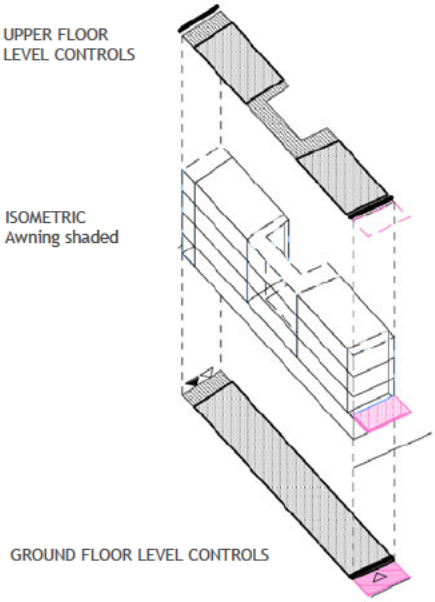


FIGURE 21 Three dimensional controls – Core area

Highlighting the continuous awnings

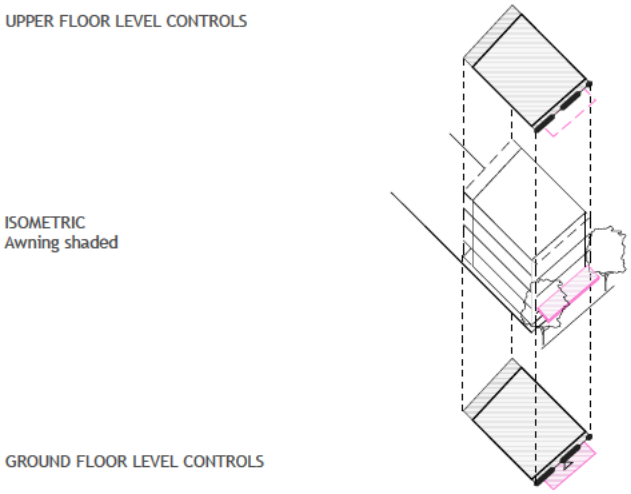


FIGURE 22 Three dimensional controls – Transition area

Highlighting the discontinuous awning zone which accommodates street tree planting.

6.6.3.8 Public art

Public art in developments can enhance the experience of the occupants and contribute to a sense of place.

Objectives

O1 To require the provision of public art in significant or large-scale developments.

O2 To integrate the public art so it is a cohesive part of the building design, interior or landscaping of the development.

O3 To design and locate the public art so that the aesthetics and amenity of the art can be appreciated by people within and outside the development.

O4 To enhance the experience of the occupants of the development and their relationship with the development through public art.

O5 To use public art to facilitate a connectedness between the development and the public domain.

Controls

C1 Development with a capital investment value of $15M or more includes public art.

C2 The public art is installed on the development site or in the immediate vicinity of the site.

C3 The public art is located so that it is not unreasonably inaccessible or obscured by a building element which makes it impossible to see in full by the building occupants and the general public.

C4 The public art is prepared and undertaken in accordance with the Woollahra Public Art Guidelines for Developers.

D6.6.4 Visual and acoustic privacy

Privacy is an important consideration in relation to the residential component of the Rose Bay Centre and neighbours adjacent to the centre, as it is a major determinant of environmental amenity.

Objectives

O1 Ensure adequate visual and acoustic privacy to residential apartments in the centre and private open spaces.

O2 Protect the privacy of adjacent residential neighbours.

Controls

Visual privacy

C1 Visual privacy is to be protected by providing adequate distance between opposite windows of neighbouring dwellings where direct view is not restricted by screening or planting (see Figure 23 Visual and acoustic privacy).

C2 Main living spaces are to be oriented to the street or rear garden to avoid overlooking between neighbouring properties. Living areas with primary openings facing the side boundary should be avoided.

Acoustic privacy

C3 Buildings are to be sited to minimise the transmission of external noise to other buildings on the site and on adjacent land.

C4 The internal layout of rooms, courtyards, terraces and balconies, the use of openings, screens and blade walls, and choice of materials, should be designed to minimise the transmission of noise externally.

C5 Bedroom areas are separated by way of barriers or distance, from on-site noise sources such as active recreation areas, car parks, vehicle accessways and service equipment areas.

C6 Restaurants and cafes should be designed to minimise the impact of noise associated with late night operation, on nearby residents.

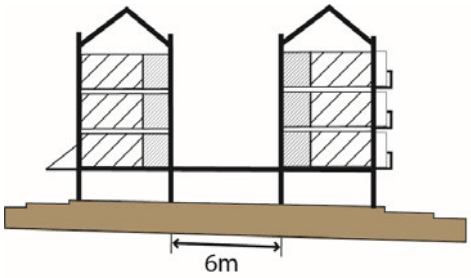
C7 Rear courtyards would only be permitted for restaurant use if Council is satisfied that the hours of operation would not have an unreasonable impact on residential amenity

C8 Noise impact associated with goods delivery and garbage collection, particularly early morning, should be minimised.

Note: Council may require a Noise Impact Assessment Report to accompany a Development Application.

FIGURE 23 Visual and acoustic privacy

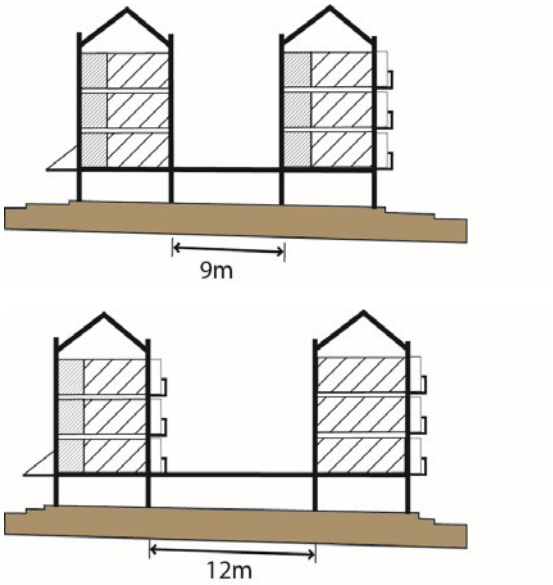
Minimum distances for visual and acoustic privacy



Habitable room

A room used for normal domestic activities that includes: a bedroom, living room, lounge room, music room, television room, dining room, sewing room, study, playroom, sunroom and kitchen.

Non-habitable room



A room of a specialised service nature occupied neither frequently nor for extended periods, including a bathroom, laundry, water closet, food storage pantry, walk in wardrobe, corridor, hallway, lobby or clothes drying room.

FIGURE 24 Ensure adequate separation between unscreened balconies

Privacy at ground floor level provided by suitable sill heights and planting

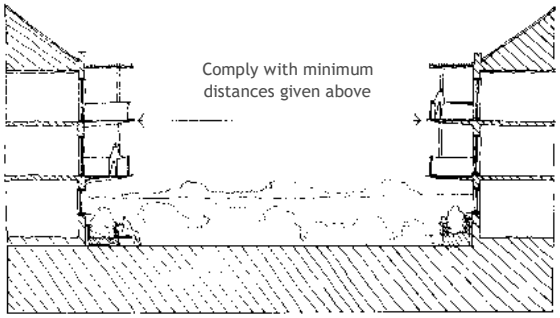


FIGURE 25 Careful location of balconies can increase privacy and reduce their separation

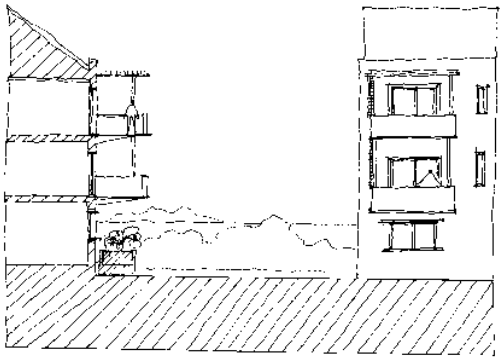
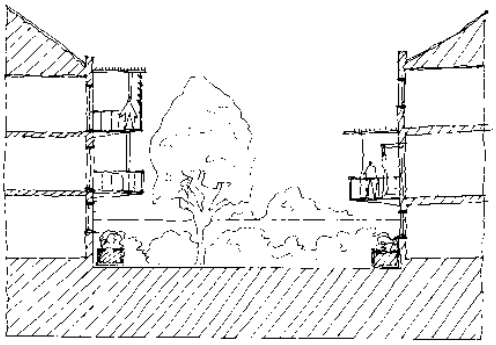


FIGURE 26 Vegetation and balcony screening can increase separation to ensure privacy.



D6.6.5 Private open space

Private open space includes landscaped area (such as permeable garden areas), and above ground open space such as roof gardens over car parking, terraces, loggias, balconies or decks. The accessibility of comfortable private and communal outdoor living areas is a major determinant of the ability of occupants to enjoy living and working in the centre. Open space plays an important role in the identity of the Rose Bay Centre, and assists stormwater management.

6.6.5.1 Landscaped area

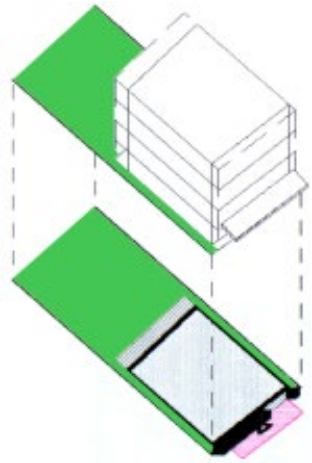
Landscaped area is an important contributing factor to the identity of the Rose Bay Centre.

Whilst the provision of deep soil landscaped area in the Core is limited due to the deep plan requirements of shops on the ground floor, the existing leafy character of the Transition Areas is formed in a large part by private gardens, which collectively create larger scale landscape spaces.

Deep soil landscaped areas play an important role in stormwater management. Contiguous garden areas assist site drainage and reducing runoff.

There is no deep soil landscaped area requirement for sites located in the Core.

FIGURE 27 Three dimensional controls – Highlighting the area for deep soil landscaped area



ISOMETRIC At least 50% of the shaded area must contain deep soil landscaped area

GROUND FLOOR LEVEL CONTROLS

FIGURE 28 Rear gardens

At least 50% of the area nominated in the control drawing should contain deep soil landscaped area

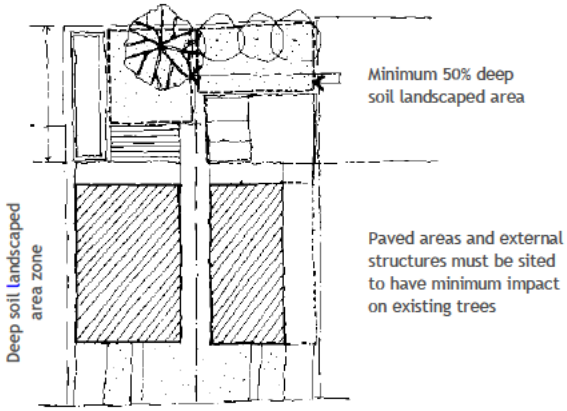
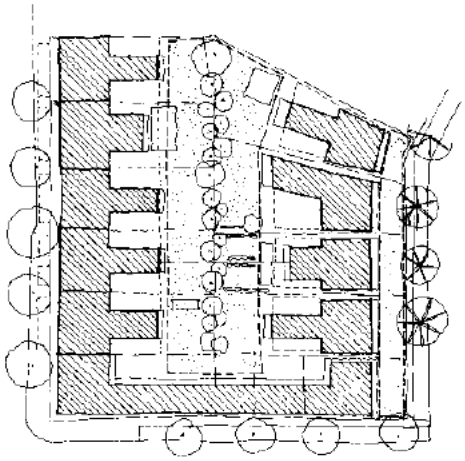


FIGURE 29 Contiguous gardens

Create contiguous garden areas to form large scale landscape space



Objectives

O1 Maintain and enhance landscape quality on private land.

O2 Encourage contiguous rear garden areas in the middle of blocks to enable retention of existing significant trees and to allow new planting of tall trees.

O3 Encourage contiguous front garden areas to strengthen the street character and allow street surveillance.

O4 Assist in stormwater control by maximising on-site infiltration through the use of permeable surfaces, and providing stormwater detention in the consolidated landscape areas.

O5 Encourage the use of planting to assist in energy conservation in buildings and comfort of outdoor living areas, and to protect privacy through screening.

Controls

General

C1 The area of deep soil landscaped area should be at least 50% of the area outside the building envelope.

C2 Planting of larger trees is encouraged to maintain Rose Bay's existing leafy quality. Where views are an issue, plant high branching native trees, or deciduous trees. In smaller courtyard spaces deciduous tree planting is preferred.

C3 Provide trees and pergolas to shade external areas and control sunlight into buildings.

C4 Paved areas and external structures must be sited to have minimum impact on existing significant trees.

C5 A landscape plan is submitted as part of any development application that includes a component of multi dwelling housing.

Front gardens

C6 Design front gardens to provide a positive setting for the building.

C7 Design front gardens for security by providing adequate lighting to entrances. Avoid planting which may obscure the entry.

C8 Garden structures such as gazebos, clothes lines, play equipment, swimming pools, spa baths and ponds, are not permitted in front gardens.

C9 Garages and parking structures are not permitted forward of the building alignment.

C10 Minimise the impact of driveways in front gardens by design, materials selection and appropriate screen planting.

C11 Driveways, kerb crossings, parking, paved areas and external structures must be sited to have minimum impact on the root zone of existing street trees.

6.6.5.2 Above ground open space

The provision of deep soil landscaped areas, particularly in the Core is limited due to the deep plan requirements of shops on the ground floor, and underground parking. In these areas open space must be provided above ground, as roof gardens over car parking, roof terraces, loggias, balconies, and verandahs (refer to control drawings in Sections 6.5.2-6.5.8).

Objectives

O1 Ensure every dwelling in the Rose Bay Centre has access to private open space by providing usable above ground open space on sites where there is no requirement for deep soil landscaped area. Refer to control drawings.

O2 Encourage occupied roof areas with roof gardens behind parapets where private open space at ground level is not available.

Controls

C1 Where direct access to ground level private open space is not available, provide at least one balcony, terrace, verandah, loggia, roof terrace or deck for each dwelling, within the area nominated for building articulation. The minimum area of this element is determined by the dwelling size (see table). The minimum permissible depth is 1.8m and the preferred depth is 2.4m. This element should be accessible from a principal living space.

Dwelling size	Minimum required area of above ground open space
Small dwelling: Up to 60m²	8m²
Medium dwelling: 60m² - 90m²	12m²
Large dwelling: More than 90m²	16m²

C2 Roof terraces and balconies must be designed to protect the privacy of neighbours.

C3 The profile and silhouette of parapets, eaves and roof top elements must be considered in roof terrace design to provide an attractive building finish when viewed from the public and private domain.

C4 Lightweight pergolas, sun screens, privacy screens and planters are permitted on the roof, provided they do not increase the bulk of the building, and do not significantly affect the views enjoyed by adjoining properties, or those in the vicinity or on the nearby ridges.

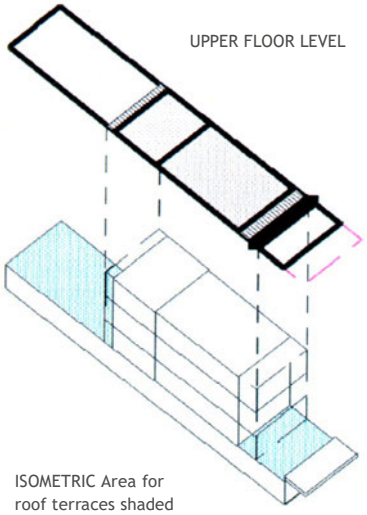
C5 Plantings over underground structures should have sufficient soil depth to allow sustainable planting.

Note: A site specific landscape specification is to be prepared for landscaping above underground structures. The specification should include considerations such as plant species, soil depth and drainage.

FIGURE 30 Above ground open space

Lightweight pergolas, sun screens and planters can enhance the quality of roof spaces, and provide privacy

FIGURE 31 Three dimensional controls – Highlighting the area for roof terraces



6.6.5.3 Front fences

Front fences occur only in the Transition Areas in the Rose Bay Centre where buildings are set back from the street alignment. They are generally integrated with the architecture of the building, enhancing its character, and contributing to the visual appeal of the street.

Objectives

O1 Encourage the design of front fences which enrich the streetscape in Transition Areas.

O2 Ensure street surveillance is possible to assist safety.

Controls

C1 The maximum height of front fences is 1.2m.

C2 Fences should be integrated with the building and landscape design through the use of materials and detailing.

C3 Fences should highlight building entrances, and allow for outlook and street surveillance.

D6.6.6 Solar access and natural ventilation

6.6.6.1 Solar access

Solar access is a major determinant of environmental comfort. Good passive solar design offers financial benefits by reducing the need for artificial heating and cooling.

Objectives

O1 Minimise overshadowing of adjoining properties or publicly accessible spaces.

O2 Building form, spacing, and layout should facilitate good solar access to both the internal and external living spaces, to maximise natural heating and cooling and minimise the use of artificial systems.

Controls

C1 Development should comply with the control drawings in Section D6.5 to ensure adequate solar access is provided to neighbouring properties.

C2 Development which does not comply with the control diagrams must maintain existing solar access to existing development for at least three hours between 9am and 3pm on 21 June

to north facing windows of habitable rooms, and at least two hours to at least 50% of the private open space.

C3 Access to sunlight should be achieved for a minimum period of three hours between 9am and 3pm on 21 June to windows of habitable rooms and two hours to private open space of new development.

C4 The overshadowing effect of new buildings on public domain areas are to be considered for the hours of 10am to 2pm on 21 March, 21 June and 24 September.

C5 Locate main living spaces including lounge, dining, kitchen and family rooms towards the north where possible. Consideration should also be given to slope, views, existing vegetation, overshadowing and streetscape.

C6 Skylights which provide the sole source of daylight and ventilation to habitable rooms are not permitted in residential or commercial areas.

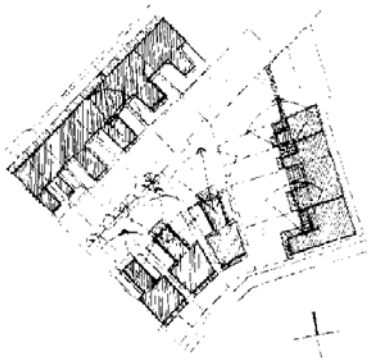


FIGURE 32 Solar access

Building form modulated within envelope to maximise good solar access to internal and external living spaces

6.6.6.2 Natural ventilation

Building envelopes in this chapter encourage building depths on floors above street level that allow good natural ventilation and light. The location of the Rose Bay Centre in proximity to the harbour provides access to cooling summer breezes.

Objectives

O1 All buildings should be designed for good natural ventilation.

Controls

C1 Provide windows to all rooms above ground floor level, including kitchens and bathrooms, to facilitate natural light and ventilation. Minimise the reliance on mechanical ventilation or air conditioning above ground level.

C2 Facilitate cross ventilation by locating windows opposite each other where possible. The placement of small low windows on the windward side of a building, and larger higher windows on the leeward side, will encourage cross ventilation.

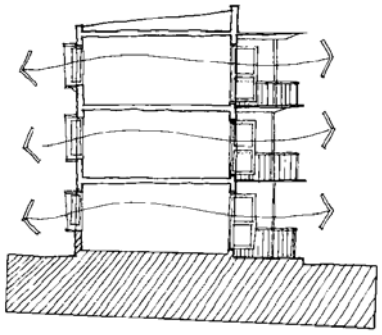


FIGURE 33 Cross ventilation

Thin cross-section design achieves good cross ventilation and avoids need for internal rooms

D6.6.7 Parking and servicing

6.6.7.1 On-site parking

On-site parking includes surface parking areas, car parking structures, semi-basement and underground parking areas.

The opportunity for on-site parking is restricted in many areas of the Rose Bay Centre. The narrow width of some lots makes it impossible to accommodate more than two spaces onsite, and site excavation for underground parking is made difficult by the level of the existing water table in the centre.

This chapter aims to satisfy the parking demand likely to be generated by future development, whilst facilitating the redevelopment of narrow sites and discouraging over-reliance on cars.

Objectives

O1 Facilitate the redevelopment or incremental development of narrow sites by implementing a parking contributions scheme to provide public car parking.

O2 Ensure the impact of car parking on the site and streetscape is handled discretely.

O3 Ensure the design of on-site car parking is safe and efficient, and integrated with the overall site and building design.

O4 Maximise natural light and ventilation to parking areas where possible.

Controls

General

C1 Car parking provision must comply with Part E of this DCP, the Chapter E1 Parking and Access.

C2 Car parking should be incorporated within the building, behind the building alignment.

C3 Consolidated parking areas should be provided below ground or screened from the street and concentrated under building footprints, to maximise the area for landscaped area.

C4 Basement parking should be naturally lit and ventilated, where practical.

Note: Where the parking involves excavation, Council will normally require geotechnical and hydrological reports prepared in accordance with the Council's 'Guide for preparing Geotechnical and Hydrogeological Reports' to demonstrate that there are no adverse geotechnical or hydrogeological impacts on any surrounding property and infrastructure as a consequence of the carrying out of development.

Retail component

C5 Retail development is required to provide a minimum of 80% of the required parking as an off-site contribution with the balance of the spaces provided on-site as private parking. The provisions for the off-site contribution are detailed in the Woollahra Section 94 Contributions Plan.

Commercial component

C6 Commercial development is required to provide a minimum of 80% of the required parking on-site as private parking with the balance of the required spaces provided as an off-site contribution.

C7 The provisions for the off-site contribution are detailed in the Woollahra Section 94 Contributions Plan.

6.6.7.2 Vehicular access

Vehicular access frontage, as indicated on the control drawings, is the preferred location for vehicular access to private sites (see Sections 6.5.2-6.5.8).

The continuity of retail frontages contributes to the liveliness of the Rose Bay Centre and its village character. Vehicular crossings interrupt street activity, diminish the amenity of the place, and reduce the area for public on-street parking.

Objectives

O1 Encourage discrete access to car parking and servicing.

O2 Maximise retail frontage in nominated streets.

O3 Maximise pedestrian safety and amenity by minimising conflict with vehicles.

Controls

C1 In the Core vehicular access is only permitted via a rear lane, rear right of way, or side street.

C2 In the Transition Areas vehicular access must be via a rear lane, rear right of way, or side street where such access is available.

C3 Driveway widths should be minimised.

C4 Allow up to one two-way driveway per development. Two single driveways may only be provided where the distance between crossings exceeds 30m.

C5 Driveways to underground car parks should be designed with minimal visual impact on the street, and maximum pedestrian safety. Pedestrian access to the development should be separate and clearly defined. Garage doors should be set back. Access ways to underground car parking should not be located in direct proximity to doors or windows to habitable rooms.

C6 Driveways and kerb crossings must be sited to have minimum impact on the root zone of existing street trees (refer to the Public Domain Improvements Plan and Streetscape Design Manual advice from Council's Technical Services Division).

C7 Driveways must be located in alignment with the garage. They must occupy a minimum proportion of any front garden area.

FIGURE 34 Three dimensional controls – Highlighting the preferred vehicular access frontage

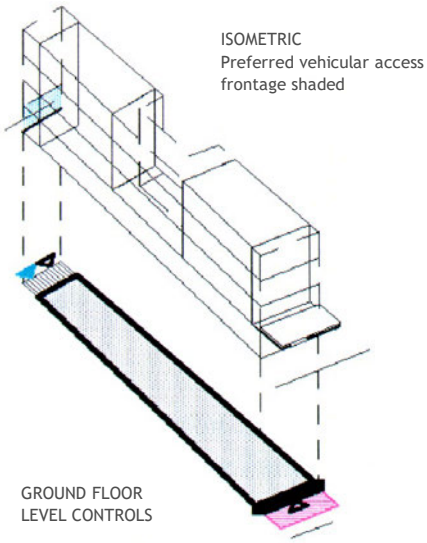


FIGURE 35 Vehicular access

Driveways and garages designed with minimal impact on the street.
Garages set back with pedestrian access separate and clearly defined.

Delete the text under this heading and make reference to DCP like Double Bay.
*"Repealed by Woollahra DCP 2015 (Amendment xxx) on [date xxx.]
Refer to Chapter E2 Stormwater and Flood Risk Management of Woollahra DCP 2015."*

D6.6.8 Geotechnology and hydrogeology

Council will normally require geotechnical and hydrogeological reports for development applications which include below ground structures.

Any proposed development with below ground structures must consider the sub-surface conditions and the effects of construction on adjacent properties. In addition, those which are likely to extend below the level of seasonal fluctuations in the groundwater table, must also consider the effect of any changes induced in the sub-surface water levels and the groundwater flow patterns on adjacent properties. Unless site specific information exists to the contrary, excavations deeper than 1m must be assumed to have this potential to intersect the groundwater level.

Council's principal objective is to ensure there are no adverse geotechnical and hydrogeological impacts on any surrounding property and infrastructure as a result of development, during and after construction. Typically, adverse geotechnical impacts may include vibration induced settlements from construction methods and equipment and inadequate support of adjacent land during and after construction. Typically adverse hydrogeological impacts may include settlement induced by changes in the groundwater level and seepage problems.

Objectives

Buildings must be designed and constructed with appropriate support and retention systems to ensure that:

O1 There will be no ground settlement or movement, during and after construction, sufficient to cause an adverse impact on adjoining properties and infrastructure.

O2 There will be no change to the ground water level, during and after construction, sufficient to cause an adverse impact on surrounding properties and infrastructure.

O3 Vibration during construction is minimised or eliminated to ensure no adverse impact on surrounding properties and infrastructure.

O4 The risk of damage to adjacent existing property and infrastructure by the new development will be reduced to a level no greater than that from an event with an "unlikely" likelihood of occurrence and "minor" consequence.

In this control "adverse impact" means any damage caused to the improvements on adjoining properties by the demolition, excavation or construction on the development site.

Controls

C1 Excavation below 1m is accompanied by a geotechnical report and a structural report to demonstrate that the works will not have any adverse effect on the neighbouring structures.

Note: Council may identify other circumstances where these reports are required. All reports must be prepared in accordance with Council's guidelines. Council may also require the preparation and submission of a pre-commencement dilapidation report for properties neighbouring the development. Development applications include a design statement and supporting drawings (if necessary) that show the proposed design measures minimise risk and ensure that no adverse impacts will occur.

D6.6.9 Site facilities

Site facilities include loading areas, garbage areas, fire safety systems, mail boxes, external stores, laundries and clothes drying areas. Development should provide appropriate site facilities for retail, commercial and residential uses, and minimise impact on the streetscape.

Objectives

O1 Ensure adequate provision of site facilities.

O2 Ensure site facilities are accessible, functional and unobtrusive.

Controls

C1 Loading facilities must be provided via a rear lane or side street where such access is available.

Any development which includes a residential component must provide laundry facilities, and at least one external clothes drying area. The public visibility of this area should be minimised.

C2 Hydraulic fire services such as fire hydrants and booster installations are concealed. These services are to be:

a) enclosed with doors if located in the building façade, or

b) housed in a cabinet or enclosure if located external to the building.

The location, design, colour and material of the doors, cabinet or enclosure are visually unobtrusive and suitably integrated with the development, including any fencing and landscaping.

C3 Lockable mail boxes should be provided close to the street~~,~~ and integrated with front fences or building entries.

C4 Buildings are designed to accommodate venting from ground floor uses, to avoid potential impacts from exhaust and odour, such as cooking smells.

C5 Air conditioning units should not be visible from the public domain.

D6.6.10 Application of bonuses

The Rose Bay Urban Design Study explored the urban potential of the centre, and sought feedback from the community reference group to identify a variety of public domain improvements including:

- a public square on New South Head Road linking the centre to the harbour foreshore;
- through block connections, such as arcades, shareways, and through shop links;
- a shop front community service facility; and
- public conveniences.

Council supports the construction of the facility and conveniences as part of private developments in the centre. Bonus FSR and height is available in Woollahra LEP 2014 for the provision of a public square.

It should be noted that provision of such facilities does not automatically mean that bonuses will be awarded. Each application will be dealt with on its merits.

Objectives

O1 The aim of a bonus system is to encourage the provision of public benefits as part of the redevelopment of privately owned sites. In return Council will offer certain bonuses or concessions with regard to development standards and controls.

Controls

C1 In determining the extent of bonuses granted, Council will examine the development against three general criteria:

a) the need for the bonus facility, based on the recommendations of the Rose Bay Urban Design Study;

b) the design and usefulness of the bonus facility provided on site or within the building to the general community; and

c) the effect the inclusion of a bonus facility or facilities has on the building's bulk and form and the building's relationship with the character of adjoining development. This chapter identifies specific public facilities which Council wishes to encourage.

6.6.10.1 Rose Bay Centre Square

The Rose Bay Urban Design Study identified the need for a Rose Bay Village Centre. It proposed a 'square' on New South Head Road, linking the centre and the harbour foreshore, to create a focus for the centre and to take advantage of its unique setting. Figures 36 and 37 indicate the location of the proposed square and provide concept designs as a guide. Council will consider other designs on their merit.

To facilitate the square, Woollahra LEP 2014 permits a maximum building height of 17.2m (5 storeys) and FSR of 2.25:1, subject to the development being compatible with the desired future character of the centre. The desired future character is articulated by the controls below.

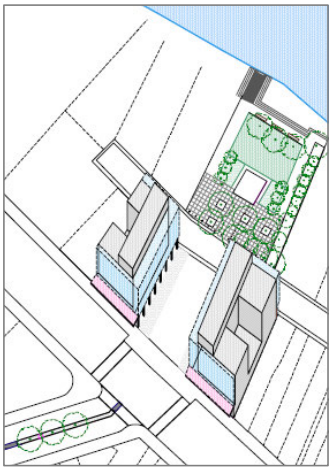
These maximum height and FSR controls proposed will only be granted to the properties identified in clause 4.4C of Woollahra LEP 2014, and only if the properties are the subject of a single development application.

FIGURE 36 Area designated for the Rose Bay Centre Square

FIGURE 37 Rose Bay Centre Square design concept

Generous square creating a strong link at the end of Newcastle Street between the centre and the harbour foreshore

Colonnades provide protected edges to the square



Objectives

O1 Improve the visual and physical connection between the centre and the harbour foreshore.

O2 Provide a memorable focus for the Rose Bay Centre.

Controls

To be considered for bonus provisions the square must comply with the following controls:

C1 The square must be located in the area designated for the construction of the 'Rose Bay Centre Square' (see Figure 36 Area designated for the Rose Bay Centre Square) which corresponds to clause 4.4C in Woollahra LEP 2014.

C2 The square must be a consolidated outdoor space open to the sky with a minimum area of 350m^2, excluding areas under colonnades.

C3 The minimum aggregate width of the square along both the New South Head Road and Collins Avenue frontages is 9m. For example, a square with two open access points with a width of 4.5m each may be considered.

C4 In mid-winter allow solar access to a minimum 30% of the area of the square at 12 noon and 70% of the area of the square at 3pm.

C5 The maximum building coverage, including colonnades and building articulation, is 70% of the consolidated site area.

C6 Provide a minimum 1.2m wide area for building articulation above street level to New South Head Road and the southern side of the square.

C7 Provide a minimum 2.4m wide area for building articulation above street level to Collins Avenue and the northern side of the square.

C8 A maximum internal plan depth of 12m above ground level applies (see Section 6.6.3.1 Building envelopes).

C9 The inclusion of colonnades is encouraged to provide pedestrian amenity, encourage visual openness to the harbour, and as a distinctive and memorable characteristic of the square.

C10 Any proposed colonnade must have a minimum soffit height of 3.2m. Colonnade design must be visually integrated with the development.

C11 The levels and paving material within the colonnade should be contiguous with the surface of the square.

C12 A wind study and shadow diagram must be submitted with the development application.

Note: Council will consider relaxation of one or a number of development standards and controls in its assessment of applications which include a public square as described above. However, it should be noted that such bonuses are not automatic and each application will be assessed on its merits.

A fifth storey is permissible as in Figure 37 above, subject to the following controls:

C13 The area of the fifth storey must not exceed 40% of the consolidated site area.

C14 The fifth storey must be set back the depth of the area for building articulation to minimise visibility from the public domain. For example, the minimum set back of the bonus storey from the new square is 2.4m.

C15 The fifth storey should be designed to protect the privacy of adjacent dwellings, in particular those in Collins Avenue.

Development incentives

If the Rose Bay Centre Square is proposed the following incentives will be considered:

I1 Allow up to 40% of the area of the square to be set aside for private lease for open air cafes and the like, to the benefit of the owners, if the area of the square is less than 600m^2.

I2 Allow up to 60% of the area of the square to be set aside for private lease for open air cafes and the like, to the benefit of the owners, if the area of the square is greater than 600m^2.

I3 Reduced on-site parking requirements.

I4 Discounted Section 94 Contributions.

6.6.10.2 Through block connections

The Rose Bay Urban Design Study identified the need for better pedestrian and vehicular circulation within the centre. Council wishes to encourage the inclusion of 'through block connections', in specific areas, in private developments. These may include arcades, through shop links, shareways, laneways and rights of way.

Improved pedestrian access to and within public car parking areas is desirable to facilitate convenient use of the centre. There is potential to take better advantage of the centre's unique location close to the harbour by providing better pedestrian access to Collins Avenue and Percival Park.

Servicing of shops and other commercial uses from the main street frontage, particularly along New South Head Road, Dover Road and Newcastle Street, disrupts the pedestrian amenity and on street parking spaces. In addition it creates conflict with the high volumes of traffic carried by these streets, particularly New South Head Road. In line with the stated design principle in Section 6.6.7.2 Vehicular access, Council is keen to encourage the creation of rear lane access to commercial properties in the centre.

Council may consider the relaxation of one or a number of standards and controls depending on the quality of public area provided and the merits of the particular application.

Council will not relax any standards or controls unless it can be demonstrated that a proposal satisfies the underlying objectives of the DCP and that compliance with relevant development standards would be unnecessary or unreasonable in the circumstances of the case.

FIGURE 38 Areas designated for through block connections

Objectives

O1 Improve the pedestrian circulation in the centre by providing arcades, through shop links, and shareways in key locations, as identified in Figure 38 Areas designated for through block connections and Figure 39 Detailed location plan.

O2 Maximise views to the harbour from the public domain.

O3 Facilitate rear site access for car parking and servicing to avoid vehicular crossings on principal streets by providing new laneways and rights of way as identified in Figure 38 Areas designated for through block connections and Figure 39 Detailed location plan.

Controls

C1 Through block connections are encouraged by Council on the following basis:

a) Through block connections must be located in the areas shown in Figure 38 Areas designated for through block connections and Figure 39 Detailed location plan).

b) Through block connections must to the extent possible provide a clear sightline from one end to the other, for surveillance and accessibility, in any of the locations identified in Figure 38 Areas designated for through block connections and Figure 39 Detailed location plan.

c) Public use of through block connections should be available at least between the hours of 6am and 10pm daily.

C2 Pedestrian safety and the security of adjacent businesses should be considered in the design of through block connections. Specific consideration must be given to street level lighting at night.

C3 Through block connections must have a minimum width of 3m and be, clear of any obstruction, except for connections through shops.

C4 Paving must be coordinated with public footpaths (refer to the Rose Bay Centre Public Domain Improvements Plan and seek advice from Technical Services).

The following controls apply to arcades:

C5 Retail frontages are to be maximised along arcades.

C6 Arcades must have substantial natural lighting and ventilation.

The following controls apply to new lanes:

C7 Lanes must have a minimum width of 3m if one way, and 5m if two way.

C8 Carriageways and drainage should be coordinated between developments that collectively create new lanes.

C9 Lanes must provide rear service access to properties fronting New South Head Road, Dover Road or Newcastle Street to sites which currently have only one vehicular frontage.

C10 Buildings should address new lanes to provide passive surveillance.

C11 Applicants must demonstrate that the proposed service lane will be of benefit to the traffic circulation system in the Rose Bay Centre as a whole.

FIGURE 39 Detailed location plan

Red – Pedestrian link
Orange – Vehicular/pedestrian link

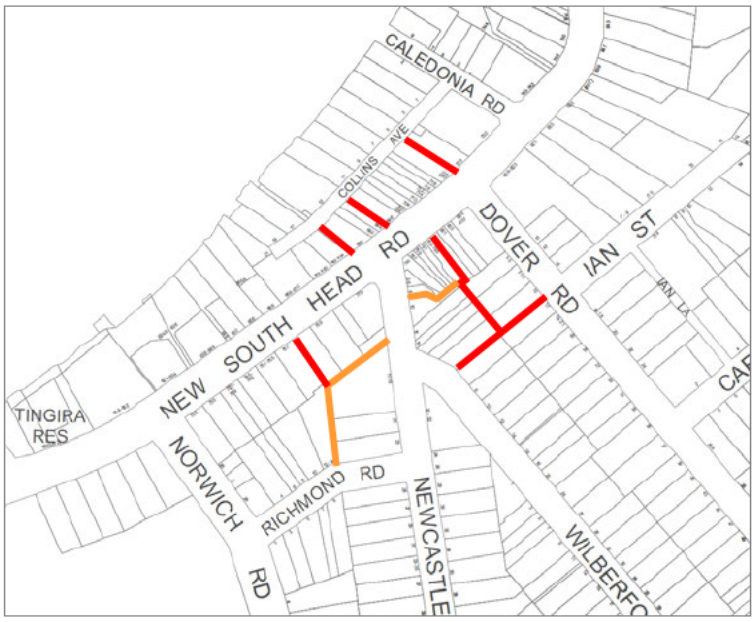
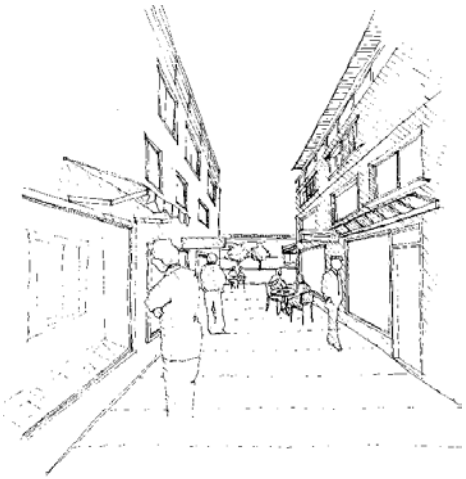


FIGURE 40 Arcades can improve circulation and provide additional retail frontage.

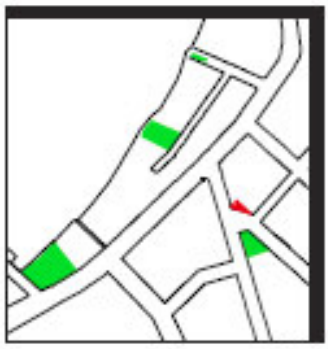


6.6.10.3 Community facility and public conveniences

The Rose Bay Urban Design Study identified the need for a community services facility and public conveniences in the Rose Bay Centre. Council may consider varying of one or a number of standards and controls depending on the suitability and merits of the facilities proposed.

Council will not relax any standards or controls unless it can be demonstrated that a proposal satisfies the underlying objectives of the DCP and that compliance with relevant development standards would be unnecessary or unreasonable in the circumstances of the case.

FIGURE 41 Area designated for the construction of a community facility (highlighted in red)



Objectives

O1 Provide a conveniently located meeting place for the community, where Council and other public organisations can advertise available community services.

O2 Provide accessible, safe and durable public conveniences which cater for the broad needs of the community.

Controls

Community facilities and public conveniences are encouraged by Council on the following basis:

C1 The community facility should be located as identified in Figure 41 Area designated for the construction of a community facility.

C2 The community facility must provide a community display area, public seating and public conveniences.

C3 The minimum area of the community facility is 100m^2, including conveniences.

C4 The community facility may incorporate a privately operated cafe.

C5 The community facility should clearly address the public domain.

C6 Public conveniences should be incorporated in building developments generally, and should cater for the needs of people with mobility disabilities such as the elderly, and the needs of parents with infants.

C7 The provision of natural light and ventilation to public conveniences is highly desirable.

Appendix C

Proposed Modification to the DA Guide Main Document

DA Guide

Contents

Separate Attachments

1. Site Waste Minimisation and Management Plan
2. Heritage Impact Statement
3. Demolition Report
4. Tree Reports
5. Acid Sulfate Soils Report
6. Geotechnical and Hydrogeological Report
7. Social Impact Statement
8. Quantity Surveyor's Report
9. 3D Digital Model Requirements
10. Aboriginal Heritage Impact Assessment

1. Why use this guide?

1.1 Introduction

Development Applications (DA) are required for a wide range of projects from starting a new business to building a new home. Every proposal is unique and requires different information to facilitate a proper assessment. Please use this Guide to collect the information that is relevant to your site and your proposed project.

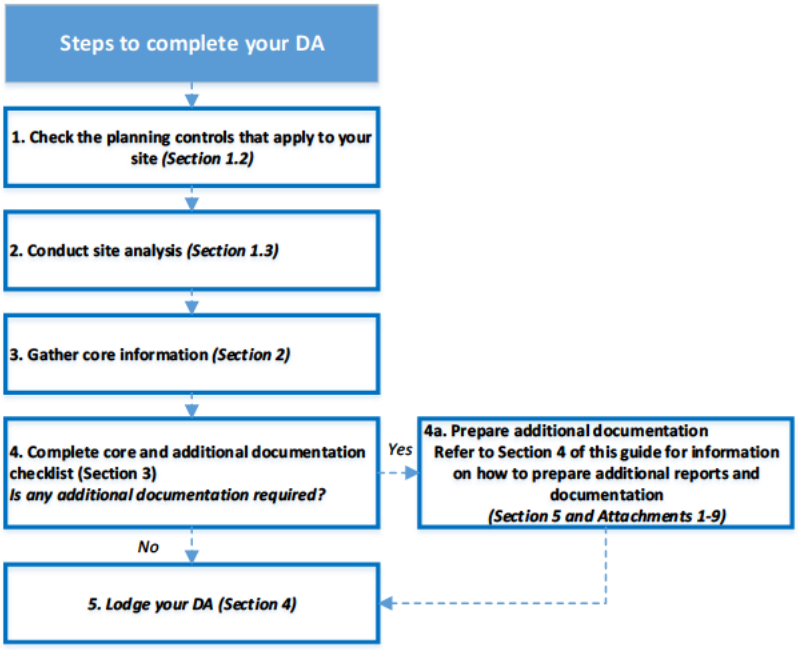
However, minor and small scale development often does not require development assessment by Council. This type of development is identified as 'exempt development' or 'complying development'. Take the time to firstly ascertain whether you actually need to submit a DA by checking whether your development may be classified as either 'exempt' or 'complying'. For more information see the Building and Development section of Council's website.

If a DA is required, it is important to provide a complete suite of documents when you submit your application as missing information can cause delays in the assessment process. In the preparation of more complex DAs, Council encourages applicants to use the services of a professional town planner. A list of consultant town planners is available from the Planning Institute of Australia - www.planning.org.au

If you need more information or advice, phone **Council's Customer Service Centre** or **Duty Planner** on 9391 7000 to discuss your proposal.

For further information on a specific proposal, we suggest that you book a pre-DA (pre-DA) meeting, where development control staff can provide you with detailed advice. If you choose to have a pre-DA meeting, Council will provide written minutes.

Following below is a step-by-step guide to the steps you will need to follow to submit your DA.



1.2 What Planning Controls apply?

The first step in preparing a DA is to identify the relevant controls, policies and guidelines. Before you start designing your proposal, you need to know about:

- Woollahra Local Environmental Plan 2014
- Woollahra Development Control Plan 2015
- State Environmental Planning Policies (SEPPs) and Regional Environmental Plans (REPs)
- Other relevant Acts and Regulations

What's an LEP?

An LEP or 'local environmental plan' is Council's main legal document for controlling development and guiding planning decisions made by Council to ensure that growth and development occurs in a planned and coordinated manner consistent with Council and community expectations and needs.

An LEP contains land use zones which establish where residential, commercial, recreation and other uses can occur. It has development controls for buildings and land, including controls for height, floor space and subdivision. An LEP also provides protection for trees, heritage items, heritage conservation areas and environmentally sensitive areas.

What's a DCP?

A DCP or 'development control plan' is a document prepared by Council to provide more detailed guidance for regulating development. It applies to any development which requires consent under the LEP.

The DCP contains seven parts, and comprises chapters within each part. Applicants and designers must read all applicable parts of the DCP to ensure they have met the DCP's requirements.

You may wish to obtain a Section 149 Planning Certificate from Council to determine some of the key planning requirements and restrictions that apply to your parcel of land. For example, the land use zone.

1.3 Site Analysis

Once you have established what controls apply to your land, the next step it so gather further information about your site. This may include photos and descriptions of:

- Existing buildings and uses
- Neighbouring buildings and uses
- Streetscape and heritage characteristics
- Storm water and drainage
- Trees and landscaping
- Views
- Privacy
- Traffic, Transport and Parking
- Access
- Sunlight
- Ventilation

Consider how your proposed development or change of use will affect the site, the streetscape and your neighbours.

Fill in the relevant information below:

The table below allows you to summarise some of the relevant planning controls for your site. Identify your site on the Woollahra LEP 2014 maps and then use the table below to record the controls that apply to you and ensure that your proposal complies with the LEP.

Identifying the relevant chapters and controls within the Woollahra DCP 2015 will then allow you to refine your proposal to ensure that your DA is successful.

Research and record below any State Environmental Planning Policies that are relevant to your proposal and whether the Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 applies.

The Duty Planner can assist you with this step.

SITE ADDRESS:	
PROPOSAL:	
WOOLLAHRA LOCAL ENVIRONMENTAL PLAN 2014	
Land Use Zone Is the proposed use permissible in this zone?	
Lot Size Does the lot size accommodate the proposed development?	
Height of Buildings	
Floor Space Ratio Note: this does not apply to dwellings, semi-detached dwellings and dual-occupancies.	
Land Reservation Acquisition	
Heritage Is the site in a Heritage Conservation Area or does it contain or adjoin a heritage item?	
Foreshore Building Line Is there a foreshore building line affecting the site?	
Acid Sulfate Soils	
Flood Planning	
Aboriginal Heritage	
WOOLLAHRA DEVELOPMENT CONTROL PLAN 2015	
Relevant Chapters:	
State Environmental Planning Policies and Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005	

2. Core information required for all DAs

As a minimum, all DAs submitted to Council must contain the information below. Depending on the type of application being proposed, additional information may be required (please refer to Section 3 for a checklist of all additional information requirements). Council may refuse to accept an application if all of the required information has not been supplied.

2.1 Owner's Consent, Application Fees and Submission Matrix

You must lodge your Development Application via the NSW Planning Portal (www.planningportal.nsw.gov.au). Supporting documentation is required when lodging an application.

View the Submission Matrix on Council's website to make sure you have everything you need.

You will need to complete:

- Owner's Consent form
- Development Cost Estimate form

These documents are available on Council's website.

Where the landowner is a company or owners' corporation, the applicant must provide legal owners' consent with the signature of a director and the appropriate ABN/ACN or common seal. Where your application relates to a structure on a common boundary or access to neighbouring land, consent from the adjoining property's owner is also required.

Our fee schedule is provided in Council's Delivery Program and Operational Plan, which can be viewed on Council's website.

2.2 Site Plan

This site plan must clearly identify the location of the proposed work or change of use. It must include the address and can also show any relevant information collected in the site analysis process. If your proposal has minimal impact beyond the site, your development plans and elevations may be sufficient.

2.3 Statement of Environmental Effects

A statement of environmental effects is a report outlining how the proposal complies with all the relevant controls, and the likely impacts of the proposal. It also describes how the impacts have been identified and the steps taken to lessen the expected impacts or to protect the environment. The statement includes written information about the proposal that cannot be readily shown on your plans and drawings.

The Statement of Environmental Effects should:

1. Summarise the site analysis; describe the existing conditions of the site and surrounding area;
2. Describe the proposal in detail and show how it meets the relevant planning controls in the SEPPs, LEP and DCP; and,
3. Summarise the elements of the proposal that may impact on the site and surrounds and show how the proposal will minimise those impacts.

Need help writing your statement of environmental effects?

Council encourages applicants to use the services of a professional town planner to assist in the preparation of more complex statements of environmental effects.

A list of consultant town planners is available from the Planning Institute of Australia – www.planning.org.au

2.4 Plans, Elevations and Sections

These drawings will clearly document the proposed buildings or works. If your application relates to a change of use only, then a scale floor plan may suffice. If the proposal is for alterations/additions to an existing building, the new work is to be coloured. See Section 5.12 for standard colours to apply.

The following information must be shown on all plans, elevations and sections:

Title block

- Applicant's name
- Address of the property
- North point (true solar north) – on plans only
- Ratio and bar scale. Use standard scales such as 1:50, 1:100 or 1:200

Plans

- Location of proposed new buildings, alterations or works (show setback distances from boundaries)
- For residential applications, the location of the building envelope controls in plan and section
- Existing buildings (show outline only)
- Room layout, partitioning, location of windows and doors
- Room dimensions, areas and proposed use
- Courtyard dimensions and areas
- Walls and fences
- Mechanical plant equipment including air-conditioning units and condensers in plan and section
- Total floor area and where relevant floor space ratio
- Disabled access
- Vehicle entrance and exit driveways
- Car parking and loading areas (show layout and dimensions)
- Electric vehicle circuitry and charging point information, including the indicative location of charging points
- Waste bin storage and collection facilities
- Enclosures and/or cabinets for fire hydrants, booster valve assembly installations, sprinkler valves and associated hydraulic equipment
- Trees being retained and proposed for removal (show trunk and canopy dimensions to scale)
- Letter boxes
- Private open spaces
- Location of windows of the buildings on adjoining properties

- Spot levels of existing ground to AHD at the corners of proposed buildings and at significant changes in levels around the perimeter of proposed buildings
- Finished floor levels to Australian Height Datum (AHD)

Vibration and settlement monitoring locations nominated by qualified engineer , if applicable

Elevations

- Existing buildings (show outline only)
- Building facade, windows (including size and sill height), roof profile
- Materials and external finishes (e.g. wall, roof, window, door and fence materials, paint colours, etc.)
- Existing and finished ground levels, floor levels, ceiling levels, eave levels and roofline levels to AHD
- Show driveway grade
- Chimneys, flues, exhaust vents, ducts and mechanical plant equipment including air-conditioning units and condensers
- Retaining walls and fences (indicate height)
- Extent of excavation or filling of the site to AHD
- Location of adjoining buildings showing address, height, setbacks and other relevant features
- Number and location of sectional drawings

including any existing structures/foundations within the influence zone, i.e., zone within 45 degrees from the base of excavation

Don't have any plans?

For large-scale or more complex projects, Council encourages you to engage an architect to provide accurate information of the proposed building. Accurate and consistent plans help speed up the assessment process.

To find the architect that is right for your project, please use the search tool provided by the Australian Institute of Architects - http://www.findanarchitect.com.au

A list of consultant town planners is available from the Planning Institute of Australia - www.planning.org.au

2.5 Site Waste Minimisation and Management Plan

A SWMMP outlines measures to minimise and manage waste generated during:

- Demolition
- Construction
- Ongoing use of the site

In doing so, the SWMMP nominates:

- Volume and type of waste and recyclables to be generated;
- Storage and treatment of waste and recyclables on site;
- Disposal of residual waste and recyclables; and,
- Procedures for ongoing waste management once the development is complete.

Refer to Attachment 1 for information to assist you in preparing your Site Waste Minimisation and Management Plan.

2.6 Survey Plan

Council highly recommends that an appointed surveyor be advised of the information contained within this part of the DA Guide prior to compiling the survey plan.

A Contour and Detail survey plan detailing the current conditions of the subject site must be submitted with all development applications. Exceptions may be permitted when the proposal exclusively comprises of the type of works listed below:

- Signage
- A change of use with no external works
- Internal alterations

For the plan to be considered a survey plan, it must be signed by a registered land surveyor as defined by the Surveying and Spatial Information Act 2002. The registered surveyor's name and ID number should also be detailed on the plan.

Boundary Surveys

Where setbacks and site area need to be taken into consideration in Council's assessment of a development application, a boundary survey is required to be incorporated into the submitted survey plan. This should include a note specifying that a boundary survey has been conducted by a registered land surveyor as defined by the *Surveying and Spatial Information Act 2002*. **Surveys with boundary dimensions based on title dimensions will not be accepted.**

Details to be included on the Survey Plan

The survey plan should mark the exact boundaries and location of buildings and other features on the subject site. The plan should be at a scale standard scale e.g. 1:100 or 1:200.

The survey plan should detail the following:

- Client or applicant's name
- Address and title of the property
- Levels and contours in AHD. Where visible or lawfully accessible from the subject site, spot levels on adjoining land should also be included
- North point (true solar north)
- Ratio and bar scale
- Surveyed site boundaries, boundary dimensions, and site area
- Location of buildings and structures (including fences and walls) on the subject site and adjoining sites, with their offsets to the boundaries clearly marked. Details should include, but are not limited to, a description of the structure, an address, floor level(s), and windows (including sill and head levels)
- Concrete pathways, footpaths, and vehicle crossings
- Details of the road reserve adjoining the site including the kerb levels
- Any visible services within the subject site and on any adjoining Council reserve (e.g. stormwater pits, Telstra pits, hydrants etc.)
- Trees 5m or higher, and a crown spread of 3m or more – details should include exact position, trunk diameter, height, and crown spread. This should include any trees on the subject site, or on land (public or private) within 5 metres of the site
- Streets adjoining the site
- Access ways and parking areas

- Location and type of all existing easements or right of ways benefiting or burdening, or otherwise affecting the subject site
- For development where Chapter B3 of the Woollahra DCP 2015 is applicable, and the front setback is required to be calculated, the survey plan should contain a sheet detailing the front setbacks of the four closest residential buildings (excluding parking structures) sharing the same primary street frontage as the subject site. Refer to Part B3.2.2 of the Woollahra DCP 2015 for further details

Registered land surveyors can be found at the following websites:

https://www.bossi.nsw.gov.au/about/find_a_registered_surveyor

https://www.surveyors.org.au/

Australian Height Datum (AHD)

Australian Height Datum (AHD) is the official unit adopted by the Australian Mapping Council and it is datum to which all vertical controls for mapping is referred.

2.7 Disclosure statement of a responsible political donation or gift

A disclosure statement is a declaration made to Council detailing any political donations or gifts made to any Councillor or gifts made to any Council employee in connection with a relevant planning application.

If any person with a financial interest in the application has within the previous 2 years, made a reportable donation to any Councillors or Council employee, a disclosure statement should be submitted with the application.

If you have not made a political donation, please fill out the statement identifying 'no donation made'.

A copy of the statement can be found on Council's website.

3. Core and additional document checklist

Core Documents			
Needed for my DA?	**Item**	**When Required**	**Further Information**
✓	Owner's Consent and Development Cost Estimate forms	Always required	Section 2.1
✓	Site Plan	Always required	Section 2.2
✓	Statement of Environmental Effects	Always required	Section 2.3
✓	Plans, Elevations and Sections	Always required	Section 2.4 and 5.12
✓	Site Waste Minimisation and Management Plan	Always required	Section 2.5 also Attachment 1
✓	Survey Plan	Always required	Section 2.6
✓	Disclosure statement of a responsible political donation or gift	Always required	Section 2.7
Additional Documents			
Needed for my DA?	**Item**	**When Required**	**Further Information**
	Heritage Impact Statement	All applications for a heritage item or draft heritage item, property within a heritage conservation area or draft heritage conservation area, archaeological sites and potential archaeological sites May be required for applications for development in the vicinity of a heritage item, a heritage conservation area, archaeological sites or potential archaeological sites	Attachment 2
	Demolition Report	All applications for buildings other than those identified as a heritage item or within a heritage conservation area where full or substantial demolition is proposed (see above for Heritage Impact Statement)	Attachment 3
	Tree Reports	Required where trees or vegetation that are protected by the TPO, are proposed to be removed or development will be sited within 5m of such trees Where any tree, subject to the TPO, is proposed to be transplanted on the site, a Transplant Method Statement is required	Attachment 4
	Landscape Plan	Applications that alter the existing building footprint or impact upon existing landscapes	Section 5.1

Additional Documents			
Needed for my DA?	**Item**	**When Required**	**Further Information**
	Shadow Diagrams	All new buildings or additions of more than one storey in height and in all cases where lot size, orientation, slope of site or adjoining buildings create the potential for overshadowing	Section 5.2
	Construction Management Plan	All development involving difficult site access or significant earthworks	Section 5.3
	BASIX Certificate and Annotated Plans	All applications for new buildings that contain one or more dwellings All applications for alterations and additions to an existing dwelling if the value of work is $50,000 or more or if the proposal includes a swimming pool of over 40,000 litres	BASIX.nsw.gov.au
	Stormwater Layout Plan	All applications which include additional building footprint	Section 5.4
	Flood Risk Management Report	Applications involving development or change of use on a site affected by 1:100 year flood require a Flood Study Any application where finished floor levels (FFLs) do not meet the requirements of the DCP require additional Flood Risk Management and/or Coastal Inundation Reports	Section 5.5 also Part E2.3 of Woollahra DCP 2015
	Acid Sulfate Soils Reports	All applications involving works described in Clause 6.1 of Woollahra LEP 2014 require a preliminary Acid Sulfate Soil assessment An Acid Sulfate Soil Management Plan is required where preliminary assessment reveals likely acid sulfate soils	Attachment 5
	Geotechnical and Hydrogeological Report	Applications that have potential to adversely affect surrounding properties during excavation works or construction of subsurface structures including any work that may: ▶ Disturb support of neighbouring property ~~(excavation within 1.5 metres of the site boundary for excavation depths over a metre in Paddington HCS and two metres elsewhere, any excavation at the toe of a retaining wall, etc.)~~ /construction ▶ Require excavation machinery which may create adverse vibrations or cause settlement ▶ Temporarily or permanently interfere with groundwater flows	Attachment 6
	Land Contamination Reports	Applications that include land excavation and for applications involving certain types of land use change	Part E4 of Woollahra DCP 2015 also SEPP 55
	Traffic and Parking Report	Applications which result in traffic generation or impact on surrounding road networks, existing parking conditions or transport requirements in the surrounding area	Section 5.6 also Part E1 of Woollahra DCP 2015

→ Comprise below ground structure (For the purpose of the DA guidelines, below ground structures means excavation to a depth greater than 300mm below the existing groundwater level, excavations within 1.5m of the neighbouring boundary, or otherwise greater than 1.0m in depth)

Additional Documents			
Needed for my DA?	**Item**	**When Required**	**Further Information**
	Electrical plan for electric vehicle circuitry and charging points	All applications for new residential and non-residential development	Section 5.6.1 also Part E1.11 of Woollahra DCP 2015
	Subdivision Plan	All forms of subdivisions and boundary adjustments	Section 5.7
	Access Report	Where disabled access is a requirement of the Disabilities Discrimination Act 1992	Section 5.8 also humanrights.gov.au
	Photomontages and 3D Images	Photomontages are required for all applications involving changes to building facades where the development cost is in excess of $200,000 All applications for residential flat development to which State Environmental Planning Policy No.65 - Design Quality of Residential Flat Development applies All applications involving alterations affecting the appearance of the site from Sydney Harbour A PDF containing 3D images of the proposal are required for applications where the cost of the proposed work exceeds $750,000	Section 5.9 also SEPP 65
	Design Verification Statement	All applications for residential flat development to which State Environmental Planning Policy No.65 - Design Quality of Residential Flat Development applies	Section 5.10 also SEPP 65
	Sample board/schedule of external materials and colours	Applications involving heritage items or heritage conservation areas Applications for residential flat buildings that involve façade changes May be required for other development	Section 5.11
	Standard Colours for Architectural Plans	All applications with architectural plans	Section 5.12
	Affordable Housing Report	Applications involving boarding houses and applications to strata title existing residential flat buildings that contain a low-rental dwelling	Section 5.13 also State Environmental Planning Policy (Affordable Rental Housing) 2009, Part 3
	Social Impact Statement	All applications for change of use of a licenced premises (including existing)	Attachment 7

Additional Documents			
Needed for my DA?	**Item**	**When Required**	**Further Information**
	Licenced Premises Management Plan	Any application for change of use of the following "high risk" licenced premises (including existing): ▶ hotels and clubs; ▶ small bars, on-premises, packaged liquor, producer/wholesaler, limited with a capacity of 100 or more patrons; ▶ any licenced premises in a residential zone; ▶ on-licences/small bars in a B1 zone	Attachment 7
	Acoustic Report	Applications for uses such as licenced premises or childcare facilities or for developments including plant or machinery in the vicinity of noise-sensitive uses	Section 5.14
	Quantity Surveyor's Report	All applications where the estimated cost of works exceeds $750,000	Attachment 8
	Public Art Plan	Applications where the estimated cost of the proposed development (CIV) is $15M or more and located on B2 zoned land (ie Double Bay, Rose Bay or Edgecliff centres) requires public art. The DA is to include a Public Art Plan identifying the public art proposed to be included in the development	Woollahra Public Art Guidelines for Developers
	Integrated Development	All applications for development described in Section 91 of the *Environmental Planning and Assessment Act 1979*	EP&A Act 1979
	3D Digital Model	All applications, amended plans or Section 4.55 applications that propose: ▶ a new building or the amendment of a building's form within the E1 Local Centre or MU1 Mixed Use Zones, or ▶ a new building or the amendment of a building's form where the building height is 12 metres or more	Attachment 9
	Aboriginal Heritage Impact Assessment	All applications, amended plans or Section 4.55 applications that are located in: ▶ Areas partly or wholly classified as an area of Aboriginal heritage sensitivity ▶ Areas partly or wholly classified as an area of potential Aboriginal heritage sensitivity ▶ Areas in proximity of registered Aboriginal sites Please refer to Council's website to identify the relevant Aboriginal heritage sensitivity.	Attachment 10

4. Lodging and tracking your application

4.1 Lodgment requirements

Once you have determined the documents required, you will need to provide electronic copies to Council via the NSW Planning Portal www.planningportal.nsw.gov.au

Electronic Copies

All drawing, documents and any other material must be submitted via the NSW Planning Portal.

Formatting

Documents must be PDF, A4 and no larger than 3MB, optimised for publishing on the internet. If a single document is larger than 3MB, it must be broken down into logical components.

PDF documents must be

- Descriptively named (e.g. Statement of Environmental Effects)
- Include the file type extension
- Date of document
- Version number

PDF Plans

- File names to include, in order
- Plan description
- Plan number, including version
- Date drawn DDMMYY
- To scale

4.2 Lodging your applications

You must prepare and submit your development application via the NSW Planning Portal.

The NSW Government Department of Planning, Industry and Environment has created a guide (www.planningportal.nsw.gov.au) to walk you through registration and lodgement on the Planning Portal.

If your application is incomplete, you'll receive details on what is required via the NSW Planning Portal.

Please be aware that if additional information is requested, and it is not provided within the nominated timeframe, your application will be rejected.

4.3 Tracking your application

After you lodge your application:

Acknowledgement

A formal letter of acknowledgement will be sent to the applicant providing the name and contact of the assessment officer assigned to your application.

If we need more information

We may need more information to undertake a proper assessment of your application. If we do, an email will be sent out as soon as possible. We will also review the estimated development costs, and require an additional application fee to be paid.

Public notification

A letter will be sent to the applicant informing them of the notification dates for the DA. Most DAs are publicly notified to enable interested persons to submit comments to the Council. The submission period is 15 days, but for some types of development it is 30 days.

You will be required to display a notification sign on the site and will also be sent a statutory declaration. It is important to ensure that the statutory declaration is signed and returned after the notification period expires to ensure that your application is assessed in a timely manner.

4.4 Determination

How are DAs determined?

There are four levels at which we determine DAs (including applications to amend consents, and applications for review of determination). Depending on the scale, complexity and value of the works, your DA will be determined by either:

1. Staff delegation by Development Assessment Team Leaders,
2. Application Assessment Panel (AAP),
3. Woollahra Local Planning Panel (WLPP),
4. Sydney Eastern City Planning Panel (SECPP)

Making enquires

If you would like to find out how your application is progressing, you can track the progress of your application on our website at www.woollahra.nsw.gov.au using the DA Tracker.

Alternatively, you can telephone us for details. When calling, you can assist us by quoting the DA number and the name of the assessment officer referred to in your application acknowledgement letter.

Notice of determination

After your application has been determined you will receive a 'Notice of Determination of the DA'. The Notice will tell you whether we have approved or refused your application.

If your application is approved, the Notice will give details of any conditions of consent, and the reasons for those conditions. It will also tell you when the consent becomes effective, and when it will lapse.

If your application is refused, the Notice will give the reasons for refusal.

The Notice will also explain your right of appeal to the New South Wales Land and Environment Court.

Varying a DA

You cannot alter or vary the development (or the way in which it operates) unless the terms of the consent are modified. To do this, you must make a separate application (Section 4.55 Application) to modify the consent.

5. Additional Information

When preparing your DA, it is important to provide a complete suite of documents as missing information can cause delays in the assessment process.

Have you completed the checklist in Section 3 to identify what additional documents you are required to prepare? This part (including the attachments) provides further information, and identifies what these documents should contain.

It is important to note that Council may refuse to accept an application if all of the required information has not been supplied.

5.1 Landscape Plan

Landscape Plans provides information on the proposed types of trees and landscaping on the site.

Plans should be prepared by a qualified arborist or landscape architect and at a minimum should clearly indicate:

- Applicant's name
- Address of the property
- North point (true solar north) – on plans only
- Ratio and bar scale. Use standard scales such as 1:50, 1:100 or 1:200
- The location of trees to be re-located and or removed (species and mature heights)
- Replacement trees and surface treatments (species and mature heights)
- Any landscaping to be retained (species and mature heights)
- Finished surface levels, embankments and grades in AHD

5.2 Shadow Diagrams

Shadow diagrams are important in determining the solar impact of the proposal on the site adjoining properties.

Shadow diagrams should be prepared by an architect and be typically 1:100 or 1:200 in scale.

Shadow diagrams should include, as a minimum:

- Applicant's name
- Address of the property
- North point (true solar north) – on plans only
- Ratio and bar scale. Use standard scales such as 1:50, 1:100 or 1:200
- The boundaries and existing buildings on the adjoining properties (particularly to the south)
- Horizontal and vertical impact of shadows cast at the winter solstice (June 21) at 9am, 12pm and 3pm. Also show the altitude and azimuth angles)
- Indicate the location and nature of existing and/or proposed fencing, with the shadows projected
- The shadows cast from the existing building compared to the proposed

5.3 Construction Management Plan

These plans are generally not required until the Construction Certificate stage. Council will normally impose specific conditions requiring these matters to be addressed prior to the issue of any Construction Certificate and prior to the commencement of any works.

For sites with traffic and access difficulties, your Construction Management Plan may document proposed Works Zones and other traffic management measures.

Where significant earthworks are proposed a Soil and Water Management Plan should be provided. A Soil and Water Management Plan is designed to control erosion and sedimentation on a building site. It details the specific methods of erosion and sediment control that will be used to meet the specific site conditions at the various stages of construction.

5.4 Stormwater Layout Plan

A Stormwater Layout Plan will need to provide information of how the proposed development, whether this be a new building or alterations and additions will connect to the Sydney Water stormwater and sewage system.

A Stormwater Plan should be prepared by a qualified Stormwater Engineer and should include, at a minimum:

- Applicant's name
- Address of the property
- North point (true solar north) – on plans only
- Ratio and bar scale. Use standard scales such as 1:50, 1:100 or 1:200
- Overland flow paths of flood liable areas present on the land and existing surface contours to AHD
- The proposed method of collection of roof or surface stormwater including the general location and levels of drains, stormwater popes, drainage pits, rainwater tanks and on-site detention tanks
- The location of infiltration measures (swales, and landscape etc.)
- The location and level of discharge points to the existing stormwater drainage system and their method of connection
- Location of stormwater easements (proposed and existing)

5.5 Flood Risk Management Report

A Flood Risk Management Report must be prepared by a suitably qualified practitioner and at a minimum it should include the following:

- Acknowledgement that the proposed development seeks to lower the minimum standard flood planning level and estuary planning level (see Chapter E2 Stormwater and Flood Risk Management in WDCP2015);
- Proposed risk management measures to minimise the impact of flooding and/or coastal inundation;
- Demonstration that the risk management measures will not adversely affect other properties;
- An Emergency Management Plan that includes an evacuation strategy.

5.6 Traffic and Parking

A traffic and parking report will be required to assess the implications of the proposal on existing traffic, parking and transport conditions surrounding the site and within any proposed parking areas. The report must be produced by a suitably qualified and experienced traffic engineer in accordance with Chapter E1 Parking and Access in WDCP2015. Depending on the type of development, is to include (but not be limited to) the following:

- Expected traffic generation rates and the impact on the surrounding road networks
- Impact on existing parking conditions and transport requirements in the surrounding area
- An assessment of the proposed off-street parking / service delivery area in accordance with AS2890
- Level of compliance with Council's Parking Development Control Plan requirements
- Any recommendations to mitigate impacts of the proposal upon the surrounding road network

5.6.1 Electric vehicle circuitry and charging points

The architectural plans (plan view) submitted with any DA must include information on electric vehicle circuitry and electric vehicle charging point requirements.

More detailed electrical plans and specifications prepared by a suitably qualified consultant for any new residential and non-residential development must be submitted at the Construction Certificate stage by way of a condition(s) with any consent.

Construction Certificate requirements:

Dwelling houses, semi-detached dwellings or dual occupancies

An accurate electrical plan of all off-street car parking must be prepared by a suitably qualified person and it must include details and specifications to illustrate how the off-street car parking will be constructed with the capacity to install at a minimum, a 'Level 2' (single phase, 7Kw power) electric vehicle charging point.

All other new residential and non-residential development

The electric vehicle plan and specifications must demonstrate:

1. *An accurate electrical plan of the building.*
2. *Identify all installed electrical vehicle charging points.*
3. *Identify electric circuitry capacity to allow 100% of car spaces to install a 'Level 2' electric vehicle charging point. This includes:*
   a) *That off-street car parking will be constructed with the capacity to have 100% of car spaces to install at a minimum 'Level 2' electric vehicle charging point, including:*
      - *Identify power capacity to each car space.*
      - *Identify load management system on each level of parking such as distribution board or sub-level.*

- *Identify conduit system to allow each car space to install an electric vehicle charging point - such as cable trays and/or buried cables underground. This system should allow future installation of cabling to power electric vehicle charging points and allow internet access (run Ethernet cable or install 4G modem).*

b) *The location of electric vehicle charging points, consistent with the provision of 1 car parking space or 10% of all car parking spaces – whichever is greater - to have a 'Level 2' electric vehicle charging point installed.*

Requirements are outlined under Part E1.11 of Woollahra DCP 2015.

5.7 Subdivision Plan

If your application involves subdivision or boundary realignment either under the Strata Schemes (Freehold Development) Act 1973 or the Real Property Act 1900 then a subdivision plan must be submitted.

The plan should be prepared by a qualified surveyor and must include the following:

- Applicant's name
- Address of the property
- North point (true solar north) – on plans only
- Ratio and bar scale. Use standard scales such as 1:50, 1:100 or 1:200
- The proposed boundaries including Lot numbers
- Any proposed easements, covenants etc.

5.8 Access Report

Access with buildings is important to ensure that all users enter, exit and move within the structure with ease. All DAs should comply with the Disability Discrimination Act 1992 (DD Act).

If you are claiming exceptional circumstances as reasons for a proposal not complying with the requirements of the DD Act, the application must be accompanied by an Access report.

The report must be prepared by a suitably qualified person with relevant, present-day work experience in the field of access provision. Qualifications and work experience of the report writer must be provided as part of the report.

Council may refer the claim and report to an independent suitably qualified and experienced consultant for assessment prior to the application being determined. Where a decision is made to seek an independent assessment, the applicant will be required to pay an additional fee.

5.9 Photomontages, 3D Images and 3D Digital Model

Photomontages

Photomontages provide a representation of the appearance of the proposed development which show the key contextual streetscape and neighbourhood setting. These are required for all new residential flat buildings and works to building facades over $200,000.

Photomontages may also show the impact of a development on the amenity of adjoining properties and from the public domain. The montages are to be generated from a survey accurate and detailed 3-dimentional computer model of the proposed development. The accuracy of the montages is to be certified by a registered surveyor and the project architect upon lodgement with the Council.

Requirement for Photomontages

1. Existing Photograph

a) A photograph showing the current, unchanged view of the location depicted in the photomontage from the same viewing point as that of the photomontage (the existing photograph);

b) A copy of the existing photograph with the wire frame lines depicted so as to demonstrate the data from which the photomontage has been constructed. The wire frame overlay represents the existing surveyed elements which correspond with the same elements in the existing photograph; and

c) A 2D plan showing the location of the camera and target point that corresponds to the same location the existing photograph was taken.

2. Survey Data

d) Confirmation that accurate 2D/3D survey data has been used to prepare the photomontages. This is to include confirmation that survey data was used:

i. for depiction of existing buildings or existing elements as shown in the wire frame; and
ii. to establish an accurate camera location and RL of the camera.

Note: Any expert statement or other document demonstrating an expert opinion that proposes to rely on a photomontage is to include details of:

a) the name and qualifications of the surveyor who prepared the survey information from which the underlying data for the wire frame from which the photomontage was derived was obtained; and
b) the camera type and field of view of the lens used for the purpose of the photograph in (1)(a) from which the photomontage has been derived.

3D Images

A PDF file containing 3D images of the proposal is required where the cost of work exceeds $750,000. The images are to show:

- The external envelope of buildings in a 3 dimensional form
- The land form
- Existing adjacent buildings
- Façade details (i.e. window openings, balconies etc.)

3D Digital Model

You will need to submit a digital model with all development applications, amended plans, or Section 4.55 applications that propose:

- A new building or the amendment of a building's form within the B2 Local Centre of B4 Mixed Use Zones, or
- A new building or the amendment of a building's form where the building height is 12 metres or more.

Refer to separate attachment 9 – 3D Digital Model Requirements

5.10 Design Verification Statement

A development application that relates to residential apartment development that is made on or after the commencement of the Environmental Planning and Assessment Amendment (Residential Apartment Development) Regulation 2015 must be accompanied by a statement by a qualified designer.

The statement by the qualified designer must verify that he or she designed, or directed the design, of the development, and provide an explanation that verifies how the development addresses how the design quality principles are achieved, and demonstrates, in terms of the Apartment Design Guide, how the objectives in Parts 3 and 4 of that guide have been achieved.

5.11 Sample boards/schedules of external materials and colours

Sample boards are required for:

1. Works to a heritage item or in a heritage conservation area
2. New residential flat buildings

[Sample boards may be required for other forms of residential development.]

Each sample of the material and colour provided on the board must be labelled so as to:

1. Describe the composition of the material and colour
2. Describe the architectural feature that will comprise the material and colour
3. Identify the location of the material and colour on facades.

To assist with interpretation the board should contain an elevation or elevations of the building, which clearly identify the location of each type of material and colour finish.

The sample board may be supplemented by technical sheets or reports that provide details on the materials and colours.

5.12 Standard Colours for Architectural Plans

Materials	Colours specified	Acceptable colour
Brick	Light Red, Venetian Red, Indian Red, Vermilion Red	*RED*
Roof tiles	Cadmium Red	*LIGHT RED*
Concrete	Viridian Green, Olive Green, Hookers Green Light, Neutral Tint	*LIGHT GREEN*
Cement render	Terra Verte	*LIGHT GREEN*
Walls of paving, tiles and terracotta	Crimson Lake	*LIGHT RED*
Artificial stones and terrazzo	Emerald Green	*LIGHT GREEN*
Cement sheets	Lime Green	*LIGHT GREEN*
Fibrous plaster, and internal plastered walls	Very Light Mauve, Very Light Violet Cake	*VERY LIGHT YELLOW*
Glass and glass bricks	Cobalt, Prussian Blue	*LIGHT BLUE*
Rock	Vandyke Brown	*LIGHT BROWN*
Earth	Sepia	*LIGHT BROWN*
Granite and other natural stones	Yellow Ochre, Raw Umber, Cadmium Orange	*ORANGE*
Marble	Mauve or Violet Cake 38	*MAUVE*
Sandstone dress or free	Vandyke Brown	*BROWN*
Bituminous products	Neutral Tint	*GREY*
Insulations	Cerulean Blue	*BLUE*
Timber, dressed	Burnt Sienna, Very Light Raw Umber, Very Light Van Dyke Brown, Very Light Sepia	*YELLOW*
Timber, sawn not dressed	Chrome Yellow, Raw Umber	*YELLOW*
Steel, galvanised iron, lead flashing	Neutral Tint, Prussian Blue	*BLUE*

5.13 Affordable Housing Report

An Affordable Housing Report provides information on whether a development is likely to result in a loss of affordable housing on the subject site.

If your application is for alterations and additions or the demolition of a boarding house, non-strata titled residential flat building containing low-rental dwellings or a vacant building previously used for either of the two previously mentioned purposes, it may be defined as 'affordable housing' under State Environmental Planning Policy (Affordable Rental Housing) 2009. In this case, an Affordable Housing Report is required.

The report should detail:

1. Whether there is likely to be a reduction in affordable housing on the land to which the application relates,
2. Whether there is available sufficient comparable accommodation to satisfy the demand for such accommodation,
3. Whether the development is likely to cause adverse social and economic effects on the general community,
4. Whether adequate arrangements have been made to assist the residents (if any) of the building likely to be displaced to find alternative comparable accommodation,
5. The extent to which the development contributes to any cumulative loss of affordable housing in the local government area,
6. The structural soundness of the building, the extent to which the building complies with any relevant fire safety requirements and the estimated cost of carrying out work necessary to ensure the structural soundness of the building and the compliance of the building with the fire safety requirements,
7. Whether the imposition of a condition requiring the payment of a monetary contribution for the purposes of affordable housing would adequately mitigate the reduction of affordable housing resulting from the development. In the case of a boarding house, the financial viability of the continued use of the boarding house.

The report should also make reference to the State Government's Guidelines for Retention of Existing Affordable Housing, July 2009. The Guidelines are available from the Department of Planning, Industry and Environment web site, www.planning.nsw.gov.au.

5.14 Acoustic Report

An acoustic report must be prepared by a suitably qualified consultant. Council may ask for an acoustic report for any application that has the potential to create a noise impact including but not limited to applications for:

- Licenced premises
- Childcare facilities
- Gyms and health clubs
- Installation of pool pumps, air conditioning or ventilation

An acoustic report should include:

1. Identification of nearby noise-sensitive locations such as residential or commercial properties
2. Existing acoustic conditions in relevant locations within and around the site such as background noise measurements at the boundaries of the site
3. Discussion of relevant standards
4. Identification of noise sources within the proposal and assessment of likely noise impact on noise-sensitive locations
5. A statement identifying how the proposal will comply with the relevant standards including details of any noise attenuation measures to be included

Licensed premises—additional matters

This section applies to a licensed premises involving a:

1. Pub or registered club or other type of licensed premises with:
    a) a capacity of 100 or more patrons and/or
    b) live or amplified music, or

2. Other “high risk” premises

The acoustic report must test or have regard to the anticipated conditions which are typical of the operation (or proposed operation) of the premises. This will require an assessment of all noise producing elements associated with the activities of the licensed premises, including but not limited to, noise from:

- internal areas of premises
- patrons seated at any open windows
- patrons in outdoor seating areas
- plant and equipment installed on the site
- patrons entering and leaving the premises

The acoustic report must include cumulative noise emissions from all licensed indoor and outdoor areas of the venue.

The acoustic report must detail all short-duration extraneous noise events experienced during the measurement and how these were removed/excluded from the measurement data.

Please also see the Social Impact Statement which must form part of the Management Plan (see Attachment 7).

5.15 Public Art Plan

Woollahra DCP (Chapters D4 Edgecliff Centre, D5 Double Bay Centre and D6 Rose Bay Centre) establishes requirements for major development to include public art when that development is valued at $15M (CIV) or more and located on B2 zoned land within the Double Bay, Rose Bay or Edgecliff centres.

The DA must include a Public Art Plan which is to be submitted when the DA is lodged.

The Public Art Plan is to be prepared consistent with the Woollahra Public Art Guidelines for Developers. The Guidelines include:

1. Objectives of the Guidelines
2. Requirements for the Public Art Plan to be submitted with the DA
3. Criteria for assessing the suitability of public art proposals
4. Process for submitting and obtaining approval for the public art, including the roles and responsibilities of key stakeholders

Prior to lodging the DA applicants should discuss their public art proposal at an early stage with Council's Public Art Coordinator.

Appendix D

Proposed Modification to the DA Guide Attachment 6 - Guidelines for Geotechnical and Hydrogeological Reports

Attachment 6
Geotechnical and Hydrogeological Reports

Guidelines for geotechnical and hydrogeological reports

Introduction

Guidelines have been prepared to assist applicants, architects and engineers to understand our requirements for the preparation of geotechnical and hydrogeological reports.

If your development proposal ~~is on land to which Chapter D5 Double Bay Centre and Chapter C1 Paddington Heritage Conservation Area of the Woollahra Development Control Plan 2015 applies and~~ includes below ground structures, you must submit geotechnical and hydrogeological reports which contain the information set out in these guidelines. For the purpose of these guidelines, below ground structures means excavation to a depth greater than 300mm below the existing groundwater level, for excavations within ~~900mm~~ 1.5m of the boundary, or otherwise greater than 1.0m in depth.

~~A geotechnical and hydrogeological report may also be required in the areas of high watertable such as Rushcutters Bay, Rose Bay, Watsons Bay as well as other sites requiring excavation~~

Applicants are advised to discuss these requirements with our Technical Services Division prior to the submission of a development application.

Objective

To ensure there are no adverse geotechnical or hydrogeological impacts on any surrounding property and infrastructure as a consequence of the carrying out of development.

Design Principles

Buildings must be designed and constructed with appropriate support and retention systems to ensure that:

- there will be no ground settlement or movement, during and after construction, sufficient to cause an adverse impact on adjoining properties and infrastructure
- there will be no change to the ground water level, during and after construction, sufficient to cause an adverse impact on surrounding properties and infrastructure
- vibration during construction is minimised or eliminated to ensure no adverse impact on surrounding properties and infrastructure
- the risk of damage to adjacent existing property and infrastructure by the new development will be reduced to a level no greater than that from an event with an 'unlikely' likelihood of occurrence and 'minor' consequence.
- all below ground structures are fully sealed to prevent the entry of all ground water such that they are fully tanked and no on-going dewatering of the site is required.

Insert the below text within Introduction

The geotechnical and hydrogeological report shall comprise, but not limited to,

- Geotechnical investigation
- Groundwater monitoring results
- Interpreted subsurface and hydrogeological conditions
- Settlement assessment
- Stability assessment
- Recommendations on geotechnical design parameters
- Recommended shoring methods and retaining walls (where applicable)
- Recommendations on foundation design
- Recommendation on excavation methods
- Vibration assessment
- Recommendations on settlement, groundwater and vibration monitoring.

Further details are discussed in the subsequent sections on this DA guidelines

Adverse Impact Definition

Generally, an adverse impact can be assumed to be any damage caused to the improvements on adjoining properties by the demolition, excavation or construction on the development site.

Development Application – Report Requirements

Geotechnical and Hydrogeological reports must be submitted with all development applications and address the following items. . The extent to which each of the items is addressed must be determined having regard to the nature of the development, site investigations and sensitivity of the surrounding properties and infrastructure. The author of the report must be satisfied as to the information provided and must be satisfied that, as a consequence of the carrying out of the development, the objectives and design principles of these guidelines will be satisfied.

General

Reports must be site specific and relate directly to the proposed development. Previous reports and data may be utilised or provided as supplementary information where certified by the author of the report as suitable for the new development.

A qualified and experienced geotechnical and/or hydrogeological engineer must prepare the reports

Should the architectural drawings be changed from a previous application or during the DA process then Council may require a revised geotechnical and hydrogeological report to be submitted

The reports must include a site specific risk assessment matrix with appropriate definitions for qualitative measures of likelihood and consequences for assessing the risk of damage to existing developments by the new development

Visual inspection and use of geological mapping alone will not be satisfactory for geotechnical and/or hydrogeological reports.

Investigations

Reports must demonstrate:

- investigation of geotechnical conditions below the proposed depth of excavation and/or founding depth for the development. Generally, the depth to bedrock should be established. As a minimum the following level of investigation is required:
  - a minimum of 2 boreholes extended to at least the likely depth of influence of construction for any site
  - Standard Penetration testing within the boreholes. The tests must be carried out at regular depth intervals not exceeding 1.5m in the upper 10m and 3m below 10m depth
  - the investigation should also target at least one continuous strength log of the subsurface soils by Cone Penetrometer Testing (CPT) to supplement the information from the boreholes.
- that the presence of groundwater has been investigated. Where present, the groundwater level must be measured and monitored. (A longer historical record of natural groundwater fluctuations will be valuable as part of the implementation program. A minimum monitoring period of six months is recommended).

- that where groundwater is present and dewatering is likely to occur on the site the following measures will be implemented:
  - a minimum of two piezometers will be located within the site or in close proximity to it.
  - a minimum of 2 piezometers will be located off site, as close to the site as possible, but outside the zone of influence of groundwater level disturbance by the new development.
  - where established in the footpath area a permanent installation with a cast iron cover and concrete surround is required.

The groundwater level monitoring must be undertaken using either electronic data loggers, or manual monitoring on regular time intervals commensurate with the expected groundwater level fluctuations. This will allow fluctuations in the site groundwater level to be calibrated against natural fluctuations in the groundwater level. ~~that~~ The investigations have to be ~~been~~ carried out to determine the design parameters appropriate to the development and site. This could include:

- foundations
- permanent and temporary supports
- settlements
- retaining walls
- groundwater levels
- batter slopes
- vibration
- dewatering including seepage and off site disposal rates.

Support and Retention

Reports must:

- include recommendations as to appropriate temporary and permanent site support and retention measures.
- predict ground settlements in areas adjacent to the development site resulting from temporary and permanent site support and retention measures and demonstrate that settlement will have no adverse impact on the surrounding properties and infrastructure.
- demonstrate that permanent earth or rock anchors will not be required on or below any road reserve or other Council property. Council may accept the use of temporary anchors if the applicant can adequately demonstrate that the use of temporary anchors would sufficiently improve the safety of the retention of excavations that may be proposed. The installation of such temporary anchors must comply with the Council's Rock Anchor Policy. (Use of permanent and/or temporary anchors on private property is not allowed without written confirmation by the property owners).
- show that permanent support and retention measures will be set back a minimum of 900mm (or minimum as advised in the relevant Development Control Plan) from the adjacent property boundaries. This is aimed at minimising the localised damage created by the installation of retention systems and to provide a corridor for perimeter drainage.

- It may be possible for a new development to be built up to the boundary on a merit-based assessment of the development. This assessment will require the geotechnical/hydrogeological report to confirm the structural adequacy of any adjacent structure including any necessary additional support for the structure as well as suitable groundwater drainage systems as outlined in Hydrogeology.

Hydrogeology

Reports must demonstrate:

- the method and rate of dewatering, including the location and disposal of site dewaterings. This includes seepage and stormwater trapped in excavations.
- that there will be no adverse impact on surrounding property and infrastructure as a result of changes in local hydrogeology (behaviour of groundwater) created by the method of construction. This includes the short-term effects resulting from construction practices, including the method and rate of dewatering and the long-term effects resulting from the support and retention of property and infrastructure after construction has been completed.
- that *temporary* changes to the groundwater level, during construction, will be kept within the historical range of natural groundwater fluctuations. Where data is limited or unavailable, reports must demonstrate that changes in the level of the natural water table, due to construction, will not exceed ~~0.3m~~ the below limits unless calculations using the results of the site specific field testing, supporting a greater change can be provided and can demonstrate no adverse impact to surrounding properties and infrastructure.
- that in a - 0.2 m within Rushcutters Bay and Watsons Bay - 0.3 m LGA wide except Double Bay and Rose Bay settlement areas, Rushcutters Bay and Watsons Bay shadow zone of a table during c lts of the site spec onstrate no adverse impact to surrounding properties and infrastructure. The temporary shadow zone during dewatering should be taken as an area within 20m of the earlier construction, unless site specific calculations can demonstrate that a different lateral extent should be adopted.
- that where data is limited or unavailable, the *permanent* change in the level of the natural watertable due to the carrying out of the development will not exceed 0.2m unless calculations using the results of the site specific field testing, supporting a greater change can be provided and can demonstrate no adverse impact to surrounding property and infrastructure.
- that in areas where the construction affects existing development within a shadow zone of an earlier construction, the *permanent* change in the water table due to the carrying out of the development will not exceed 0.1m. The permanent shadow zone of an earlier construction with full penetrating cut-off walls but without appropriate subsurface drainage should be taken as a distance equal to one building width along the groundwater flow path both in front and behind the earlier construction, unless site specific calculations can demonstrate that a different lateral extent should be adopted.
- that groundwater drainage systems have been designed to transfer groundwater through or under the proposed development without a change in the range of the natural groundwater level fluctuations.

in other areas of LGA outside Double Bay and Rose Bay settlement areas defined DCP Chapter E2 Section E2.2.10

-that temporary changes to the groundwater level, during construction, for Double Bay and Rose Bay settlement areas will be kept within the limits specified in DCP Chapter E2 Section E2.2.10

- that all below ground structures are fully sealed to prevent the entry of all ground water such that they are fully tanked and no on-going dewatering of the site is required.

For short term dewatering during construction a separate approval is required from Council under S138 of the *Roads Act 1993* where the water is to be discharged to the public road.

Where an impediment to the natural flowpath is created as a result of the nature of the construction methods utilised and/or the bulk of the below ground structure, artificial drains such as perimeter drains and through drainage may be utilised. These systems may only be utilised where is can be demonstrated that the natural ground-flow regime is re-established both upstream and downstream of the site without any adverse effects on surrounding property or infrastructure.

- that groundwater drainage systems are designed for a design life of 100 years.
- that the groundwater drainage system is designed to be easily maintained. Council will require a positive covenant to ensure the continued functioning and maintenance of the approved groundwater system. Laboratory tests to approved standards should be carried out to determine the clogging potential of any proposed filters used in the design of the drainage system for the new development.
- that where there is the potential for a damming effect created by several consecutive below ground structures, this potential impact has been the subject of hydrogeological modelling to demonstrate no adverse impact on the surrounding property or infrastructure. The extent of modelling must consider the potential for future development to extend the damming effect and must, as a minimum, extend between street blocks.
- that where below ground structures are in close proximity to each other (typically less than 3m) no allowance for natural groundwater flow through these narrow corridors has been included in the design of perimeter or though drainage.

Vibration

Reports must:

- demonstrate that there will be no adverse impact on the surrounding properties and infrastructure as a result of vibration created by the method of construction used for the development. As a minimum, reports must demonstrate compliance with the ~~requirements of AS2187.2 Appendix J~~.
- recommend appropriate plant, equipment and construction methods.

vibration limits for human comfort as required by Assessing Vibration - a technical guideline by Department of Environment and Conservation NSW (DEC), 2006 and the vibration limits for structural damage as required by German standard DIN 4150-3 - Vibrations in buildings - Part 3: Effects on structures.

Implementation Plan

The Implementation Plan will normally be part of the Conditions of Consent for the development and generally are not required to be submitted in association with the DA.

The implementation plan will comprise of the *monitoring program, contingency plan* and *construction methodology*.

Monitoring Program

The geotechnical and hydrogeological monitoring program for the development should include pre-set acceptable limits for the variation of:

- settlements associated with temporary and permanent structures;
- deflection or movement of retaining mechanisms (shoring, braces, etc.)
- vibration in accordance with ~~AS 2187.2 Appendix J, including acceptable velocity of vibration;~~ applicable standards, guidelines and legislations
- groundwater changes calibrated against natural groundwater fluctuations.

It should also:

- include the location and type of monitoring systems to be utilised;
- include recommended hold points to allow for the inspection and certification of geotechnical and hydrogeological measures by a geotechnical engineer.
- relate back to the contingency plan should the present acceptable limits for variation be exceeded.

Contingency Plan

A *Contingency Plan* must be prepared for situations where the monitoring shows the preset acceptable limits for the geological and hydrogeological parameters are exceeded. This could include details of measures to be adopted for restoring groundwater, additional support or bracing, remedial works and alternative procedures. Where possible, the contingency measures should be linked back to the monitoring program to enable early warning and time for preventative measures to be implemented

Construction Methodology

The construction methodology must address all aspects of the construction process as it relates to the geotechnical and hydrogeological requirements. Generally, this will include the method and staging the excavation, installing monitoring devices, support and retention measures, groundwater control, retention of groundwater flow paths and reinstatement. It may also include appropriate plant and equipment to minimise vibration, localised damage from installation of supports and noise.

Further Investigations

Reports may include recommendations for further investigations to be carried out prior to construction. Each case will be consider on their merits and whether or not further investigations are required prior to the granting of development consent or whether the additional information can be provided after the granting of consent but before the issue of a construction certificate.

Construction Certificate Application - Report Requirements

The following additional information may, as a condition of consent, be required before issue of the Construction Certificate:

- dilapidation reports
- details of dewatering method with licences as appropriate
- finalised Implementation Plan incorporating finalised Geotechnical and Hydrogeological Monitoring Program, Contingency Plan and Construction Methodology.
- further geotechnical and hydrogeological investigations as may be required by special consent conditions or as recommended in the geotechnical and/or hydrogeological report submitted with the Development Application
- design certificate from suitably qualified and experienced geotechnical and/or geotechnical engineer confirming that the design of the new below ground structure has been undertaken in accordance with approved standards (such as Australian or British Standards, etc) where applicable.

Construction Phase

The works on the site must be inspected and monitored in accordance with the Implementation Plan, Geotechnical and Hydrogeological Monitoring Program and any other recommendations made in the geotechnical and/or hydrogeological engineer must conduct monitoring and inspection. Copies of inspections and monitoring reports must be supplied to the Principal Certifying Authority.

Occupation Certificate - Report Requirements

A record of inspections and monitoring as required by the Implementation Plan and Geotechnical and Hydrogeological Monitoring Program must be submitted in report from to the Principal Certifying Authority for approval prior to release of the Occupation Certificate. A geotechnical/hydrogeological engineer must certify that all work, including groundwater drainage systems has been carried out in accordance with the applicable development consent conditions and the recommendations of the geotechnical and hydrogeological reports.

Further Information

A checklist of the above-mentioned geotechnical and hydrogeological requirements is attached. If you need further information about our requirements for geotechnical and hydrogeological reports please telephone our Development Engineer on 9391 7000.

Definitions

Geotechnical Engineer means NPER registered with a minimum of 10 years practice in the geotechnical field in the last 15 years

Geotechnical and Hydrogeological Requirement Check List

Development Application

Geotechnical and/or hydrogeological reports to include:

- ❑ Site specific risk assessment matrix
- ❑ Results of geotechnical investigation including boreholes, CPT and groundwater level piezometers.
- ❑ Recommended pertinent geotechnical design parameters.
- ❑ Recommendations on appropriate temporary and permanent site support and retention measures.
- ❑ Method and rate of dewatering where required.
- ❑ Proposed groundwater drainage systems and laboratory tests to determine filter clogging potential.
- ❑ Recommenced appropriate plant, equipment and construction methods to limit vibration.

Implementation Plan comprising the following:

- ❑ Monitoring program including various preset acceptable limits, location and type of monitoring systems and recommended hold points.
- ❑ Contingency Plan including details of measures to be adopted to restore groundwater level or to provide any necessary additional support.
- ❑ Construction Methodology to address all aspects of the construction process relating to the geotechnical and hydrogeological requirements.

Recommendations for further investigations to be carried out prior to construction.

Development Consent

The approval of the Development Application by the Council may contain the following conditions:

- ❑ DA Standard Conditions of Consent – Geology and Hydrogeology
- ❑ Special Conditions of Consent

Construction Certificate Application

Depending upon the conditions of consent, the following information may be required:

- ❑ Dilapidation reports
- ❑ Details of dewatering
- ❑ Finalised implementation plan
- ❑ Further geotechnical and hydrogeological investigation report when required
- ❑ Design Certificate from a suitably qualified and experienced geotechnical and/or hydrogeological engineer

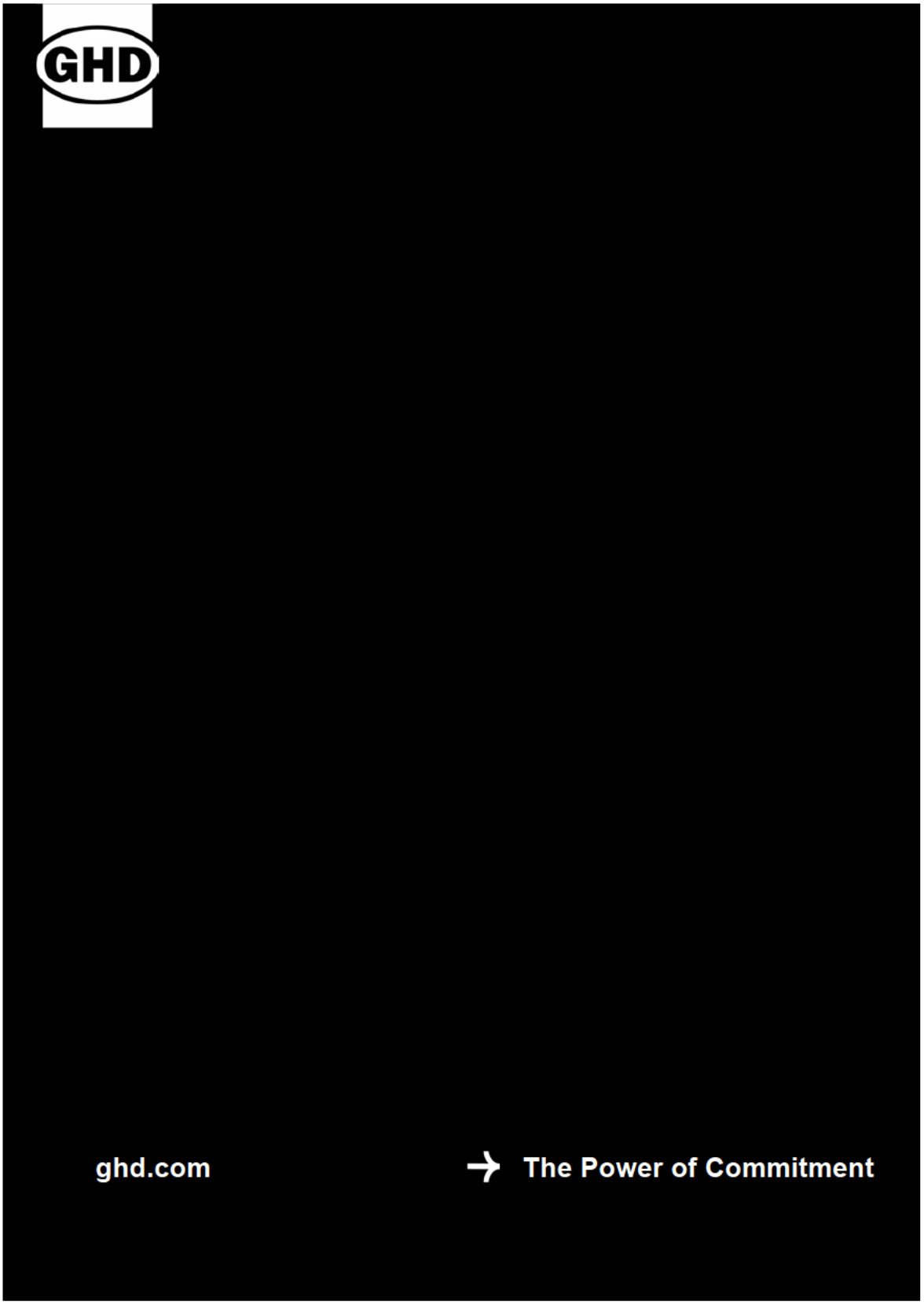
Construction Phase

A suitably qualified and experienced geotechnical and/or hydrogeological engineer must supply the following reports:

- ❑ Construction inspection reports
- ❑ Geotechnical and hydrogeological monitoring reports
- ❑ Occupation Certificate

Prior to the release of the Occupation Certificate, the following information must be supplied:

- ❑ Final construction inspection report
- ❑ Final geotechnical and hydrogeological monitoring report
- ❑ Certificate from a geotechnical and/or hydrogeological engineer to confirm that the completed structure conforms to the design.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