INFORMATION CHECKLIST

Attachment 1

> STEP 1: REQUIRED FOR ALL PROPOSALS

(*under s55(a) – (e) of the EP&A Act)*

- Objectives and intended outcome
- Mapping (including current and proposed zones)
- Community consultation (agencies to be consulted)
- Explanation of provisions
- Justification and process for implementation (including compliance assessment against relevant section 117 direction/s)

> STEP 2: MATTERS - CONSIDERED ON A CASE BY CASE BASIS

(Depending on complexity of planning proposal and nature of issues)

PLANNING MATTERS OR ISSUES	To be considered	N/A	PLANNING MATTERS OR ISSUES	To be considered	N/A
Strategic Planning Context			**Urban Design Considerations**		
• Demonstrated consistency with relevant Regional Strategy	☒	☐	• Existing site plan (buildings vegetation, roads, etc)	☐	☒
• Demonstrated consistency with relevant sub-regional strategy	☐	☒	• Building mass/block diagram study (changes in building height and FSR)	☐	☒
• Demonstrated consistency with or support for the outcomes and actions of relevant DG endorsed local strategy	☒	☐	• Lighting impact	☐	☒
• Demonstrated consistency with Threshold Sustainability Criteria	☐	☒	• Development yield analysis (potential yield of lots, houses, employment generation)	☐	☒
Site Description/Context			**Economic Considerations**		
• Aerial photographs	☒	☐	• Economic impact assessment	☐	☒
• Site photos/photomontage	☒	☐	• Retail centres hierarchy	☐	☒
Traffic and Transport Considerations			• Employment land	☐	☒
• Local traffic and transport	☒	☐	**Social and Cultural Considerations**		
• TMAP	☐	☒	• Heritage impact	☐	☒
• Public transport	☐	☒	• Aboriginal archaeology	☒	☐
• Cycle and pedestrian movement	☒	☐	• Open space management	☐	☒
Environmental Considerations			• European archaeology	☐	☒
• Bushfire hazard	☐	☒	• Social and cultural impacts	☒	☐
• Acid Sulphate Soil	☐	☒	• Stakeholder engagement	☐	☒
• Noise impact	☒	☐	**Infrastructure Considerations**		
• Flora and/or fauna	☐	☒	• Infrastructure servicing and potential funding arrangements	☐	☒
• Soil stability, erosion, sediment, landslip assessment, and subsidence	☒	☐	**Miscellaneous/Additional Considerations**		
• Water quality	☐	☒	*List any additional studies*		
• Stormwater management	☐	☒			
• Flooding	☐	☒			
• Land/site contamination (SEPP55)	☒	☐			
• Resources (including drinking water, minerals, oysters, agricultural lands, fisheries, mining)	☐	☒			
• Sea level rise	☐	☒			

ATTACHMENT 4 – EVALUATION CRITERIA FOR THE DELEGATION OF PLAN MAKING FUNCTIONS

Checklist for the review of a request for delegation of plan making functions to councils

Local Government Area: Kiama LGA

Name of draft LEP: Planning Proposal to amend Kiama Local Environmental Plan 2011 with respect to: Lot 73 DP 1153471 Bland Street, Kiama, NSW 2533.

Address of Land (if applicable): 35 Bland Street, Kiama, NSW 2533

Intent of draft LEP: The intent of this draft LEP is to rezone a portion of the site from zone SP2 Infrastructure to zone R2 Low Density Residential and apply associated planning controls to the site in accordance with Kiama Council's adopted Urban Strategy.

Additional Supporting Points/Information: Supporting studies/reports have been prepared by the applicant to support the proposal including:

- Concept Planning Proposal Report – prepared by SET Consultants Pty Ltd
- Phase 1 Site Contamination Assessment and Preliminary Geotechnical Assessment – prepared by Network Geotechnics Pty Ltd

Evaluation criteria for the issuing of an Authorisation **(Note: where the matter is identified as relevant and the requirement has not been met, council is to attach information to explain why the matter has not been addressed)**	**Council response**		**Department assessment**	
	Y/N	**Not relevant**	**Agree**	**Not agree**
Is the planning proposal consistent with the Standard Instrument Order, 2006?	Y			
Does the planning proposal contain an adequate explanation of the intent, objectives, and intended outcome of the proposed amendment?	Y			
Are appropriate maps included to identify the location of the site and the intent of the amendment?	Y			
Does the planning proposal contain details related to proposed consultation?	N			
Is the planning proposal compatible with an endorsed regional or sub-regional planning strategy or a local strategy endorsed by the Director-General?	Y			
Does the planning proposal adequately address any consistency with all relevant S117 Planning Directions?	Y			
Is the planning proposal consistent with all relevant State Environmental Planning Policies (SEPPs)?	Y			
Minor Mapping Error Amendments	**Y/N**			
Does the planning proposal seek to address a minor mapping error and contain all appropriate maps that clearly identify the error and the manner in which the error will be addressed?		NR		
Heritage LEPs	**Y/N**			
Does the planning proposal seek to add or remove a local heritage item and is it supported by a strategy/study endorsed by the Heritage Office?		NR		
Does the planning proposal include another form of endorsement or support from the Heritage Office if there is no supporting strategy/study?		NR		
Does the planning proposal potentially impact on an item of State Heritage Significance and if so, have the views of the Heritage Office been obtained?		NR		

Reclassifications	**Y/N**			
Is there an associated spot rezoning with the reclassifications?		NR		
If yes to the above, is the rezoning consistent with an endorsed Plan of Management (POM) of strategy?		NR		
Is the planning proposal proposed to rectify an anomaly in a classification?		NR		
Will the planning proposal be consistent with an adopted POM or other strategy related to the site?		NR		
Will the draft LEP discharge any interest in public land under section 30 of the Local Government Act, 1993?		NR		
If, so has council identified all interests; whether any rights or interests will be extinguished, any trusts and covenants relevant to the site, and, included a copy of the title with the planning proposal?		NR		
Has the council identified that it will exhibit the planning proposal in accordance with the department's Practice Note (PN 09-003) Classification and reclassification of public land through a local environmental plan and Best Practice Guideline for LEPs and Council Land?		NR		
Has council acknowledged in its planning proposal that a Public Hearing will be required and agreed to hold one as part of its documentation?		NR		
Spot Rezonings	**Y/N**			
Will the proposal result in a loss of development potential for the site (ie reduced FSR or building height? That is not supported by an endorsed strategy?	N			
Is the rezoning intended to address an anomaly that has been identified following the conversion of a principal LEP into a Standard Instrument LEP format?	N			
Will the planning proposal deal with a previously deferred matter in an existing LEP and if so, does it provide enough information to explain how the issue that lead to the deferral has been addressed?	N			
If yes, does the planning proposal contain sufficient documented justification to enable the matter to proceed?		NR		

Does the planning proposal create an exception to a mapped development standard?	N		
Section 73A matters	**Y/N**		
Does the proposed instrument a. Correct an obvious error in the principal instrument consisting of a misdescription, the inconsistent numbering of provisions, a wrong cross-reference, a spelling error, a grammatical mistake, the insertion of obviously missing words, the removal of obviously unnecessary words or a formatting error?, b. Address matters in the principal instrument that are of a consequential, transitional, machinery or other minor nature?, c. Deal with matters that do not warrant compliance with the conditions precent for the making of the instrument because they will not have any significant adverse impact on the environment or adjoining land? (Note – the Minister (or Delegate) will need to form an Opinion under section 73A(1)(c) of the Act in order for a matter in this category to proceed).	Y		

NOTES

- Where a council responds 'yes' or can demonstrate that the matter is 'not relevant', in most cases, the planning proposal will routinely be delegated to council to finalise as a matter of local planning significance.
- Endorsed strategy means a regional strategy, sub-regional strategy, or any other local strategic planning document that is endorsed by the Director-General of the department.

Planning Proposal

Amendment to KLEP 2011
to Rezone Land

35 Bland Street, Kiama
Part Lot 11 DP 1153471
North-Eastern Corner Bland Street and King Street

24 August 2015
Reference: L103244

SET Consultants Pty Ltd
51 Graham Street Nowra 2541
Tel: (02) 4421 4500
Fax: (02) 4423 1496

Planning Proposal

AMENDMENT TO KIAMA LOCAL ENVIRONMENTAL PLAN 2011 TO REZONE PART LOT 73 DP 1153471

Prepared By:
Karen Mion B.TP,
Town Planner
SET Consultants Pty Ltd

Reviewed By:
Bronwyn Seiden B.App.Sc. (Env. Planning),
Town Planner
Corporate Member - PIA (CPP)
SET Consultants Pty Ltd

Date: 24 August 2015

This report has been prepared for and in accordance with the scope of services provided by Kiama Municipality Council for the purpose of preparing a Planning Proposal in accordance with S55 of the Environmental Planning and Assessment Act 1979. The Planning Proposal seeks to rezone Part Lot 73 DP 1153471 on the north-eastern corner of Bland Street and King Street, Kiama.

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Contents

Tables

1 Statement of Objectives or intended outcomes

The objective of this planning proposal is to amend the Kiama Local Environmental Plan (LEP) 2011 to rezone Part Lot 73 DP 1153471 from SP2 Infrastructure to R2 Low Density Residential.

The portion of Lot 73 DP 1153471 to be rezoned has an area of 583.5m^2. This portion of land was formerly owned by Kiama Municipal Council and formed part of the adjoining road reserve. Council closed this portion of the road reserve and sold it to the adjoining property owner. The adjoining property (Lot 101 DP 1029485) and the former road reserve land (Lot 1 DP 1087370) were then consolidated to form Lot 73 DP 1153471 which is now entirely privately owned.

Lot 73 DP 1153471 has two zonings which reflect the history of the site. The portion of the site previously road reserve is zoned SP2 Infrastructure while the remainder of the site is zoned R2 Low Density Residential. This planning proposal seeks to rezone the SP2 portion of the site to correspond with the R2 portion such that residential planning controls apply uniformly to the whole of Lot 73 DP 1153471.

2 Explanation of Provisions

The intended outcome will be achieved by amending Kiama LEP 2011 as follows:-

1. Amend the Land Zoning Map – Sheet LZN_012 applying to Part Lot 73 1153471 from zone SP2 to zone R2 such that the whole of Lot 73 DP 1153471 is zoned R2.

2. Amend the Lot Size Map – Sheet LSZ_012 applying to Part Lot 73 1153471 to apply a minimum lot size of G 450 sqm such that the whole of of Lot 73 DP 1153471 has a minimum lot size of 450 sqm.

3. Amend the Height of Buildings Map – Sheet HOB_012 applying to Part Lot 73 1153471 to apply a maximum height of I 8.5m such that the whole of Lot 73 DP 1153471 has maximum height of 8.5m.

3 Justification

3.1 Need for a Planning Proposal

3.1.1 Is the Planning proposal the result of any strategic study or report?

In 2003 Council began a process to close part of the King Street road reserve and sell it to the adjoining property owner. Records indicate that this sale was likely made on the basis of the land having a residential capacity. Despite the apparent intention, the land was never rezoned to residential. On 17 March 2015 Council resolved that *"a planning proposal commence for that part of Lot 73 DP 1153471 Bland Street, Kiama currently SP2 Infrastructure to R2 Residential under Kiama LEP 2011…"*

Further to the above recommendation, the Kiama Urban Strategy (KUS) which was adopted by Council on 20 September 2011 aims to protect agricultural land from urban expansion through the provision of additional housing in suitable locations within existing townships of the Kiama Local Government Area (LGA). The planning proposal is consistent with the aims of the KUS as it would facilitate the use of suitable land within an existing residential area of residential purposes.

3.1.2 Is the Planning Proposal the best means of achieving the objectives or intended outcomes, or is there a better way?

Lot 73 DP 1153471 is partly zoned for Infrastructure. Residential uses are not permitted on this part of the site. This part of the site is also without all the principal development standards which currently apply to the remaining residential portion of the site. The best way of achieving the outcome of having consistent residential controls across the whole site is to amend the Kiama LEP such that the zoning and development standards maps clearly reflect the intended land use and to apply suitable development restrictions.

3.2 Relationship to Strategic Planning Framework

3.2.1 Is the planning proposal consistent with objectives and actions of the applicable regional or sub-regional strategy (including the Sydney Metropolitan and exhibited draft strategies)?

The site is located within the Kiama LGA. The Kiama LGA falls outside the scope of the Sydney Metropolitan Plan. The applicable regional strategy for the area is the Illawarra Regional Strategy (IRS). The Planning Proposal is consistent with the vision detailed in the IRS. The Planning Proposal would result in the provision of residential land within an existing residential area and would not adversely impact the regions natural or cultural assets as identified in the IRS. Similarly the proposal is also consistent with the Illawarra Draft Regional Growth and Infrastructure Plan exhibited in 2014.

3.2.2 Is the planning proposal consistent with a Council's local strategy or other local strategic plan?

The Kiama Urban Strategy (KUS) was adopted by Council on 20 September 2011 and is Kiama's overarching strategy to meeting housing targets identified in the IRS. The KUS had a direct influence on the preparation of the Kiama LEP 2011.

The site affected by the Planning Proposal is not specifically identified or explored in the KUS. The Planning Proposal is consistent with the Community Panel's recommendation stated in the KUS that "Council's aim should be to accommodate growth as much as possible by infill development to increase the density of the existing built-up areas."[1]

The core factors driving the KUS were the need to meet housing targets identified in the IRS and the desire to protect rural land in the Municipality and maintain separate towns and villages within the LGA. The Planning Proposal provides an additional 583.5m^2 of residential land within an existing residential area without impacting upon rural land or expanding townships closer to each other. The planning proposal is consistent with the KUS.

[1] Kiama Municipal Council *Kiama Urban Strategy* Adopted 20 September 2011, p5.

3.2.3 Is the planning proposal consistent with applicable State Environmental Planning Policies?

The Planning Proposal is consistent with applicable State Environmental Planning Policies (SEPPs) and deemed State Environmental Planning Policies (deemed SEPPs) as detailed below.

IREP No.1 – Illawarra Regional Environment Plan (Deemed SEPP)

IREP No.1 (Deemed SEPP) seeks to maximise the opportunities for the people of the region and the State to meet their individual and community economic and social needs with particular reference to the way in which these needs are related to the allocation, availability, accessibility and management of the region's land resources.

Clause 9 requires that the objectives, policies and principles specified in Parts 2-16 of the Deemed SEPP be given effected, in so far as possible by any draft Local Environment Plan. Parts 2-16 have been reviewed and considered as part of this Planning Proposal. Given the site specific nature of this Planning Proposal not all Parts are relevant nor is the Proposal able to give effect to them. Notwithstanding this, the proposal is not inconsistent in any way with this Deemed SEPP.

SEPP 55 – Remediation of Land

SEPP 55 aims to provide a planning approach to the remediation of contaminated land for the purposes of reducing risk of harm to human health or any other aspect of the environment. Specifically relevant is that SEPP 55 specifies certain matters to be considered when rezoning land.

A Phase 1 Contamination Report has been undertaken for the subject site in accordance with the Contamination Land Management Act. The Report found that the site is suitable for the proposed rezoning of the land to residential. A copy of this Report is provided in Appendix 2.

SEPP 71 – Coastal Protection

The subject site is located within the SEPP 71 Coastal Zone. The site is not located within a 'sensitive coastal location' as defined by SEPP 71. Clause 8 of the SEPP details matters to be considered when preparing a draft LEP. The Planning Proposal has been assessed against these matters. The Planning Proposal is consistent with the SEPP.

SEPP – Infrastructure

The subject site is located near a road corridor. Part 3 Division 17 Subdivision 2 of the SEPP contains development controls for development in or adjacent to road corridors or road

reserves. The SEPP does not contain any relevant requirements for the preparation of a draft LEP. The Planning Proposal is consistent with the SEPP.

3.2.4 Is the planning proposal consistent with applicable Ministerial Directions (s117 directions)?

The Planning Proposal has been assessed against the relevant Ministerial Directions. The proposal is consistent with these Directions. A checklist has been provided in Appendix 1.

3.3 Environmental Social and Economic Impact

3.3.1 Is there any likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected as a result of the proposal?

The site is not known or mapped to contain any critical habitats or threatened species, populations or ecological communities. The site is not mapped on either Council's Terrestrial Biodiversity Map as containing any biodiverse land or on Councils Riparian Land and Watercourses Map as containing a watercourse. The site is predominantly overgrown with low lying weeds. No trees are located on the site. The Planning Proposal is unlikely to adversely impact on any critical habitat or threatened species.

The Kiama LEP contains Biodiversity and Riparian maps referred to by Clause 6.4 Terrestrial Biodiversity and Clause 6.5 Riparian Land and Watercourses. These Clauses contain controls for development occurring on or within close proximity of land so mapped. In this regard, a Category 3 water course is located to the north-east of the site (predominantly downslope from the site). Clause 5.9 also provides controls for the preservation of trees and vegetation. Any future development of the land would be subject to all relevant Clauses of the Kiama LEP as part of the Development Assessment process. The planning proposal does not seek to change the Biodiversity and Riparian maps nor Clause 5.9, 6.4 or 6.5 of the Kiama LEP.

3.3.2 Are there any other likely environmental effects as a result of the Planning Proposal and how are they proposed to be managed?

The site is located within an existing and established residential locality. Any issues that may arise would be addressed during the assessment of any future development application for the site.

Geotechnical Constraints

A preliminary Geotechnical Report has been undertaken (Appendix 2). Previous use of the site has resulted in fill being placed on the site. Due to the absence of any records regarding this fill, this fill was deemed 'uncontrolled'. The Report assesses the site as Class P in accordance with AS2870-2011 Residential Slabs and Footings. Construction of residential dwelling(s) is possible on Class P land although structural details of construction methods and/or the preparation of a final geotechnical report (which carries out further drilling focusing on targeting depth of natural soils and level of bedrock) would be needed prior to the construction of any residential development on the site.

Further investigation of this matter is not deemed necessary as part of the Planning Proposal (unless as part of forthcoming Gateway Determination). The site analysis and residential design process which form part of the Development Application and Construction Certificate stage is considered a more suitable time for further detail on this matter to be provided. The preliminary Geotechnical Report should be made available to owners of the site such that they are aware of Class P classification and the Report's recommendations when considering any proposed future development proposal.

Acoustic Impacts

The site is located within visual distance of the M1 Princes Motorway as it passes over Bland Street. The site is setback from the M1 by way of Bland Street to the south-west and King Street to the North-west. This section of the M1 is raised significantly above natural ground level with land on the western side of King Street forming a steep vegetated embankment. No acoustic barriers are provided along this portion of the M1 and traffic noise is audible from the site. The Planning Proposal will not impact on the ongoing operation of the M1. However, acoustic design measures will need to be considered as part of any future residential development of the site in accordance with the Department's Interim Guide to *"Development Near Rail Corridors and Busy Roads"*.

Lot 73 DP1153471 is already partly zoned residential. This Planning Proposal seeks to rezone the remainder of the site to residential. This additional area will broaden the choice of housing designs and types capable of being accommodated on the site and in turn assist to ensure that a good design suitable for incorporating acoustic privacy measures can be achieved for the site. An acoustic report is not considered necessary as part of the Planning Proposal as the acoustic impacts do not prevent the site being used for residential purposes and are better considered at the Development Application stage for the future development.

Traffic Impacts

Based purely on the permissible residential uses within an R2 zone and the minimum lot size controls, it is reasonable to conclude that a maximum of two (2) dwellings would currently be permitted on the site (dual occupancy). The Planning Proposal seeks to rezone part Lot 73 DP1153471 to residential such that the whole lot is zoned R2 Low Density residential. The total site area of Lot 73 DP1153471 is 1259m^2. Applying the above method the maximum number of dwellings that could be permitted on the site would increase to four (4) as a result of the rezoning.

The Planning Proposal therefore results in an increase in development potential for the site of 2 additional dwellings. In accordance with the RTA's (2002) Guide to Traffic Generating Development, the estimated traffic generation for dwelling houses is 9 vehicle movements per dwelling per day. The existing road infrastructure around the subject site mostly localised traffic with the carrying capacity to cope with the potential increase of the number of dwellings permissible on the site as a result of this Planning Proposal. A traffic impact assessment is therefore not considered necessary for this Planning Proposal.

3.3.3 Has the Planning Proposal adequately addressed any social and economic effects?

Adequate road infrastructure exists in the vicinity of the site. Bland Street, King Street and the M1 Princes Motorway have all been constructed and the area of land subject to this planning proposal is currently vacant. It can be concluded that Council deemed the land surplus to the needs of the road reserve from the subsequent closure of this part of the road reserve and sale of the land into private ownership. The Planning Proposal does not seek to extinguish existing easements or restrictions over the land. There are no easements or restrictions over the land for road purposes and the site is not mapped for Land Reservation Acquisition.

The land is located within an established residential area which has access to adequate existing infrastructure. The land is not identified as needing protection. The Planning Proposal seeks to rezone the land to a residential zone consistent with the remainder of the lot and adjoining residential land. The development standards proposed for the site would be consistent with those applicable to adjoining residential land. Using surplus land in this well serviced locality for residential purposes will assist to reduce the housing pressure on rural and agricultural land.

3.4 State and Commonwealth Interests

3.4.1 Is there adequate public infrastructure for the planning proposal?

The Planning Proposal seeks to rezone 583.5m^2 of land to residential. Applying the method used in 3.3.2 above, the Planning Proposal would result in an additional two (2) dwellings being permissible on the site. Development of the site in this manner would result in a minor increase in the demand for facilities relative to the existing demand generated by the established residential population of the area. The site is located within an existing residential locality where all utility services are available. It is not expected that there would be any limitation connecting to existing services nor for there to be any issues as a result of the potential minor increase in demand on services.

3.4.2 What are the views of State and Commonwealth public authorities consulted in accordance with the Gateway determination?

No State or Commonwealth authorities have been consulted as part of the preparation of this Planning Proposal.

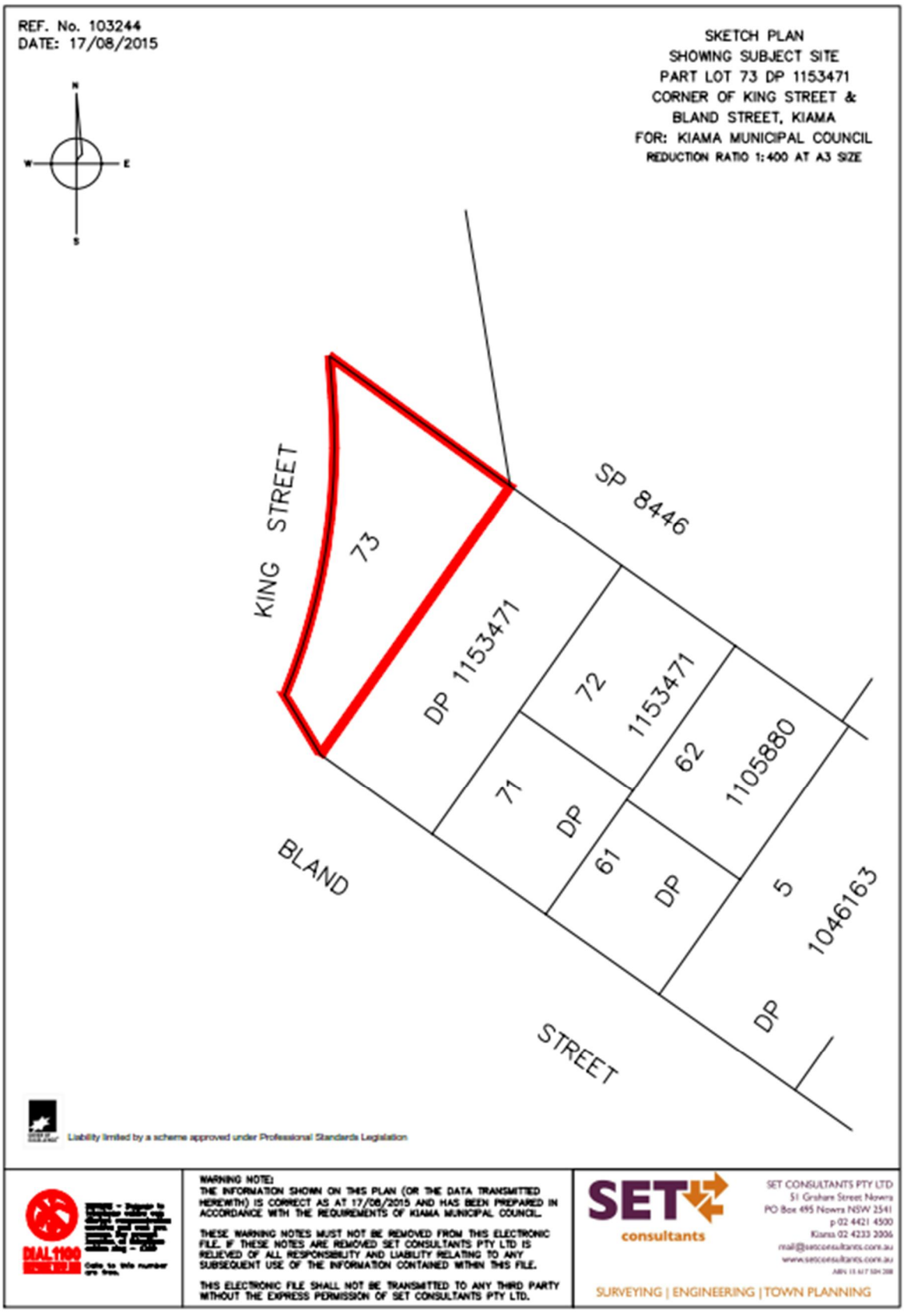
It is requested that the Gateway determination confirm the following list of State authorities to be consulted and nominate any other State or Commonwealth authorities required for consultation.

- NSW Department of Planning and Infrastructure;
- NSW Roads and Maritime Services

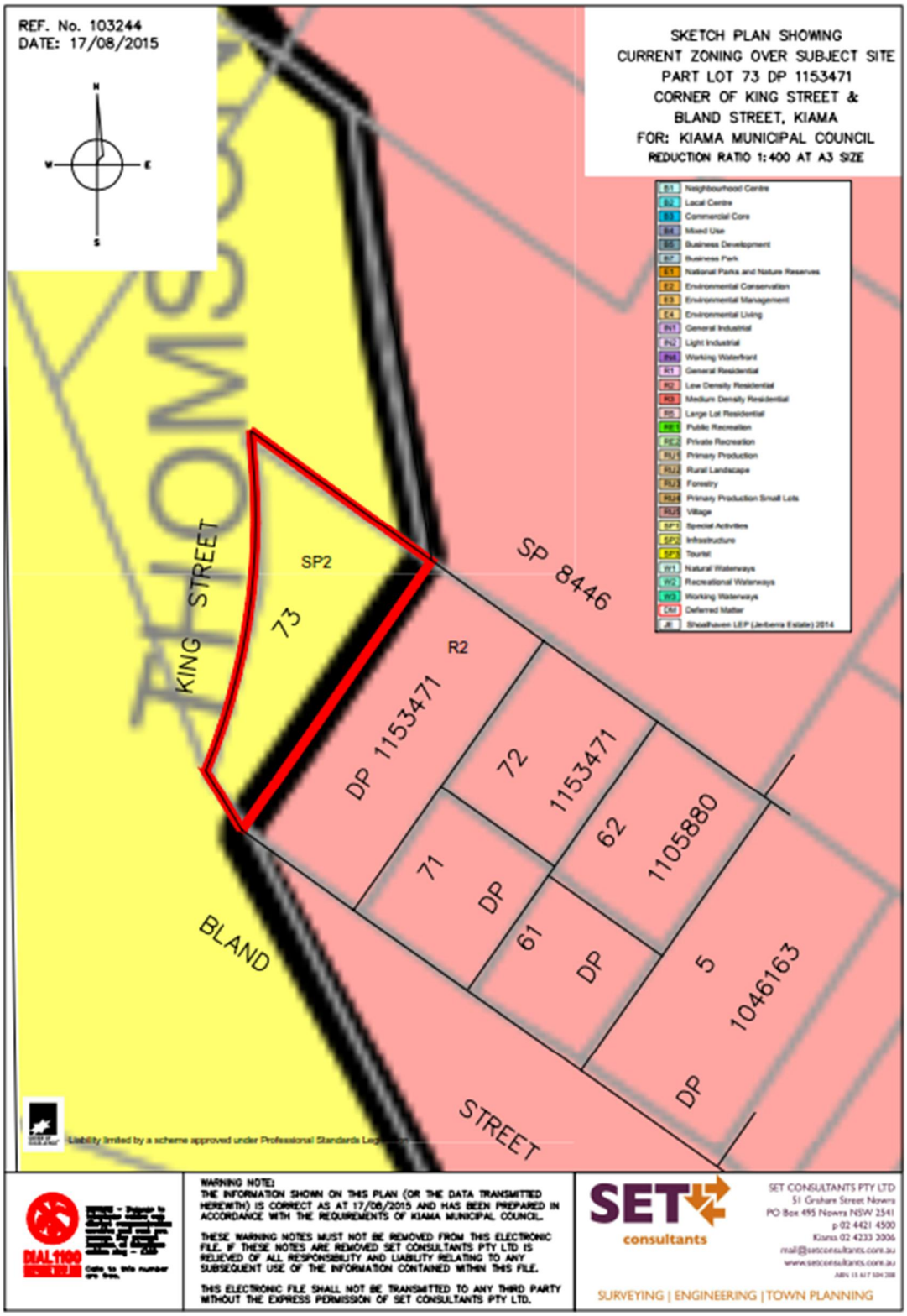
4 Mapping

The following images illustrate the current land use zoning and proposed land use zoning amendments to the Kiama LEP 2011 for the subject site and are indicative only. Changes to the Principal Development Standards are outlined in Section 2. These changes will be mapped after the gateway determination. The maps below are reproduced in Appendix 3 on the paper size noted on the scale. Aerial photographs of the sites are also included in the Appendix 3.

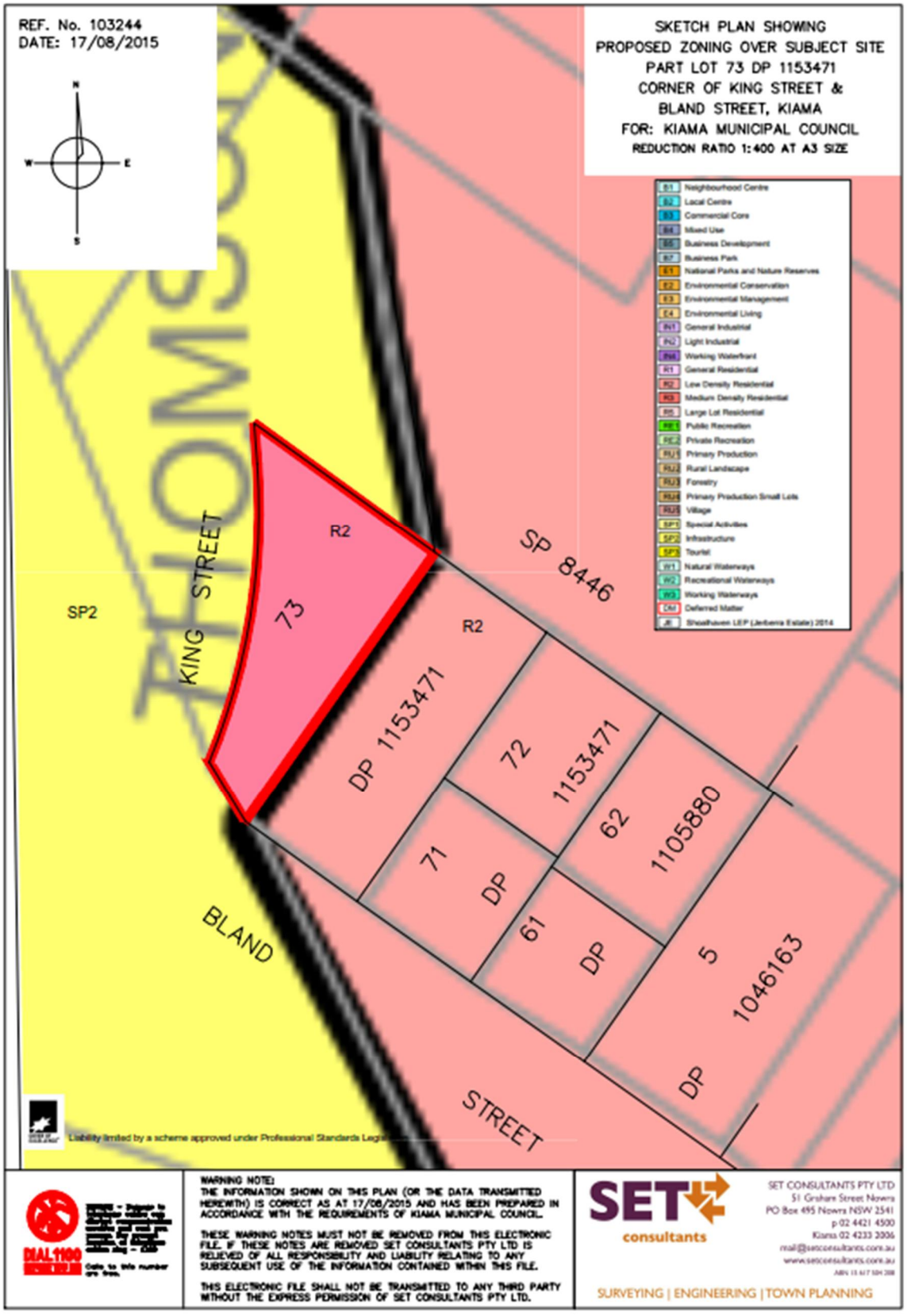
4.1 Land the subject of the Planning Proposal



4.2 Current Land Use Zone under the Kiama Local Environmental Plan 2011



4.3 Proposed Land Use Zone under this Planning Proposal



5 Community Consultation

A notification period of 14 days is recommended for this Planning Proposal. This would include:-

- Notification in local newspaper;
- Hard copies made available at the Council Administration Building;
- Electronic copy on Council's website;
- Notification letters to adjoining and surrounding property owners;
- Letters to any State and Commonwealth Public Authorities identified in the gateway determination; and
- any other consultation methods deemed appropriate for the proposal.

6 Project Timeline

The following table outlines the anticipated timeline for the project. This timeline has been established on the basis of the proposal being reported to the Council meeting scheduled for 20 October 2015.

Stage	Anticipated Timeframe	Possible Dates
Planning Proposal to the Department	Following Council meeting either September or October 2015	October 2015
Gateway determination	4 weeks from Council forwarding the Planning Proposal to the Minister	November 2015
Consultation with State / Commonwealth agencies	4 weeks after gateway determination.	December 2015
Exhibition of Planning Proposal	4 weeks after gateway determination.	December 2015
Review of submissions and preparation of report to Council.	4 weeks from end of public exhibition period.	January 2016
Report to Council	First available Council meeting after review of submissions and report preparation.	February 2016

Stage	Anticipated Timeframe	Possible Dates
Submission to the department to finalise	4weeks from Council meeting	March 2016
Anticipated date LEP will be notified		April 2016

Table 1: Project Timeline

7 Appendix

APPENDIX 1

S.117 DIRECTIONS

S.117 DIRECTION TITLE	CONSISTENCY OF PLANNING PROPOSAL
Employment and Resources	
1.1 Business and Industrial Zones	N/A
1.2 Rural Zones	N/A
1.3 Mining, Petroleum Production and Extractive Industries	N/A
1.4 Oyster Aquaculture	N/A
1.5 Rural Lands	N/A
Environment and Heritage	
2.1 Environmental Protection Zones A planning proposal must include provisions that facilitate the protection and conservation of environmentally sensitive areas. A planning proposal that applies to land within an environment protection zone or land otherwise identified for environment protection purposes in a LEP must not reduce the environmental protection standards that apply to the land (including by modifying development standards that apply to the land). This requirement does not apply to a change to a development standard for minimum lot size for a dwelling in accordance with clause (5) of Direction 1.5 "Rural Lands".	The site is not zoned for Environmental Protection Zone. The Planning Proposal does not seek to alter the provisions made for Environmental Protection Zones. The Planning Proposal is consistent with Direction 2.1 – Environmental Protection Zones.
2.2 Coastal Protection A planning proposal must include provisions that give effect to and are consistent with: a) the NSW Coastal Policy: A Sustainable Future for the New South Wales Coast 1997, and b) the Coastal Design Guidelines 2003, and c) the manual relating to the management of the coastline for the purposes of section 733 of the Local Government Act 1993 (the	The site is within the Coastal Zone. Clause 5.5 of KLEP contains provisions relating to development within the coastal zone. Clause 5.5 is consistent with the relevant Coastal policy, guidelines and manual. The Planning Proposal does not seek to alter the provisions of Clause 5.5. The Planning Proposal is consistent with Direction 2.2 – Coastal Protection.

S.117 DIRECTION TITLE	CONSISTENCY OF PLANNING PROPOSAL
NSW Coastline Management Manual 1990).	
2.3 Heritage Conservation A planning proposal must contain provisions that facilitate the conservation of: a) items, places, buildings, works, relics, moveable objects or precincts of environmental heritage significance to an area, in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item, area, object or place, identified in a study of the environmental heritage of the area, b) Aboriginal objects or Aboriginal places that are protected under the National Parks and Wildlife Act 1974, and c) Aboriginal areas, Aboriginal objects, Aboriginal places or landscapes identified by an Aboriginal heritage survey prepared by or on behalf of an Aboriginal Land Council, Aboriginal body or public authority and provided to the relevant planning authority, which identifies the area, object, place or landscape as being of heritage significance to Aboriginal culture and people.	The site is not known to contain any items of heritage significance and is not protected for Aboriginal heritage. Research indicates that the site has been generally vacant with some possible farming between 1855 to 1950. Records of the use of the land prior to 1855 is limited. In more recent times while the site has remained vacant it appears to have been partly used as an access route for construction vehicles associated with surrounding developments. Some of the site may have had fill placed on it during this time (see report in Appendix 2). Use of this site in this manner has not resulted in any archaeological discoveries and should there have been unknown aboriginal objects on the site they are likely to have been disturbed during this period. Clause 5.10 of KLEP contains provisions relating to heritage conservation including provisions for assessment of development on land that is within the vicinity of a heritage item. The Planning Proposal does not seek to alter this clause nor does the planning proposal seek to alter the list of heritage items contained within the KLEP. The Planning Proposal is consistent with Direction 2.3 – Heritage Conservation.
2.4 Recreational Vehicle Areas	N/A
Housing, Infrastructure and Urban Development	

S.117 DIRECTION TITLE	CONSISTENCY OF PLANNING PROPOSAL
3.1 Residential Zones A planning proposal must include provisions that encourage the provision of housing that will: a) broaden the choice of building types and locations available in the housing market, and b) make more efficient use of existing infrastructure and services, and c) reduce the consumption of land for housing and associated urban development on the urban fringe, and d) be of good design. A planning proposal must, in relation to land to which this direction applies: a) contain a requirement that residential development is not permitted until land is adequately serviced (or arrangements satisfactory to the council, or other appropriate authority, have been made to service it), and b) not contain provisions which will reduce the permissible residential density of land.	The Planning Proposal would result in land being zoned for residential purposes with controls under the KLEP matching that of surrounding residential land. The site is located within an existing residential locality with access to appropriate existing infrastructure and services. The planning proposal will result in a larger residential site area which will broaden the choice of housing design for the site. The Planning Proposal is consistent with Direction 3.1 – Residential Zones.
3.2 Caravan Parks and Manufactured Home Estates	N/A
3.3 Home Occupations Planning proposals must permit home occupations to be carried out in dwelling houses without the need for development consent.	The Planning Proposal would rezone the sites to Residential R2 (Low Density). Home Occupations are permitted without consent within the R2 zone under the KLEP. The Planning Proposal would not alter this permissibility. The Planning Proposal is consistent with Direction 3.3 – Home Occupations
3.4 Integrated Land Use and Transport	

S.117 DIRECTION TITLE	CONSISTENCY OF PLANNING PROPOSAL
A planning proposal must locate zones for urban purposes and include provisions that give effect to and are consistent with the aims, objectives and principles of: a) Improving Transport Choice – Guidelines for planning and development (DUAP 2001), and b) The Right Place for Business and Services – Planning Policy (DUAP 2001).	The Planning Proposal increases the amount of residentially zoned land within an established residential locality with existing transport systems. The additional land will lead to increased viability of these existing transport systems. The Planning Proposal is consistent with Direction 3.4 – Integrated Land Use Transport.
3.5 Development Near Licensed Aerodromes	N/A
3.6 Shooting Ranges	N/A
Hazard and Risk	
4.1 Acid Sulfate Soils	N/A
4.2 Mine Subsidence and Unstable Land When preparing a draft LEP that would permit development on land that is within a Mine Subsidence District a council shall: a) consult the Mine Subsidence Board to ascertain: (i) if the Mine Subsidence Board has any objection to the draft Local Environmental Plan, and the reason for such an objection, and (ii) the scale, density and type of development that is appropriate for the potential level of subsidence, and b) incorporate provisions into the draft Local Environmental Plan that are consistent with the recommended scale, density and type of development recommended under (4)(a)(ii), and c) include a copy of any information received from the Mine Subsidence	The land is not within a Mine Subsidence District. The site is not identified on any available Council maps as being unstable land. Notwithstanding this a preliminary geotechnical report has been undertaken (see Appendix 2). This report found there to be uncontrolled fill on the site & subsequently assessed the site as Class P in accordance with AS2870-2011 Residential Slabs and Footings. Construction of residential dwelling(s) area possible on the site although further details of construction methods and/or the preparation of a final geotechnical report would be needed prior to any Development Approval for the site.

S.117 DIRECTION TITLE	CONSISTENCY OF PLANNING PROPOSAL
Board with the statement to the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) under section 64 of the Environmental Planning and Assessment Act 1979. A draft LEP shall not permit development on unstable land referred to in paragraph 3(b).	
4.3 Flood Prone Land	N/A
4.4 Planning For Bushfire Protection	N/A
Regional Plan Making	
5.1 Implementation of Regional Strategies Planning proposals must be consistent with a regional strategy released by the Minister for Planning.	The Planning Proposal is consistent with the Illawarra Regional Strategy (see Section 3.2.1 of this report). The Planning Proposal is therefore consistent with Direction 5.1 – Implementation of Regional Strategies.
5.2 Sydney Drinking Water Catchments	N/A
5.3 Farmland of State and Regional Significance on the NSW Far North Coast	N/A
5.4 Commercial and Retail Development along the Pacific Highway, North Coast	N/A
5.8 Second Sydney Airport: Badgerys Creek	N/A
5.9 North West Rail Link Corridor Strategy	N/A
Local Plan Making	
6.1 Approval and Referral Requirements A planning proposal must: a) minimise the inclusion of provisions that require the concurrence, consultation or referral of development applications to a Minister or public authority, and b) not contain provisions requiring concurrence, consultation or referral of a Minister or public	The Planning Proposal does not include any additional provisions to the LEP which would require the concurrence, consultation or referral of future development applications to a Minister or public authority. The Planning Proposal does not identify development as designated development.

S.117 DIRECTION TITLE	CONSISTENCY OF PLANNING PROPOSAL
authority unless the relevant planning authority has obtained the approval of: (i) the appropriate Minister or public authority, and (ii) the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General), prior to undertaking community consultation in satisfaction of section 57 of the Act, and c) not identify development as designated development unless the relevant planning authority: (i) can satisfy the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) that the class of development is likely to have a significant impact on the environment, and (ii) has obtained the approval of the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) prior to undertaking community consultation in satisfaction of section 57 of the Act.	The Planning Proposal is consistent with Direction 6.1 – Approval and Referral Requirements.
6.2 Reserving Land for Public Purposes	

S.117 DIRECTION TITLE	CONSISTENCY OF PLANNING PROPOSAL
A planning proposal must not create, alter or reduce existing zonings or reservations of land for public purposes without the approval of the relevant public authority and the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General). When a Minister or public authority requests a relevant planning authority to reserve land for a public purpose in a planning proposal and the land would be required to be acquired under Division 3 of Part 2 of the Land Acquisition (Just Terms Compensation) Act 1991, the relevant planning authority must: a) reserve the land in accordance with the request, and b) include the land in a zone appropriate to its intended future use or a zone advised by the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General), and c) identify the relevant acquiring authority for the land. When a Minister or public authority requests a relevant planning authority to include provisions in a planning proposal relating to the use of any land reserved for a public purpose before that land is acquired, the relevant planning authority must: a) include the requested provisions, or b) take such other action as advised by the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General)	The Planning Proposal seeks to rezone and land currently zoned SP2 (Infrastructure). The land is not classified as community land. The land is in private ownership following the road closure of this section of land and the sale of this section of land by Council. There are no easements or restrictions over the land for road purposes and the site is not shown on the Land Reservation Acquisition Map nor marked as "Classified road". The land is not zoned or reserved for public purposes and as such approval from the relevant public authority and the Director-General of the Department of Planning is not considered to be required by way of this Directive. This Planning Proposal is consistent with Direction 6.1 – reserving land for public purposes.

S.117 DIRECTION TITLE	CONSISTENCY OF PLANNING PROPOSAL
with respect to the use of the land before it is acquired. When a Minister or public authority requests a relevant planning authority to include provisions in a planning proposal to rezone and/or remove a reservation of any land that is reserved for public purposes because the land is no longer designated by that public authority for acquisition, the relevant planning authority must rezone and/or remove the relevant reservation in accordance with the request.	
6.3 Site Specific Provisions	N/A
Metropolitan Planning	
7.1 Implementation of the Metropolitan Plan for Sydney 2036	N/A

APPENDIX 2

PHASE 1 SITE CONTAMINATION ASSESSMENT AND PRELIMINARY GEOTECHNICAL ASSESSMENT

Report

Phase 1 Contamination Assessment & Preliminary Geotechnical Assessment

Proposed Re-zoning, Lot 73 DP 115347 Bland Street, Kiama NSW

Prepared for:

SET Consultants

No. 51 Graham Street
NOWRA NSW 2541

Prepared by:

Network Geotechnics

18 June 2015

Ref: G09/1746-A

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Appendices

Executive Summary

SET Consultants commissioned Network Geotechnics Pty Ltd (NG) to carry out a Stage 1 Site Contamination Assessment in accordance with Contamination Land Management Act in order to lodge a Development Application for proposed re-zoning of land at Lot 73 Bland Street, Kiama. The investigation also included a preliminary geotechnical assessment.

The site is identified as Lot 73 in DP 1153471 bordering Bland Street, Kiama in Kiama Municipal Council (KMC) Area. A plan of the site is included in *Appendix B,* Drawing No. G09/1746-1.

It is understood that the Client has purchased the section of land (western and north western portion of the site) from KMC, which was previously part of the adjoining (King Street) road reserve and zoned accordingly under the prevailing planning instrument. Therefore KMC have requested a Stage I Contamination Assessment for the portion of the land that is proposed to be re-zoned.

The objective of this investigation was to carry out a Stage I Contamination Assessment in order to assess the risks of site contamination from historical land usage and to assess the suitability of the site for the proposed rezoning.

The scope of work undertaken to achieve the objectives included:

- Review of regional geology.
- Review of historical aerial photographs and title records to facilitate identification of potential site contamination.
- Walk over assessment to identify site features affecting potential site contamination and limited testing for potential contaminants.
- Evaluation of findings and preparation of Stage I Contamination Assessment.

Based on Aerial Photographs and title records, the site has been generally vacant, however the site has been subject to filling between years 2004 to 2007. It is presumed the filling material may have been from the previous residential subdivisions to the north and east of the site.

Based on the above the risk of site contamination is assessed to be low and hence a Stage 2 Contamination Assessment is not required for the proposed re-zoning. Any contamination that may be found is likely to be localised and can be remediated during normal earthworks. The site is suitable for the proposed rezoning. It is noted that the fill material on-site would need to be subject to further testing, if to be removed off-site.

Due to the underlying fill deemed to be uncontrolled, in the absence of records to the contrary, the site is assessed as Class P in accordance with AS2870-2011 Residential Slabs and Footings. It is recommended that further drilling investigation be carried out for the final geotechnical report, targeting depth of natural soils and level of bedrock.

1.0 Introduction

SET Consultants commissioned Network Geotechnics Pty Ltd (NG) to carry out a Stage 1 Site Contamination Assessment in accordance with Contamination Land Management Act in order to lodge a Development Application for proposed re-zoning of land at Lot 73 Bland Street, Kiama. The investigation also included a preliminary geotechnical assessment.

The site is identified as Lot 73 in DP 1153471 bordering Bland Street, Kiama in Kiama Municipal Council (KMC) Area. A plan of the site is included in *Appendix B,* Drawing No. G09/1746-1.

The investigation was undertaken in accordance with NG Proposal G09/1746 dated 30 April 2015.

2.0 Scope of Work

The objective of this investigation was to carry out a Stage I Contamination Assessment in order to assess the risks of site contamination from historical land usage and to assess the suitability of the site for the proposed rezoning.

The scope of work undertaken to achieve the objectives included:

- Review of regional geology.
- Review of historical aerial photographs and title records to facilitate identification of potential site contamination.
- Walk over assessment to identify site features affecting potential site contamination and limited testing for potential contaminants.
- Evaluation of findings and preparation of Stage I Contamination Assessment.

3.0 Site Identification

The site is located north of Bland Street, Kiama. The site is bounded by:

- SP 84446 to the north,
- Lots 71 & 72 in D.P. 1153471 to the east,
- And King Street to the west.

The subject site covers a total area of about 1259m^2 and is located in Kiama Municipal Council area in Parish of Kiama and County of Camden.

4.0 Site History

4.1 Zoning

Council zoning plans (LEP 2011) identifies Lot 73 in DP 1153471 as partly R2 'Low Density Residential' (covering the central, southern and eastern portion of the site) and partly SP2 'Infrastructure' (covering the western and north western portions of the site).

4.2 Land use

The land is currently vacant. The only structure on-site is an container shed, possibly being used as storage facility for the current owner.

4.3 Council Re-Zoning

It is understood that the western and north western portions of the site will be re-zoned as R2 'Low density Residential Zone' from the current zoning as SP2 'Infrastructure.

4.4 Title Records

A record of ownership/leasing as can be inferred from title records is given in Table 1 below.

Table 1 - Historical Ownership

Date	Lot /DP Number	Volume/Folio	Remarks
13 July, 1855	11 Sec. 24		Crown Grant to James Hall.
16 April, 1855	12 Sec. 24		Crown Grant to George Grey
13 July, 1855	13 Sec. 24		Crown Grant to Paul Harrison
1 May, 1918	Lots 11, 12 & 13	BK 1127 No. 528	Nesbit Evans Hindmarsh, gentleman to Benjamin Henry Burrows Boniface (Farmer) who died 17-07-1943.
7 February, 1950	Lots 11, 12 & 13	BK 2113 No. 368	George Laurence Boniface (dairy farmer) to Elizabeth May Gowan, wife of Percy Martin Gowan (Quarryman).
5 April, 1963		BK 2649 No. 219	Elizabeth May Gowan to Keith Gowan (Clerk) in holy orders and Anne Gwendoline, wife.
23 December, 1986	37/708076	BK 3692 No. 597	Elizabeth May Gowan to the Commissioner for Main Roads (Gov. Gaz 29-03-1985).
2 February, 1999	37/708076	Request 5573634	Roads & Traffic Authority of NSW to the Council of Municipality of Kiama.
10 January, 2006	37/708076	AC 77055	The Council of the Municipality of Kiama to Anthony John Wallace and Angela May Wallace.

4.5 Aerial Photographs

Aerial photographs for Lot 101 in DP 785139 Crest Road, Albion Park were purchased from NSW Department of Lands. A summary of findings are presented in Table 2.

Table 2 - Summary of Aerial Photograph Review

Year of Photo	*Scale*	*Colour*	*Description*
1949	1:30000	Black & White	The site is completely covered with grasslands and the surrounding areas are partly rural properties and partly vacant.
1963	1:40000	Black & White	The site seems to be vacant with a couple dwellings (rural residential) to the eastern side and a creek line west of the site. There are trees/shrubs visible along the creek line. Further east of the site, a lot more dwellings visible.
1974	1:40000	Black & White	Same as above.
1984	1:40000	Black & White	Some minor residential development to the north and east of the site.
1993	1:25000	Colour	The Princes Highway Bridge has now been constructed to the west of the site. the surrounding lands adjacent to the subject site have not changed dramatically, however the lands immediately to the east and north of subject site comprise residential dwellings.
2005	Google Earth	Colour	Old dwellings to the east and north of the site have been demolished and earthworks in progress. A site access road (dirt road) runs through the subject site to the north, giving access for construction of new dwellings.
2015	Google Earth	Colour	Lands to the north and east are now low density residential properties. The site has a shipping container located at the centre of the subject site, assumed to be from the construction works carried out in 2005.

4.6 Historical Site Usage

Based on Aerial Photographs and title records, the site has been generally vacant and possible farming from 1855 to 1950. Between years 1950 and 2006, the site has been generally vacant. Between years 2006 to 2015 the site has been vacant, however the surrounding lands to the north and east had been part of a residential subdivision of which the subject site may have been used for storage of construction equipment and partly used as an access way to the construction site. The land (subject site) may have also been subject to filling during the construction period of the residences to the north and to the east (years 2005 - 2007) with the excess material.

Based on title records and aerial photographs, the following historical uses could be identified:

Table 3 - Historical Land Use

1855 - 1950	Vacant & possible farming
1950 - 2006	Vacant.
2006 - 2015	Generally vacant, however the site was partly used as an access-way for the residential construction to the north and to the east with potential of filling of land during that period. The subject site may have been used for storage of construction equipment.

4.7 Potential Contamination

The site history records available do not show the use of chemicals onsite. The following chemicals and waste may be associated with demolition of sheds/ dwellings and filling of land.

- Contamination such as heavy metals, hydrocarbons and asbestos associated with any imported fill.
- Possible asbestos contamination in crushed rock/ recycled products associated with Construction of access routes.
- Possible asbestos from demolition of old sheds and cottages.

5.0 Site Condition & Surrounding Environment

5.1 Topography

The site is located east of King Street and north of Bland Street, Kiama. The site comprises one break in slope, as observed from the western corner of the site, with east facing slopes of 15^{o} over a span of about 7m going to a gentle 2^{o} east facing slopes. The site is generally covered with grass overlying gravelly CLAY fill. There was a locked shipping container near the centre of the site and one small stockpile located near the northern boundary comprising concrete pieces and some scrap metal.

5.2 Visible Signs of Contamination

During the site visit on 1 June, 2015 six boreholes were drilled (BH1-BH6). Potential contamination sources within the site is generally associated with fill placed with unknown contaminant sources and possible oil/petroleum surface leakages, however no signs of surface soils staining suggesting oil leakages were evident at the time of the investigation. The surface soils mainly contained gravelly CLAY fill.

5.3 Flood Potential

A flood study was not carried out for this investigation. The closest body of water is Kiama Beach located about 1.8km to the east of the subject site.

5.4 Geology & Subsurface Profile

Geological maps for the area indicate the site to be underlain by Bumbo Latite Member 'P_{sgb}' comprising Aphanitic to Porphyritic Latite.

The subsurface profile encountered in the boreholes may be generalised as follows:

Table 4: Subsurface Profile Encountered

Layer/Description		Depth to Base of Layer
FILL:	gravelly CLAY, low to medium plasticity, brown, some fine to medium grained sands	1.5 – 3.0
FILL:	gravelly sandy CLAY, medium plasticity, grey/brown (Only in BH1)	3.9
FILL:	CLAY, medium to high plasticity, brown/grey (Only BH2 & BH6)	3.0 – 4.0
FILL:	Sandy CLAY, medium to high plasticity, pale brown some coarse gravels (BH5 comprised two concrete pieces at about 2.5m depth)	1.5 - > 3.9

Groundwater was not encountered during drilling in of the boreholes. However, the depth to groundwater may change with the variation of environmental factors.

6.0 Fieldwork

Fieldwork carried out on 1 June 2015 comprised drilling 6 boreholes (BH1 to BH6) to depths ranging from 2.0m to 4.5m using a skid steer Dingo drill rig. Disturbed samples were placed in plastic bags/ buckets and sealed and transported to NG's Laboratory located in Mount Kuring-Gai for materials testing and chemical testing at SGS Laboratory located in Alexandria.

Field investigation was carried out by a Geotechnical Engineer from NG who selected borehole locations, carried out sampling and prepared borehole logs. Borehole locations are shown on Drawing No. G09/1746-1, included in *Appendix B* and the borehole logs are included in *Appendix C*.

7.0 Sampling, Analysis Plan & Sampling Methodology

The NSW EPA Sampling Design Guidelines (1995) for contaminated site investigations states a recommendation of 6 evenly spaced sampling points for each 1259m^2 of land. The Guidelines are commonly used during Stage 2 Detailed Investigations.

Based on the site history and findings of the fieldwork carried out, the potential for contamination was assessed to be medium. Potential sources of contamination were considered to be heavy metals, hydrocarbons, asbestos and pesticides.

Soil samples for contamination testing were collected from auger cuttings. All hand tools and augers were decontaminated (DECON 90) prior to drilling and samples were collected into laboratory prepared jars using decontaminated hand tools.

All samples were placed in glass jars with plastic caps and teflon seals with minimum headspace. Each sample was labelled with job number G09/1746, the sample location and date. All samples were recorded on the Chain of Custody (COC) record stored in our office files. The table below provides rationale for sampling and testing details:

Table 5: Samples Tested for Contaminants

Sample No.	Depth (m)	Analytes Tested
SS1 (Surface sample 1)	-	TRH/BTEX/PAH, Heavy Metals
SS2 (Surface sample 2)	-	Heavy Metals
BH1	1.5	Heavy Metals, Sulphate, Chloride, pH, EC and resistivity
BH6	0.05	Asbestos & OC/OP
BH4	0.1	Heavy Metals
BH5	0.1	Heavy Metals

On completion of fieldwork, the samples were delivered under cold storage conditions to a SGS Alexandria, a NATA registered laboratory, for analysis for pH, heavy metals, Pesticides (OC/OP), Polynuclear Aromatic Hydrocarbon (PAH), Total Recoverable Hydrocarbons (TRH), Benzene, Toluene, Ethyl benzene, Xylene (BTEX) and Asbestos under Standard COC procedures.

8.0 Quality Assurance & Quality Control

8.1 Field Quality Assurance & Quality control

Field quality assurance objectives were designed based on Australian Standard AS4482 and comprised the following:

- Sample collection and dispatch to testing laboratory were carried out by experienced environmental/ civil engineers appropriately trained for such tests.
- All sampling tools were decontaminated prior to use.
- Chain of custody forms were used in dispatching samples.
- Containers, sampling packaging and holding times were checked prior to dispatch of samples and checked after samples were received by the laboratories.

8.2 Laboratory Quality Assurance & Quality Control

Only NATA accredited laboratories were used for testing. Certificates of analysis and quality control records were reviewed for each batch of test results.

Specific elements that have been checked and assessed include the following:

- Preservation and storage of samples upon collection and during transport to the laboratory;

- Sample holding times;
- Use of appropriate analytical and field sampling procedures;
- Required limits of reporting;
- Frequency of conducting quality control measurements;
- The occurrences of apparently unusual or anomalous results, eg laboratory results that appear to be inconsistent with field observations or measurements have been assessed.

On the basis of the analytical data validation procedures employed, the overall quality of the analytical data produced is considered to be of an acceptable standard for interpretive use.

9.0 Assessment Criteria

The assessment of potentially contaminated land involves the evaluation of potential human health hazards and environmental impacts. The receptors (or potential receptors) of concern may be within the site being assessed, or outside the site boundaries due to potential off-site migration of contaminants.

The following assessment criteria were used for assessment of the site soils:

- The Health-Based Investigation Levels (HBIL) summarised in the following Table 1a, which are extracted from Schedule B1 of the NEPM and Guidelines May 2013 or the NSW Site Auditor Scheme, 1998, are used for assessing the risk to human health.

- The Ecological Investigation Levels (EIL's) and Ecological Screening Levels (ESL's) from Schedule B1 of the NEPM and Guidelines May 2013 were used for assessing the possibility of further appropriate investigations that may be required.

The above mentioned levels are presented on the following Tables 1a and 1b.

Table 6 Health Investigation Levels for soil contaminants (mg/kg)

Chemical	Health-based investigation levels (mg/kg)			
	Residential[1] A	**Residential[1] B**	**Recreational[1] C**	**Commercial / industrial[1] D**
Metals and Inorganics				
Arsenic[2]	100	500	300	3 000
Cadmium	20	150	90	900
Chromium (VI)	100	500	300	3600
Copper	6000	30 000	17 000	240 000
Lead[3]	300	1200	600	1 500
Mercury (inorganic)[5]	40	120	80	730
Methyl mercury[4]	10	30	13	180
Nickel	400	1200	1200	6 000
Zinc	7400	60 000	30 000	400 000

Chemical	Health-based investigation levels (mg/kg)			
	Residential[1] A	Residential[1] B	Recreational[1] C	Commercial / industrial[1] D
Polycyclic Aromatic Hydrocarbons (PAHs)				
Carcinogenic PAHs (as BaP TEQ)[6]	3	4	3	40
Total PAHs[7]	300	400	300	4000
Organochlorine Pesticides				
DDT+DDE+DDD	240	600	400	3600
Aldrin and dieldrin	6	10	10	45
Chlordane	50	90	70	530
Endosulfan	270	400	340	2000
Endrin	10	20	20	100
Heptachlor	6	10	10	50
HCB	10	15	10	80
Methoxychlor	300	500	400	2500
Mirex	10	20	20	100
Toxaphene	20	30	30	160
Other Pesticides				
Atrazine	320	470	400	2500
Chlorpyrifos	160	340	250	2000
Bifenthrin	600	840	730	4500

Notes:

(1) Generic land uses are described in detail in Schedule B7 Section 3 of NEPM
HIL C – Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. This does not include undeveloped public open space where the potential for exposure is lower and where a site-specific assessment may be more appropriate.

(2) Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability may be important and should be considered where appropriate (refer Schedule B7).

(3) Lead: HIL is based on blood lead models (IEUBK for HILs A, B and C and adult lead model for HIL D where 50% oral bioavailability has been considered. Site-specific bioavailability may be important and should be considered where appropriate.

(4) Methyl mercury: assessment of methyl mercury should only occur where there is evidence of its potential source. It may be associated with inorganic mercury and anaerobic microorganism activity in aquatic environments. In addition the reliability and quality of sampling/analysis should be considered.

(5) Elemental mercury: HIL does not address elemental mercury. A site-specific assessment should be considered if elemental mercury is present, or suspected to be present,

(6) Carcinogenic PAHs: HIL is based on the 8 carcinogenic PAHs and their TEFs (potency relative to B(a)P) adopted by CCME 2008 (refer Schedule B7). The B(a)P TEQ is calculated by multiplying the concentration of each carcinogenic PAH in the sample by its B(a)P TEF, given below, and summing these products.

Table 7 ESLs for TRH Fractions F1 – F4, BTEX and Benzo(a)pyrene in Soil

CHEMICAL	Soil texture	ESLs (mg/kg dry soil)		
		Areas of ecological significance	Urban residential and public open space	Commercial and industrial
F1 C_6-C_{10}	*Coarse / Fine*	125*	180*	215*
F2 $>C_{10}$-C_{16}		25*	120*	170*
F3 $>C_{16}$-C_{34}	*Coarse*	-	300	1700
	Fine	-	1300	2500
F4 $>C_{34}$-C_{40}	*Coarse*	-	2800	3300
	Fine	-	5600	6600
Benzene	*Coarse*	10	50	75
	Fine	10	65	95
Toluene	*Coarse*	10	85	135
	Fine	65	105	135
CHEMICAL	**Soil texture**	**ESLs (mg/kg dry soil)**		
		Areas of ecological significance	**Urban residential and public open space**	**Commercial and industrial**
Ethylbenzene	*Coarse*	1.5	70	165
	Fine	40	125	185
Xylenes	*Coarse*	10	105	180
	Fine	1.6	45	95
Benzo(a)pyrene	*Coarse*	0.7	0.7	0.7
	Fine	0.7	0.7	0.7

Notes:

(1) ESLs are of low reliability except where indicated by * which indicates that the ESL is of moderate reliability.

(2) '-' indicates that insufficient data was available to derive a value.

(3) To obtain F1, subtract the sum of BTEX concentrations from C_6-C_{10} fraction and subtract naphthalene from $>C_{10}$-C_{16} to obtain F2.

Table 8 EILs for Heavy Metals in Soil

Chemical	Ecological Investigation levels (ACL) (mg/kg)
	Urban residential/public open space
Metals and Inorganics	
Arsenic	100
Chromium (III)	400
Copper	130-190 (ACL) + 40 (ABC) = 170 to 230
Lead[3]	1100
Nickel	170 (ACL) + 20 (ABC) = 190
Zinc	180 (ACL) + 40 (ABC) = 220

Notes:

1. Urban residential/public open space is broadly equivalent to the HIL A, HIL B and HIL C land use scenarios in Table 4 Footnote 1 and as described in Schedule B7.

2. The EIL is calculated from summing the Added Contaminant Limit (ACL) and the Ambient Background Concentration (ABC).

3. The EIL is based on a CEC of 10 and pH of 5 for the fill.

The subject site is proposed for residential use. Consequently, the issues of concern for contamination within the site are considered to be the risk of harm to human health and environmental impacts.

The test results for soils will therefore be assessed against the available Health-Based Investigation Levels (HBIL) for Residential 'A' and relevant Ecological Investigation Levels (EIL's).

10.0 Results & Discussion - Contamination

10.1 Summary of Desk Study

The site history records available do not show the use of chemicals onsite. The site has been generally vacant, however the site has been subject to deep filling in the past. The following chemicals and waste may be associated with the filling material placed, potential past demolition of sheds and access routes since 2005.

- Possible asbestos contamination in crushed rock/ recycled products associated with construction access routes.

- Contamination such as heavy metals, hydrocarbons and asbestos associated with any imported fill.

- Possible asbestos from demolition of old sheds and cottages.

In general, there is assessed to be a low risk of potential contamination as there was no evidence of the above possible contaminants.

10.2 Borehole Logs & Visual Assessment

During the site inspection carried out on 1 June 2015 by NG staff, there was no visible staining of soil surfaces. The eastern corner of the shipping container comprised some timber and also an old oil container (10L) sitting on the timer. There were no signs of oil/petroleum leakage in and around that area, however a surface sample was collected from the soil directly beneath the oil container (SS1) and tested for hydrocarbons and heavy metals.

A small stockpile comprising concrete pieces and some scrap metal was located near the mid-section of the northern boundary. A surface soil sample was collected immediately downslope of the stockpile (SS2) and tested for heavy metals.

Samples recovered from boreholes did not have any obvious odours and discolouration.

10.3 Analytical Test Results

Tests were carried out on discrete soil samples collected mainly from areas assessed to have a risk of contamination. The results are discussed below:

10.3.1 Metals

Five soil samples (including the two surface samples) were tested for heavy metals and the results were all below the assessment criteria for health based guidelines for Residential 'A'.

Heavy metal concentrations were also compared against the relevant Environmental Investigation Levels (EIL's) and exceeded Zinc threshold level of 220mg/kg in one soil sample BH5 (0.1)m, recording a value of 260mg/kg. This minor exceedance can be ignored as the background levels of Zinc for soils in Kiama (volcanic soil) tend to be higher than that of soils elsewhere in the region.

10.3.2 Polynuclear Aromatic Hydrocarbon

One soil sample wwa tested for PAH compounds and the results were below the laboratory detection levels.

10.3.3 Total Recoverable Hydrocarbons/ BTEX

One sample was tested for TRH/ BTEX and the results were below the laboratory detection levels.

10.3.4 OC/OP Pesticides

One shallow depth sample was tested for Organochloride & Organophosphorus Pesticides and the results were below the laboratory detection levels.

10.3.5 Asbestos

One shallow depth sample was tested for asbestos and no asbestos was detected in the soil samples.

11.0 Geotechnical Aspects

11.1 Laboratory Test Results

Laboratory field moisture content test results on three samples ranged from 36.5% to 46.3%. Based on the above and Table 4 Laboratory Test Results, it is assessed the gravelly clay fill to be highly reactive. The laboratory results are included in *Appendix D* and are summarised as follows:

Table 9 Laboratory Test Results

Borehole No/ Depth (m)	Soil Description / Origin	LL (%)	PL (%)	PI (%)	LS (%)	FMC (%)
BH1 (4.0-4.5)	Sandy CLAY, pale brown	-	-	-	-	40.2
BH2 (0.7-1.2)	Gravelly CLAY, brown	63	26	37	16.5	36.5
BH6 (2.5-3.0)	CLAY, brown/grey	-	-	-	-	46.3

Note: LL (Liquid Limit), PL (Plastic Limit), PI (Plastic Index), FMC % (Field Moisture Content), LS (Linear Shrinkage), SO_4 (Sulphate), Cl (Chloride), pH (Power of Hydrogen)

Based on the test results a Shrink-Swell Index of 4.0% is assigned for gravelly CLAY fill. The fill is generally described as high plasticity Gravelly CLAY and is assessed to not meet conventional engineered or controlled fill requirements. However in the location of the drilled boreholes, Dynamic Cone Penetrometer (DCP) tests carried out indicated firm to stiff consistency and becoming very stiff below 2.5m depth.

There were some latite boulders present within the fill material and concrete pieces were also encountered in BH5 at about 2.5m – 2.8m depth.

11.2 Interim AS2870 Classification

Due to the underlying fill deemed to be uncontrolled, in the absence of records to the contrary, the site is assessed as Class P in accordance with AS2870-2011 Residential Slabs and Footings. Footings should be designed based on engineering principals using parameters discussed below. Footing design should be carried out in accordance with engineering principles.

It is recommended that further drilling investigation be carried out for the final geotechnical report, targeting depth of natural soils and level of bedrock.

The classifications and recommendations presented in this report are provided on the basis that the performance expectations set out in Appendix B of AS2870-2011 are acceptable and that future site maintenance complies with CSIRO Sheet BTF-18, a copy of which is attached in Appendix A. In particular, the site should be maintained in stable moisture conditions by providing adequate drainage.

11.3 Geochemical Properties

One soil sample was subjected to geochemical testing at SGS Laboratory in Alexandria as described below:

- Soil pH
- Soil Conductivity
- Chloride
- Sulphate (SO_4)

The results obtained are shown below in table 5.

Table 5 - Geochemical Results

Borehole Number/ Depth (m)	Electrical Conductivity (µS/cm)	pH	Sulphate Content (mg/kg)	Chloride Content (mg/kg)
BH1 (1.5)	63	5.1	36	10

The results obtained are discussed below:

Soil pH

Soil pH for one sample was 5.1 which makes the soil Mild in accordance with AS2159-2009 Piling for Exposure classification for concrete structures in contact with soil. The exposure classification in accordance with AS2870-2011 would likely be A1 or A2.

Electrical Conductivity

Electrical Conductivity for one sample was 0.063 dS/m which for heavy clay present on site makes the soil non-saline.

Chloride Content

The Chloride content in the soil was 10mg/kg (ppm). AS2159 indicates chloride content up to 5000ppm to be non aggressive to steel elements in ground.

Sulphates Content

The Sulphates content assessed as SO_4 was 36mg/kg, which is well below the 5000ppm indicated in AS2159-2009 for non aggressive soils for concrete members.

12.0 Conclusion

Based on the desk study, field investigation and laboratory tests the following conclusions are made:

- Based on Aerial Photographs and title records, the site has been generally vacant.

- There may have been sheds and other structures which may have been removed in the past. While no records have been found in the documents reviewed based on the land use, it is possible that debris from past demolition to be buried on site. It is not uncommon that such areas to contain asbestos.

- There may be buried domestic and construction waste on site.

- The limited tests carried out for contamination, did not indicate any soil contamination in the areas tested, however based on the heterogeneity nature of the fill, there may be isolated sections that may contain contamination.

Based on the above the risk of site contamination is assessed to be low and hence a Stage 2 Contamination Assessment is not required for the proposed re-zoning. Any contamination that may be found is likely to be localised and can be remediated during normal earthworks. The site is suitable for the proposed rezoning. It is noted that the fill material on-site would need to be subject to further testing, if removed from site.

Due to the underlying fill deemed to be uncontrolled, in the absence of records to the contrary, the site is assessed as Class P in accordance with AS2870-2011 Residential Slabs and Footings. It is recommended that further drilling investigation be carried out for the final geotechnical report, targeting depth of natural soils and level of bedrock.

13.0 Limitations

This report has been prepared for SET Consultants in accordance with NG's proposal dated 30 April 2015 (Ref. G09/1746) under NG's Terms of Engagement.

The report is provided for the exclusive use of SET Consultants for the specific development and purpose as described in the report. The report may not contain sufficient information for developments or purposes other than that described in the report or for parties other than SET Consultants.

The information in this report is considered accurate at the date of issue with regard to the current conditions of the site. The conclusions drawn in the report are based on interpolation between boreholes or test pits. Conditions can vary between test locations that cannot be explicitly defined or inferred by investigation.

The report, or sections of the report, should not be used as part of a specification for a project, without review and agreement by NG, as the report has been written as advice and opinion rather than instructions for construction.

The report must be read in conjunction with the attached Information Sheets and any other explanatory notes and should be kept in its entirety without separation of individual pages or sections. NG cannot be held responsible for interpretations or conclusions from review by others of this report or test data, which are not otherwise supported by an expressed statement, interpretation, outcome or conclusion stated in this report. In preparing the report NG has necessarily relied upon information provided by the client and/or their agents.

Appendix A

Information Sheets

General Notes About This Report

INTRODUCTION

These notes have been prepared by Network Geotechnics Pty Ltd (NG) to help our Clients interpret and understand the limitations of this report. Not all sections below are necessarily relevant to all reports.

SCOPE OF SERVICES

This report has been prepared in accordance with the scope of services set out in NG's proposal under NG's Terms of Engagement, or as otherwise agreed with the Client. The scope of work may have been limited by a range of factors including time, budget, access and/or site constraints.

RELIANCE ON INFORMATION PROVIDED

In preparing the report NG has necessarily relied upon information provided by the Client and/or their Agents. Such data may include surveys, analyses, designs, maps and plans. NG has not verified the accuracy or completeness of the data except as stated in this report.

GEOTECHNICAL AND ENVIRONMENTAL REPORTING

Geotechnical and environmental reporting relies on the interpretation of factual information based on judgment and opinion and is far less exact than other engineering or design disciplines.

Geotechnical and environmental reports are for a specific purpose, development and site as described in the report and may not contain sufficient information for other purposes, developments or sites (including adjacent sites) other than that described in the report.

SUBSURFACE CONDITIONS

Subsurface conditions can change with time and can vary between test locations. For example, the actual interface between the materials may be far more gradual or abrupt than indicated and contaminant presence may be affected by spatial and temporal patterns.

Therefore, actual conditions in areas not sampled may differ from those predicted since no subsurface investigation, no matter how comprehensive, can reveal all subsurface details and anomalies.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations can also affect subsurface conditions and thus the continuing adequacy of a geotechnical report. NG should be kept informed of any such events and should be retained to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

GROUNDWATER

Groundwater levels indicated on borehole and test pit logs are recorded at specific times. Depending on ground permeability, measured levels may or may not reflect actual levels if measured over a longer time period. Also, groundwater levels and seepage inflows may fluctuate with seasonal and environmental variations and construction activities.

INTERPRETATION OF DATA

Data obtained from nominated discrete locations, subsequent laboratory testing and empirical or external sources are interpreted by trained professionals in order to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions in accordance with any relevant industry standards, guidelines or procedures.

SOIL AND ROCK DESCRIPTIONS

Soil and rock descriptions are based on AS 1726 – 1993, using visual and tactile assessment except at discrete locations where field and / or laboratory tests have been carried out. Refer to the accompanying soil and rock terms sheet for further information.

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FURTHER ADVICE

NG would be pleased to further discuss how any of the above issues could affect a specific project. We would also be pleased to provide further advice or assistance including:

- Assessment of suitability of designs and construction techniques;
- Contract documentation and specification;
- Construction control testing (earthworks, pavement materials, concrete);
- Construction advice (foundation assessments, excavation support).

Abbreviations, Notes & Symbols

SUBSURFACE INVESTIGATION

METHOD

Borehole Logs		Excavation Logs	
AS#	Auger screwing (#-bit)	BH	Backhoe/excavator bucket
AD#	Auger drilling (#-bit)	NE	Natural exposure
B	Blank bit	HE	Hand excavation
V	V-bit	X	Existing excavation
T	TC-bit		
HA	Hand auger	**Cored Borehole Logs**	
R	Roller/tricone	NMLC	NMLC core drilling
W	Washbore	NQ/HQ	Wireline core drilling
AH	Air hammer		
AT	Air track		
LB	Light bore push tube		
MC	Macro core push tube		
DT	Dual core push tube		

SUPPORT

Borehole Logs		Excavation Logs	
C	Casing	S	Shoring
M	Mud	B	Benched

SAMPLING

B	Bulk sample
D	Disturbed sample
U#	Thin-walled tube sample (#mm diameter)
ES	Environmental sample
EW	Environmental water sample

FIELD TESTING

PP	Pocket penetrometer (kPa)
DCP	Dynamic cone penetrometer
PSP	Perth sand penetrometer
SPT	Standard penetration test
PBT	Plate bearing test
s_U	Vane shear strength peak/residual (kPa) and vane size (mm)
N*	SPT (blows per 300mm)
Nc	SPT with solid cone
R	Refusal

**denotes sample taken*

BOUNDARIES

——— Known

– – – – Probable

..... Possible

SOIL

MOISTURE CONDITION

D	Dry
M	Moist
W	Wet
Wp	Plastic Limit
Wl	Liquid Limit
MC	Moisture Content

CONSISTENCY		DENSITY INDEX	
VS	Very Soft	VL	Very Loose
S	Soft	L	Loose
F	Firm	MD	Medium Dense
St	Stiff	D	Dense
VSt	Very Stiff	VD	Very Dense
H	Hard		
Fb	Friable		

USCS SYMBOLS

GW	Well graded gravels and gravel-sand mixtures, little or no fines
GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
GM	Silty gravels, gravel-sand-silt mixtures
GC	Clayey gravels, gravel-sand-clay mixtures
SW	Well graded sands and gravelly sands, little or no fines
SP	Poorly graded sands and gravelly sands, little or no fines
SM	Silty sand, sand-silt mixtures
SC	Clayey sand, sand-clay mixtures
ML	Inorganic silts of low plasticity, very fine sands, rock flour, silty or clayey fine sands
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays
OL	Organic silts and organic silty clays of low plasticity
MH	Inorganic silts of high plasticity
CH	Inorganic clays of high plasticity
OH	Organic clays of medium to high plasticity
PT	Peat muck and other highly organic soils

ROCK

WEATHERING		STRENGTH	
RS	Residual Soil	EL	Extremely Low
XW	Extremely Weathered	VL	Very Low
HW	Highly Weathered	L	Low
MW	Moderately Weathered	M	Medium
DW*	Distinctly Weathered	H	High
SW	Slightly Weathered	VH	Very High
FR	Fresh	EH	Extremely High

**covers both HW & MW*

ROCK QUALITY DESIGNATION (%)

$$= \frac{\text{sum of intact core pieces} > 100\text{mm}}{\text{total length of section being evaluated}} \times 100$$

CORE RECOVERY (%)

$$= \frac{\text{core recovered}}{\text{core lIft}} \times 100$$

NATURAL FRACTURES

Type

JT	Joint
BP	Bedding plane
SM	Seam
FZ	Fractured zone
SZ	Shear zone
VN	Vein

Infill or Coating

Cn	Clean
St	Stained
Vn	Veneer
Co	Coating
Cl	Clay
Ca	Calcite
Fe	Iron oxide
Mi	Micaceous
Qz	Quartz

Shape

pl	Planar
cu	Curved
un	Undulose
st	Stepped
ir	Irregular

Roughness

pol	Polished
slk	Slickensided
smo	Smooth
rou	Rough

Soil & Rock Terms

SOIL

MOISTURE CONDITION

Term	Description
Dry	Looks and feels dry. Cohesive and cemented soils are hard, friable or powdery. Uncemented granular soils run freely through the hand.
Moist	Feels cool and darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.
Wet	As for moist, but with free water forming on hands when handled.

For cohesive soils, moisture content may also be described in relation to plastic limit (W_P) or liquid limit (W_L). [>> much greater than, > greater than, < less than, << much less than].

CONSISTENCY

Term	c_u (kPa)	Term	c_u (kPa)
Very Soft	< 12	Very Stiff	100 - 200
Soft	12 - 25	Hard	> 200
Firm	25 - 50	Friable	-
Stiff	50 - 100		

DENSITY INDEX

Term	I_D (%)	Term	I_D (%)
Very Loose	< 15	Dense	65 – 85
Loose	15 – 35	Very Dense	> 85
Medium Dense	35 – 65		

PARTICLE SIZE

Name	Subdivision	Size (mm)
Boulders		> 200
Cobbles		63 - 200
Gravel	coarse	20 - 63
	medium	6 - 20
	fine	2.36 - 6
Sand	coarse	0.6 - 2.36
	medium	0.2 - 0.6
	fine	0.075 - 0.2
Silt & Clay		< 0.075

MINOR COMPONENTS

Term	Proportion by Mass coarse grained	fine grained
Trace	≤ 5%	≤ 15%
Some	5 - 2%	15 - 30%

SOIL ZONING

Layers	Continuous exposures
Lenses	Discontinuous layers of lenticular shape
Pockets	Irregular inclusions of different material

SOIL CEMENTING

Weakly	Easily broken up by hand
Moderately	Effort is required to break up the soil by hand

SOIL STRUCTURE

Massive	Coherent, with any partings both vertically and horizontally spaced at greater than 100mm
Weak	Peds indistinct and barely observable on pit face. When disturbed approx. 30% consist of peds smaller than 100mm
Strong	Peds are quite distinct in undisturbed soil. When disturbed >60% consists of peds smaller than 100mm

ROCK

SEDIMENTARY ROCK TYPE DEFINITIONS

Rock Type	Definition (more than 50% of rock consists of….)
Conglomerate	… gravel sized (> 2mm) fragments
Sandstone	… sand sized (0.06 to 2mm) grains
Siltstone	… silt sized (<0.06mm) particles, rock is not laminated
Claystone	… clay, rock is not laminated
Shale	… silt or clay sized particles, rock is laminated

STRENGTH

Term	Is50 (MPa)	Term	Is50 (MPa)
Extremely Low	< 0.03	High	1 – 3
Very Low	0.03 – 0.1	Very High	3 – 10
Low	0.1 – 0.3	Extremely High	> 10
Medium	0.3 – 1		

WEATHERING

Term	Description
Residual Soil	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident
Extremely Weathered	Rock is weathered to such an extent that it has 'soil' properties, i.e. it either disintegrates or can be remoulded, in water. Fabric of original rock is still visible
Highly Weathered	Rock strength usually highly changed by weathering; rock may be highly discoloured
Moderately Weathered	Rock strength usually moderately changed by weathering; rock may be moderately discoloured
Distinctly Weathered	See 'Highly Weathered' or 'Moderately Weathered'
Slightly Weathered	Rock is slightly discoloured but shows little or no change of strength from fresh rock
Fresh	Rock shows no signs of decomposition or staining

NATURAL FRACTURES

Type	Description
Joint	A discontinuity or crack across which the rock has little or no tensile strength. May be open or closed
Bedding plane	Arrangement in layers of mineral grains of similar sizes or composition
Seam	Seam with deposited soil (infill), extremely weathered insitu rock (XW), or disoriented usually angular fragments of the host rock (crushed)
Shear zone	Zone with roughly parallel planar boundaries, of rock material intersected by closely spaced (generally < 50mm) joints and /or microscopic fracture (cleavage) planes
Vein	Intrusion of any shape dissimilar to the adjoining rock mass. Usually igneous

Shape	Description
Planar	Consistent orientation
Curved	Gradual change in orientation
Undulose	Wavy surface
Stepped	One or more well defined steps
Irregular	Many sharp changes in orientation

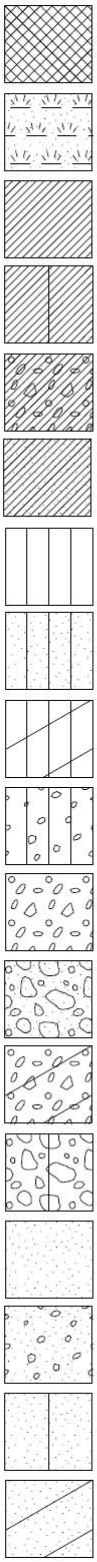
Infill or Coating	Description
Clean	No visible coating or discolouring
Stained	No visible coating but surfaces are discoloured
Veneer	A visible coating of soil or mineral, too thin to measure; may be patchy
Coating	Visible coating ≤ 1mm thick. Ticker soil material described as seam

Roughness	Description
Polished	Shiny smooth surface
Slickensided	Grooved or striated surface, usually polished
Smooth	Smooth to touch. Few or no surface irregularities
Rough	Many small surface irregularities (amplitude generally < 1mm). Feels like fine to coarse sandpaper

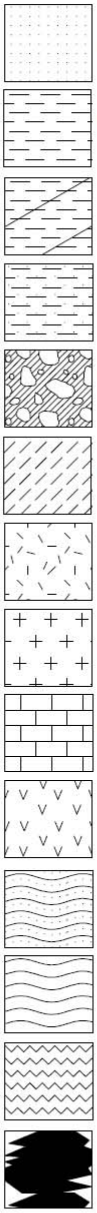
Note: soil and rock descriptions are generally in accordance with AS1726-1993 Geotechnical Site Investigations

Graphic Symbols Index

Soil



Rock



Other

Water Measurements

Foundation Maintenance and Footing Performance:
A Homeowner's Guide

CSIRO

BTF 18 replaces Information Sheet 10/91

Buildings can and often do move. This movement can be up, down, lateral or rotational. The fundamental cause of movement in buildings can usually be related to one or more problems in the foundation soil. It is important for the homeowner to identify the soil type in order to ascertain the measures that should be put in place in order to ensure that problems in the foundation soil can be prevented, thus protecting against building movement.

This Building Technology File is designed to identify causes of soil-related building movement, and to suggest methods of prevention of resultant cracking in buildings.

Soil Types

The types of soils usually present under the topsoil in land zoned for residential buildings can be split into two approximate groups – granular and clay. Quite often, foundation soil is a mixture of both types. The general problems associated with soils having granular content are usually caused by erosion. Clay soils are subject to saturation and swell/shrink problems.

Classifications for a given area can generally be obtained by application to the local authority, but these are sometimes unreliable and if there is doubt, a geotechnical report should be commissioned. As most buildings suffering movement problems are founded on clay soils, there is an emphasis on classification of soils according to the amount of swell and shrinkage they experience with variations of water content. The table below is Table 2.1 from AS 2870, the Residential Slab and Footing Code.

Causes of Movement

Settlement due to construction
There are two types of settlement that occur as a result of construction:

- Immediate settlement occurs when a building is first placed on its foundation soil, as a result of compaction of the soil under the weight of the structure. The cohesive quality of clay soil mitigates against this, but granular (particularly sandy) soil is susceptible.
- Consolidation settlement is a feature of clay soil and may take place because of the expulsion of moisture from the soil or because of the soil's lack of resistance to local compressive or shear stresses. This will usually take place during the first few months after construction, but has been known to take many years in exceptional cases.

These problems are the province of the builder and should be taken into consideration as part of the preparation of the site for construction. Building Technology File 19 (BTF 19) deals with these problems.

Erosion
All soils are prone to erosion, but sandy soil is particularly susceptible to being washed away. Even clay with a sand component of say 10% or more can suffer from erosion.

Saturation
This is particularly a problem in clay soils. Saturation creates a bog-like suspension of the soil that causes it to lose virtually all of its bearing capacity. To a lesser degree, sand is affected by saturation because saturated sand may undergo a reduction in volume – particularly imported sand fill for bedding and blinding layers. However, this usually occurs as immediate settlement and should normally be the province of the builder.

Seasonal swelling and shrinkage of soil
All clays react to the presence of water by slowly absorbing it, making the soil increase in volume (see table below). The degree of increase varies considerably between different clays, as does the degree of decrease during the subsequent drying out caused by fair weather periods. Because of the low absorption and expulsion rate, this phenomenon will not usually be noticeable unless there are prolonged rainy or dry periods, usually of weeks or months, depending on the land and soil characteristics.

The swelling of soil creates an upward force on the footings of the building, and shrinkage creates subsidence that takes away the support needed by the footing to retain equilibrium.

Shear failure
This phenomenon occurs when the foundation soil does not have sufficient strength to support the weight of the footing. There are two major post-construction causes:

- Significant load increase.
- Reduction of lateral support of the soil under the footing due to erosion or excavation.
- In clay soil, shear failure can be caused by saturation of the soil adjacent to or under the footing.

GENERAL DEFINITIONS OF SITE CLASSES

Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture changes
S	Slightly reactive clay sites with only slight ground movement from moisture changes
M	Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes
H	Highly reactive clay sites, which can experience high ground movement from moisture changes
E	Extremely reactive sites, which can experience extreme ground movement from moisture changes
A to P	Filled sites
P	Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise

Tree root growth

Trees and shrubs that are allowed to grow in the vicinity of footings can cause foundation soil movement in two ways:

- Roots that grow under footings may increase in cross-sectional size, exerting upward pressure on footings.
- Roots in the vicinity of footings will absorb much of the moisture in the foundation soil, causing shrinkage or subsidence.

Unevenness of Movement

The types of ground movement described above usually occur unevenly throughout the building's foundation soil. Settlement due to construction tends to be uneven because of:

- Differing compaction of foundation soil prior to construction.
- Differing moisture content of foundation soil prior to construction.

Movement due to non-construction causes is usually more uneven still. Erosion can undermine a footing that traverses the flow or can create the conditions for shear failure by eroding soil adjacent to a footing that runs in the same direction as the flow.

Saturation of clay foundation soil may occur where subfloor walls create a dam that makes water pond. It can also occur wherever there is a source of water near footings in clay soil. This leads to a severe reduction in the strength of the soil which may create local shear failure.

Seasonal swelling and shrinkage of clay soil affects the perimeter of the building first, then gradually spreads to the interior. The swelling process will usually begin at the uphill extreme of the building, or on the weather side where the land is flat. Swelling gradually reaches the interior soil as absorption continues. Shrinkage usually begins where the sun's heat is greatest.

Effects of Uneven Soil Movement on Structures

Erosion and saturation

Erosion removes the support from under footings, tending to create subsidence of the part of the structure under which it occurs. Brickwork walls will resist the stress created by this removal of support by bridging the gap or cantilevering until the bricks or the mortar bedding fail. Older masonry has little resistance. Evidence of failure varies according to circumstances and symptoms may include:

- Step cracking in the mortar beds in the body of the wall or above/below openings such as doors or windows.
- Vertical cracking in the bricks (usually but not necessarily in line with the vertical beds or perpends).

Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

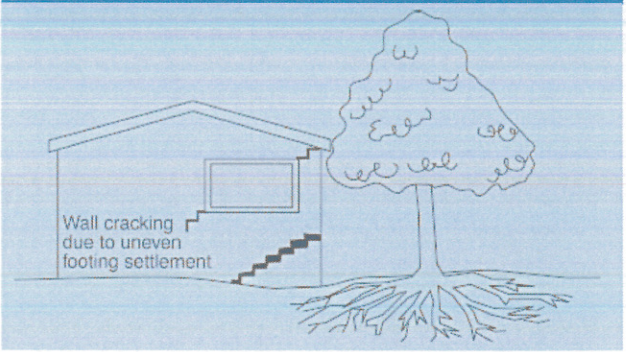
Seasonal swelling/shrinkage in clay

Swelling foundation soil due to rainy periods first lifts the most exposed extremities of the footing system, then the remainder of the perimeter footings while gradually permeating inside the building footprint to lift internal footings. This swelling first tends to create a dish effect, because the external footings are pushed higher than the internal ones.

The first noticeable symptom may be that the floor appears slightly dished. This is often accompanied by some doors binding on the floor or the door head, together with some cracking of cornice mitres. In buildings with timber flooring supported by bearers and joists, the floor can be bouncy. Externally there may be visible dishing of the hip or ridge lines.

As the moisture absorption process completes its journey to the innermost areas of the building, the internal footings will rise. If the spread of moisture is roughly even, it may be that the symptoms will temporarily disappear, but it is more likely that swelling will be uneven, creating a difference rather than a disappearance in symptoms. In buildings with timber flooring supported by bearers and joists, the isolated piers will rise more easily than the strip footings or piers under walls, creating noticeable doming of flooring.

Trees can cause shrinkage and damage



As the weather pattern changes and the soil begins to dry out, the external footings will be first affected, beginning with the locations where the sun's effect is strongest. This has the effect of lowering the external footings. The doming is accentuated and cracking reduces or disappears where it occurred because of dishing, but other cracks open up. The roof lines may become convex.

Doming and dishing are also affected by weather in other ways. In areas where warm, wet summers and cooler dry winters prevail, water migration tends to be toward the interior and doming will be accentuated, whereas where summers are dry and winters are cold and wet, migration tends to be toward the exterior and the underlying propensity is toward dishing.

Movement caused by tree roots

In general, growing roots will exert an upward pressure on footings, whereas soil subject to drying because of tree or shrub roots will tend to remove support from under footings by inducing shrinkage.

Complications caused by the structure itself

Most forces that the soil causes to be exerted on structures are vertical – i.e. either up or down. However, because these forces are seldom spread evenly around the footings, and because the building resists uneven movement because of its rigidity, forces are exerted from one part of the building to another. The net result of all these forces is usually rotational. This resultant force often complicates the diagnosis because the visible symptoms do not simply reflect the original cause. A common symptom is binding of doors on the vertical member of the frame.

Effects on full masonry structures

Brickwork will resist cracking where it can. It will attempt to span areas that lose support because of subsided foundations or raised points. It is therefore usual to see cracking at weak points, such as openings for windows or doors.

In the event of construction settlement, cracking will usually remain unchanged after the process of settlement has ceased.

With local shear or erosion, cracking will usually continue to develop until the original cause has been remedied, or until the subsidence has completely neutralised the affected portion of footing and the structure has stabilised on other footings that remain effective.

In the case of swell/shrink effects, the brickwork will in some cases return to its original position after completion of a cycle, however it is more likely that the rotational effect will not be exactly reversed, and it is also usual that brickwork will settle in its new position and will resist the forces trying to return it to its original position. This means that in a case where swelling takes place after construction and cracking occurs, the cracking is likely to at least partly remain after the shrink segment of the cycle is complete. Thus, each time the cycle is repeated, the likelihood is that the cracking will become wider until the sections of brickwork become virtually independent.

With repeated cycles, once the cracking is established, if there is no other complication, it is normal for the incidence of cracking to stabilise, as the building has the articulation it needs to cope with the problem. This is by no means always the case, however, and monitoring of cracks in walls and floors should always be treated seriously.

Upheaval caused by growth of tree roots under footings is not a simple vertical shear stress. There is a tendency for the root to also exert lateral forces that attempt to separate sections of brickwork after initial cracking has occurred.

The normal structural arrangement is that the inner leaf of brickwork in the external walls and at least some of the internal walls (depending on the roof type) comprise the load-bearing structure on which any upper floors, ceilings and the roof are supported. In these cases, it is internally visible cracking that should be the main focus of attention, however there are a few examples of dwellings whose external leaf of masonry plays some supporting role, so this should be checked if there is any doubt. In any case, externally visible cracking is important as a guide to stresses on the structure generally, and it should also be remembered that the external walls must be capable of supporting themselves.

Effects on framed structures
Timber or steel framed buildings are less likely to exhibit cracking due to swell/shrink than masonry buildings because of their flexibility. Also, the doming/dishing effects tend to be lower because of the lighter weight of walls. The main risks to framed buildings are encountered because of the isolated pier footings used under walls. Where erosion or saturation cause a footing to fall away, this can double the span which a wall must bridge. This additional stress can create cracking in wall linings, particularly where there is a weak point in the structure caused by a door or window opening. It is, however, unlikely that framed structures will be so stressed as to suffer serious damage without first exhibiting some or all of the above symptoms for a considerable period. The same warning period should apply in the case of upheaval. It should be noted, however, that where framed buildings are supported by strip footings there is only one leaf of brickwork and therefore the externally visible walls are the supporting structure for the building. In this case, the subfloor masonry walls can be expected to behave as full brickwork walls.

Effects on brick veneer structures
Because the load-bearing structure of a brick veneer building is the frame that makes up the interior leaf of the external walls plus perhaps the internal walls, depending on the type of roof, the building can be expected to behave as a framed structure, except that the external masonry will behave in a similar way to the external leaf of a full masonry structure.

Water Service and Drainage

Where a water service pipe, a sewer or stormwater drainage pipe is in the vicinity of a building, a water leak can cause erosion, swelling or saturation of susceptible soil. Even a minuscule leak can be enough to saturate a clay foundation. A leaking tap near a building can have the same effect. In addition, trenches containing pipes can become watercourses even though backfilled, particularly where broken rubble is used as fill. Water that runs along these trenches can be responsible for serious erosion, interstrata seepage into subfloor areas and saturation.

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem.
Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

- Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.
- Corroded guttering or downpipes can spill water to ground.
- Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C1 of AS 2870.

AS 2870 also publishes figures relating to cracking in concrete floors, however because wall cracking will usually reach the critical point significantly earlier than cracking in slabs, this table is not reproduced here.

Prevention/Cure

Plumbing
Where building movement is caused by water service, roof plumbing, sewer or stormwater failure, the remedy is to repair the problem. It is prudent, however, to consider also rerouting pipes away from the building where possible, and relocating taps to positions where any leakage will not direct water to the building vicinity. Even where gully traps are present, there is sometimes sufficient spill to create erosion or saturation, particularly in modern installations using smaller diameter PVC fixtures. Indeed, some gully traps are not situated directly under the taps that are installed to charge them, with the result that water from the tap may enter the backfilled trench that houses the sewer piping. If the trench has been poorly backfilled, the water will either pond or flow along the bottom of the trench. As these trenches usually run alongside the footings and can be at a similar depth, it is not hard to see how any water that is thus directed into a trench can easily affect the foundation's ability to support footings or even gain entry to the subfloor area.

Ground drainage
In all soils there is the capacity for water to travel on the surface and below it. Surface water flows can be established by inspection during and after heavy or prolonged rain. If necessary, a grated drain system connected to the stormwater collection system is usually an easy solution.

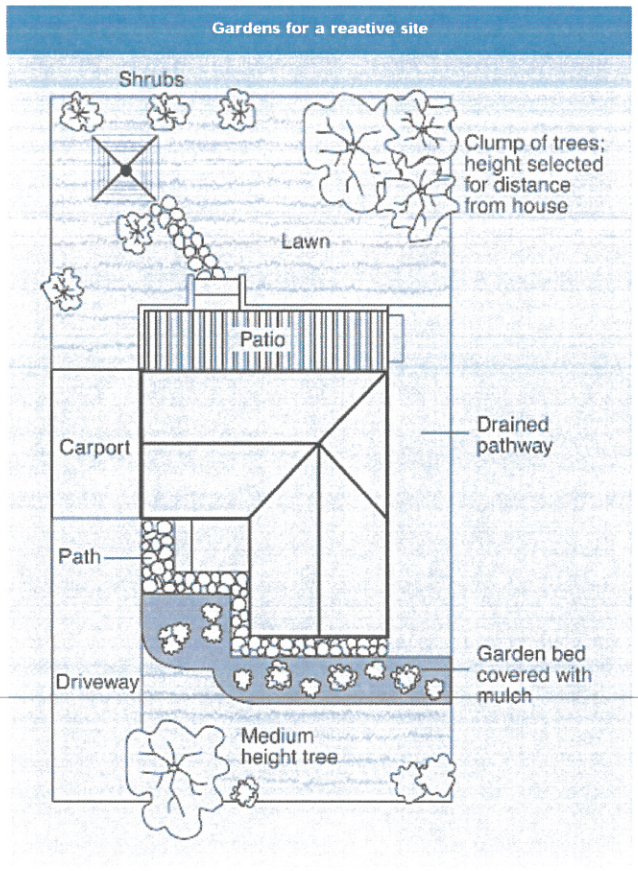
It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

Protection of the building perimeter
It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

For this reason, particularly where problems exist or are likely to occur, it is recommended that an apron of paving be installed around as much of the building perimeter as necessary. This paving

CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS

Description of typical damage and required repair	Approximate crack width limit (see Note 3)	Damage category
Hairline cracks	<0.1 mm	0
Fine cracks which do not need repair	<1 mm	1
Cracks noticeable but easily filled. Doors and windows stick slightly	<5 mm	2
Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired	5–15 mm (or a number of cracks 3 mm or more in one group)	3
Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted	15–25 mm but also depend on number of cracks	4



should extend outwards a minimum of 900 mm (more in highly reactive soil) and should have a minimum fall away from the building of 1:60. The finished paving should be no less than 100 mm below brick vent bases.

It is prudent to relocate drainage pipes away from this paving, if possible, to avoid complications from future leakage. If this is not practical, earthenware pipes should be replaced by PVC and backfilling should be of the same soil type as the surrounding soil and compacted to the same density.

Except in areas where freezing of water is an issue, it is wise to remove taps in the building area and relocate them well away from the building – preferably not uphill from it (see BTF 19).

It may be desirable to install a grated drain at the outside edge of the paving on the uphill side of the building. If subsoil drainage is needed this can be installed under the surface drain.

Condensation

In buildings with a subfloor void such as where bearers and joists support flooring, insufficient ventilation creates ideal conditions for condensation, particularly where there is little clearance between the floor and the ground. Condensation adds to the moisture already present in the subfloor and significantly slows the process of drying out. Installation of an adequate subfloor ventilation system, either natural or mechanical, is desirable.

Warning: Although this Building Technology File deals with cracking in buildings, it should be said that subfloor moisture can result in the development of other problems, notably:

- Water that is transmitted into masonry, metal or timber building elements causes damage and/or decay to those elements.
- High subfloor humidity and moisture content create an ideal environment for various pests, including termites and spiders.
- Where high moisture levels are transmitted to the flooring and walls, an increase in the dust mite count can ensue within the living areas. Dust mites, as well as dampness in general, can be a health hazard to inhabitants, particularly those who are abnormally susceptible to respiratory ailments.

The garden

The ideal vegetation layout is to have lawn or plants that require only light watering immediately adjacent to the drainage or paving edge, then more demanding plants, shrubs and trees spread out in that order.

Overwatering due to misuse of automatic watering systems is a common cause of saturation and water migration under footings. If it is necessary to use these systems, it is important to remove garden beds to a completely safe distance from buildings.

Existing trees

Where a tree is causing a problem of soil drying or there is the existence or threat of upheaval of footings, if the offending roots are subsidiary and their removal will not significantly damage the tree, they should be severed and a concrete or metal barrier placed vertically in the soil to prevent future root growth in the direction of the building. If it is not possible to remove the relevant roots without damage to the tree, an application to remove the tree should be made to the local authority. A prudent plan is to transplant likely offenders before they become a problem.

Information on trees, plants and shrubs

State departments overseeing agriculture can give information regarding root patterns, volume of water needed and safe distance from buildings of most species. Botanic gardens are also sources of information. For information on plant roots and drains, see Building Technology File 17.

Excavation

Excavation around footings must be properly engineered. Soil supporting footings can only be safely excavated at an angle that allows the soil under the footing to remain stable. This angle is called the angle of repose (or friction) and varies significantly between soil types and conditions. Removal of soil within the angle of repose will cause subsidence.

Remediation

Where erosion has occurred that has washed away soil adjacent to footings, soil of the same classification should be introduced and compacted to the same density. Where footings have been undermined, augmentation or other specialist work may be required. Remediation of footings and foundations is generally the realm of a specialist consultant.

Where isolated footings rise and fall because of swell/shrink effect, the homeowner may be tempted to alleviate floor bounce by filling the gap that has appeared between the bearer and the pier with blocking. The danger here is that when the next swell segment of the cycle occurs, the extra blocking will push the floor up into an accentuated dome and may also cause local shear failure in the soil. If it is necessary to use blocking, it should be by a pair of fine wedges and monitoring should be carried out fortnightly.

This BTF was prepared by John Lewer FAIB, MIAMA, Partner, Construction Diagnosis.

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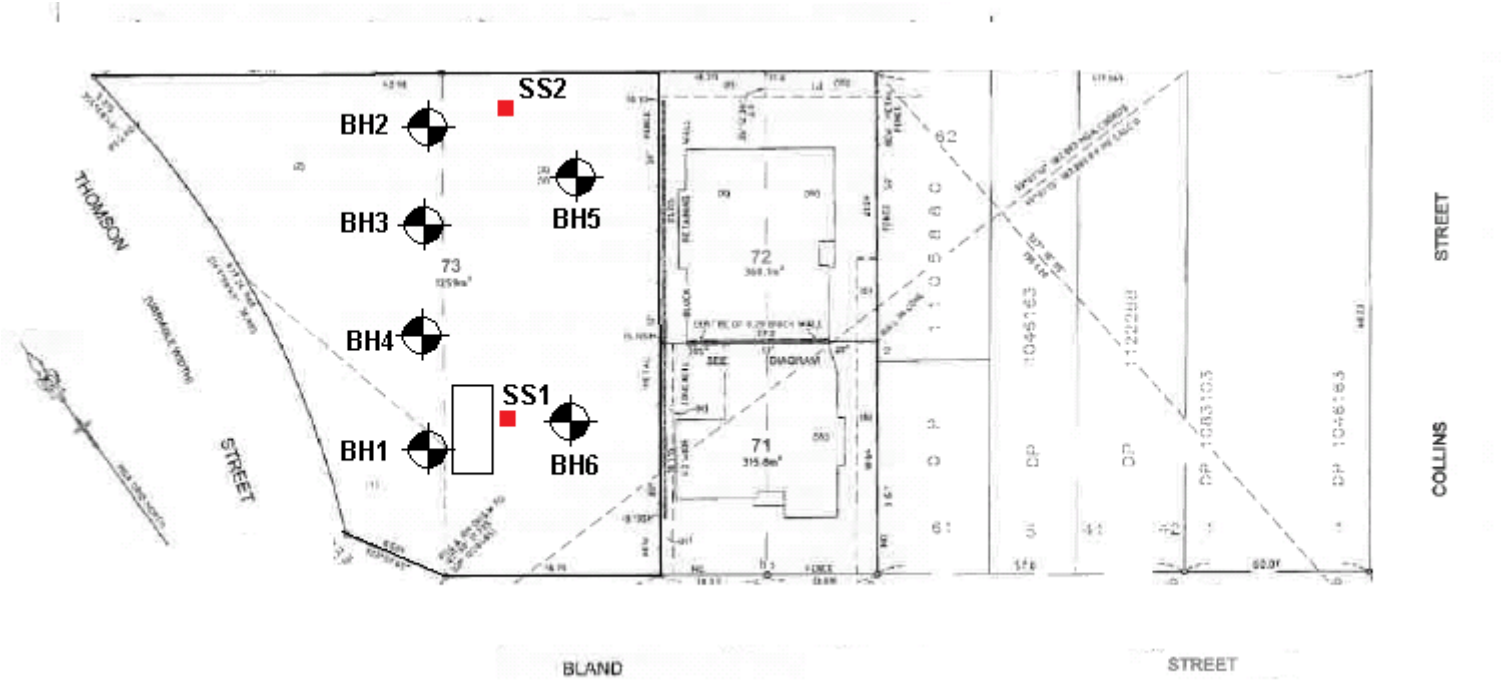
Appendix B

Site Plan and Test Locations



	LEGEND:	Network Geotechnics Pty Ltd *12/9-15 Gundah Road,* *MT KURING-GAI NSW 2080* *Tel: (02) 8438 0300* *Fax: (02) 8438 0310* *Email: engineering@netgeo.com.au*	Scale: A4 - NOT TO SCALE	Client: SET CONSULTANTS	
⊕	APPROXIMATE BOREHOLE LOCATIONS		Date: 18/06/2015	Project: PROPOSED RE-ZONING	
			Drawing: MA	Location: LOT 73, BLAND STREET, KIAMA	
			Drawing No: G09/1746-1	Sheet: 1 of 1	**SITE PLAN**

Appendix C

Borehole Logs

BOREHOLE LOG

Network Geotechnics Pty Ltd

ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

Job No:	G09/1746
Hole No:	**BH1**
Sheet:	PAGE 1 / 1
Started:	01/06/15
Finished:	01/06/15
Logged:	MA
Checked:	VdS
RL Surface:	
Datum:	

Client: SET Consultants

Project: Proposed Rezoning of Land

Location: Lot 73 Bland St, Kiama
GPS

Equipment Type: Skid Steer Dingo

Borehole Diameter: 100mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
ADV	None Encountered		5 5 7 3 5	1.0		CL/CI	Gravelly CLAY low to medium plasticity, brown	≥Wp	-	FILL
			4 3 7 5 6 6	2.0		CI	Gravelly Sandy CLAY medium plasticity, grey/brown	≥Wp	-	
			8 10 10 12 12	3.0		CI/CH	Sandy CLAY medium plasticity, pale brown, some coarse gravels	≥Wp	-	
			10 15 15 16	4.0			BH1 Terminated at 4.5 m			
				5.0						
				6.0						
				7.0						

BOREHOLE LOG G09-1746 LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 12/06/15

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

BOREHOLE LOG

Network Geotechnics Pty Ltd

ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

Job No:	G09/1746
Hole No:	**BH2**
Sheet:	PAGE 1 / 1
Started:	01/06/15
Finished:	01/06/15
Logged:	MA
Checked:	VdS
RL Surface:	
Datum:	

Client: SET Consultants

Project: Proposed Rezoning of Land

Location: Lot 73 Bland St, Kiama
GPS

Equipment Type: Skid Steer Dingo

Borehole Diameter: 100mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
ADV	None Encountered		11 5 12 10	1.0		CL/CI	Gravelly CLAY low to medium plasticity, brown	-	-	FILL
			7 10 20+	2.0		CI/CH	CLAY medium to high plasticity, brown mottled grey	-	-	
			7 7 8 13 10	3.0						
				4.0		CH	Sandy CLAY high plasticity, pale brown	>Wp	-	
							BH2 Terminated at 4.5 m			
				5.0						
				6.0						
				7.0						

BOREHOLE LOG G09-1746 LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 12/06/15

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

Network Geotechnics Pty Ltd

ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

BOREHOLE LOG

Job No:	G09/1746
Hole No:	**BH3**
Sheet:	PAGE 1 / 1
Started:	01/06/15
Finished:	01/06/15
Logged:	MA
Checked:	VdS
RL Surface:	
Datum:	

Client: SET Consultants

Project: Proposed Rezoning of Land

Location: Lot 73 Bland St, Kiama
GPS

Equipment Type: Skid Steer Dingo

Borehole Diameter: 100mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
ADV	None Encountered		5 20+ 4 4 6 7 5 9 8 12 12	1.0 2.0 3.0		CL/CI	Gravelly CLAY low to medium plasticity, brown, some fine to medium grained sand	-	-	FILL
				4.0 5.0 6.0 7.0			BH3 Terminated at 3 m			

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

BOREHOLE LOG

Network Geotechnics Pty Ltd

ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

Job No:	G09/1746
Hole No:	**BH4**
Sheet:	PAGE 1 / 1
Started:	01/06/15
Finished:	01/06/15
Logged:	MA
Checked:	VdS
RL Surface:	
Datum:	

Client: SET Consultants

Project: Proposed Rezoning of Land

Location: Lot 73 Bland St, Kiama
GPS

Equipment Type: Skid Steer Dingo

Borehole Diameter: 100mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
ADV	None Encountered		3 2 3 5 5 4 7 10 8 15	1.0 2.0		CL/CI	Gravelly CLAY medium plasticity, brown/dark grey, traces of gravels	≤Wp	-	FILL
							BH4 Terminated at 2 m			
				3.0						
				4.0						
				5.0						
				6.0						
				7.0						

BOREHOLE LOG G09-1746 LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 12/06/15

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

BOREHOLE LOG

Network Geotechnics Pty Ltd

ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

Job No:	G09/1746
Hole No:	**BH5**
Sheet:	PAGE 1 / 1
Started:	01/06/15
Finished:	01/06/15
Logged:	MA
Checked:	VdS
RL Surface:	
Datum:	

Client: SET Consultants

Project: Proposed Rezoning of Land

Location: Lot 73 Bland St, Kiama
GPS

Equipment Type: Skid Steer Dingo

Borehole Diameter: 100mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
ADV	None Encountered		1 1 4 5 4 3 7 5 5 8	1.0		CL/CI	Gravelly CLAY medium plasticity, brown/dark grey, traces of gravels	≤Wp	-	FILL
			10 6	2.0		CI/CH	Sandy CLAY medium to high plasticity, brown, traces of crushed latite and concrete	>Wp	-	
			6 20+	3.0			BH5 Terminated at 3 m			
				4.0						
				5.0						
				6.0						
				7.0						

BOREHOLE LOG G09-1746 LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 12/06/15

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

Network Geotechnics Pty Ltd

ACN 069 211 561
12/9-15 Gundah Rd
Mt Kuring-gai, 2080
0284380300

BOREHOLE LOG

Job No:	G09/1746
Hole No:	**BH6**
Sheet:	PAGE 1 / 1
Started:	01/06/15
Finished:	01/06/15
Logged:	MA
Checked:	VdS
RL Surface:	
Datum:	

Client: SET Consultants

Project: Proposed Rezoning of Land

Location: Lot 73 Bland St, Kiama
GPS

Equipment Type: Skid Steer Dingo

Borehole Diameter: 100mm (I.D.) Inclination: Bearing:

method	water	samples, tests etc	DCP Blows per 150 mm	depth (m)	graphic log	USCS symbol	Material Description	Moisture condition	Consistency/ relative density	comments / notes, structure, and additional observations
ADV	None Encountered		10 9 12 5 6 3 5 10 12 15 20+	1.0 2.0		CL/CI	Gravelly CLAY medium plasticity, brown/dark grey, traces of gravels	≤Wp	-	FILL
			10 16 18 13	3.0		CH	CLAY high plasticity, brown/grey	>Wp	-	
							BH6 Terminated at 3 m			
				4.0 5.0 6.0 7.0						

BOREHOLE LOG G09-1746 LOGS.GPJ NETWORK GEOTECHNICS PTY LTD.GDT 12/06/15

Refer To Explanation Sheets For Description Of Terms And Symbols Used.

Appendix D

Laboratory Test Results

ACN 069 211 561
Unit 12, 9-15 Gundah Road
Mt Kuring-Gai,,2080,AUSTRALIA
(02) 8438 0300
(02) 8438 0310
laboratory@netgeo.com.au

TEST REPORT

Client:	SET Consultants	Job No:	G09/1746	Sheet:	1 of 1
Client Address:	51 Graham Street/ PO Box 495 Nowra NSW 2541	Report No:	1		
Principal:					
Project:	Proposed Land Rezoning	Tested By:	Cathy McDonald	Date:	5/06/2015
Location:	Lot 73 DP1153471 Corner King and Bland St - Kiama				

Sample Procedure: AS1289.1.2.1 (Clause 6.5.3 - Power Auger Drilling)

MOISTURE CONTENT - AS1289.2.1.1

Sample Number	Test Pit or Borehole	Depth	Test Results
G48445	Test Pit or Borehole: BH2	Depth: 0.7 - 1.2m	36.5
G48446	Test Pit or Borehole: BH6	Depth: 2.5 - 3.0m	46.3
G48447	Test Pit or Borehole: BH1	Depth: 4.0 - 4.5m	40.2

REMARKS:

NATA WORLD RECOGNISED ACCREDITATION

Accredited for compliance with ISO/IEC 17025.

Mt Kuring-Gai Laboratory 1318

APPROVED SIGNATORY: Steven Waugh
DATE: 15/06/2015

ACN 069 211 561
Unit 12, 9-15 Gundah Road
Mt Kuring-Gai,NSW,2080,AUSTRALIA
(02) 8438 0300
(02) 8438 0310
laboratory@netgeo.com.au

TEST REPORT

Client: SET Consultants
Project: Proposed Land Rezoning
Location: Lot 73 DP1153471 Corner King and Bland St - Kiama
TR Number :

Job Number: G09/1746
Report Number: 2
Issue No: 1

This report replaces all previous issues of the above report number.

Lot Number :
Lot Description :
Test Pit or Borehole: BH2
Depth: 0.7 - 1.2m

Lab Number: G48445
Date Sampled: 1/06/2015
Sampling Procedure: AS1289.1.2.1 (Clause 6.5.3 - Power Auger Drilling)
Sample Description: Refer to logs

ATTERBERG LIMITS & LINEAR SHRINKAGE

TEST PROCEDURE		TEST RESULTS
Liquid Limit (W_L) AS1289.3.1.1	%	63
Plastic Limit (W_P) AS1289.3.2.1	%	26
Plasticity Index (I_P) AS1289.3.3.1	%	37
Linear Shrinkage AS1289.3.4.1	%	16.5
LS Comments		-
Sample History:		Oven Dried
Preparation Method:		Dry
Shrinkage Mould Length(mm)		251

REMARKS:

Accredited for compliance with ISO/IEC 17025.

Mt Kuring-Gai Laboratory 1318

APPROVED SIGNATORY Steven Waugh
DATE 15/06/2015

ANALYTICAL REPORT

WORLD RECOGNISED ACCREDITATION

CLIENT DETAILS

Contact	Mehran Asadabadi
Client	NETWORK GEOTECHNICS PTY LTD
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Telephone	02 8438 0312 / 0411 112 824
Facsimile	02 8438 0310
Email	masadabadi@netgeo.com.au
Project	**G09-1746**
Order Number	**NGEO140903065**
Samples	1

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	SE140106 R0
Report Number	0000112650
Date Reported	12 Jun 2015
Date Received	03 Jun 2015

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(4354).

A portion of the sample supplied has been sub-sampled for asbestos according to SGS In-house procedures. We therefore cannot guarantee that the sub-sample is representative of the entire sample supplied.
SGS Environmental Services recommends supplying approximately 50-100g of sample in a separate container.

No respirable fibres detected in all samples using trace analysis technique.

Asbestos analysed by Approved Identifier Yusuf Kuthpudin.

SIGNATORIES

Andy Sutton
Senior Organic Chemist

Dong Liang
Metals/Inorganics Team Leader

Huong Crawford
Production Manager

Kamrul Ahsan
Senior Chemist

Ly Kim Ha
Organic Section Head

Ravee Sivasubramaniam
Asbestos Analyst

ANALYTICAL REPORT

RESULTS

Fibre Identification in soil — Method AN602

Laboratory Reference	Client Reference	Matrix	Sample Description	Date Sampled	Fibre Identification	Est.%w/w*
SE140106.004	BH6 0.05	Soil	39g Clay,Soil,Rocks	01 Jun 2015	No Asbestos Found	<0.01

METHOD	METHODOLOGY SUMMARY
AN602	Qualitative identification of chrysotile, amosite and crocidolite in bulk samples by polarised light microscopy (PLM) in conjunction with dispersion staining (DS). AS4964 provides the basis for this document. Unequivocal identification of the asbestos minerals present is made by obtaining sufficient diagnostic `clues`, which provide a reasonable degree of certainty, dispersion staining is a mandatory `clue` for positive identification. If sufficient `clues` are absent, then positive identification of asbestos is not possible. This procedure requires removal of suspect fibres/bundles from the sample which cannot be returned.
AN602	Fibres/material that cannot be unequivocably identified as one of the three asbestos forms, will be reported as unknown mineral fibres (umf).
AN602	AS4964.2004 Method for the Qualitative Identification of Asbestos in Bulk Samples , Section 8.4, Trace Analysis Criteria, Note 4 states:"Depending upon sample condition and fibre type, the detection limit of this technique has been found to lie generally in the range of 1 in 1,000 to 1 in 10,000 parts by weight, equivalent to 1 to 0.1 g/kg."
AN602	The sample can be reported “no asbestos found at the reporting limit of 0.1 g/kg” (<0.01%w/w) where AN602 section 4.5 of this method has been followed, and if- (a) no trace asbestos fibres have been detected (i.e. no ‘respirable’ fibres): (b) the estimated weight of non-respirable asbestos fibre bundles and/or the estimated weight of asbestos in asbestos-containing materials are found to be less than 0.1g/kg: and (c) these non-respirable asbestos fibre bundles and/or the asbestos containing materials are only visible under stereo-microscope viewing conditions.

FOOTNOTES

Amosite	-	Brown Asbestos	NA	-	Not Analysed
Chrysotile	-	White Asbestos	LNR	-	Listed, Not Required
Crocidolite	-	Blue Asbestos	*	-	Not Accredited
Amphiboles	-	Amosite and/or Crocidolite	**	-	Indicative data, theoretical holding time exceeded.

(In reference to soil samples only) This report does not comply with the analytical reporting recommendations in the Western Australian Department of Health Guidelines for the Assessment and Remediation and Management of Asbestos Contaminated sites in Western Australia - May 2009.

Sampled by the client.

Where reported: 'Asbestos Detected': Asbestos detected by polarized light microscopy, including dispersion staining.
Where reported: 'No Asbestos Found': No Asbestos Found by polarized light microscopy, including dispersion staining.
Where reported: 'UMF Detected': Mineral fibres of unknown type detected by polarized light microscopy, including dispersion staining. Confirmation by another independent analytical technique may be necessary.

Even after disintegration it can be very difficult, or impossible, to detect the presence of asbestos in some asbestos-containing bulk materials using polarised light microscopy. This is due to the low grade or small length or diameter of asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

ANALYTICAL REPORT

WORLD RECOGNISED ACCREDITATION

CLIENT DETAILS

Contact	Mehran Asadabadi
Client	NETWORK GEOTECHNICS PTY LTD
Address	Unit 12/9 - 15 Gundah Road, Mt Kuring-Gai NSW 2080
Telephone	02 8438 0312 / 0411 112 824
Facsimile	02 8438 0310
Email	masadabadi@netgeo.com.au
Project	**G09-1746**
Order Number	**NGEO140903065**
Samples	6
Date Received	3/6/2015

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE140106 R0**
Report Number	0000112649
Date Reported	12/6/2015
Date Started	5/6/2015

COMMENTS

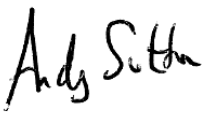
Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(4354).

A portion of the sample supplied has been sub-sampled for asbestos according to SGS In-house procedures. We therefore cannot guarantee that the sub-sample is representative of the entire sample supplied.
SGS Environmental Services recommends supplying approximately 50-100g of sample in a separate container.

No respirable fibres detected in all samples using trace analysis technique.

Asbestos analysed by Approved Identifier Yusuf Kuthpudin.

SIGNATORIES



Andy Sutton
Senior Organic Chemist

Dong Liang
Metals/Inorganics Team Leader

Huong Crawford
Production Manager

Kamrul Ahsan
Senior Chemist

Ly Kim Ha
Organic Section Head

Ravee Sivasubramaniam
Asbestos Analyst

VOC's in Soil [AN433/AN434] Tested: 5/6/2015

PARAMETER	UOM	LOR	SS1 SOIL - 1/6/2015 SE140106.001
Benzene	mg/kg	0.1	<0.1
Toluene	mg/kg	0.1	<0.1
Ethylbenzene	mg/kg	0.1	<0.1
m/p-xylene	mg/kg	0.2	<0.2
o-xylene	mg/kg	0.1	<0.1
Total Xylenes*	mg/kg	0.3	<0.3
Total BTEX*	mg/kg	0.6	<0.6
Naphthalene	mg/kg	0.1	<0.1

Volatile Petroleum Hydrocarbons in Soil [AN433/AN434/AN410] Tested: 5/6/2015

PARAMETER	UOM	LOR	SS1 SOIL - 1/6/2015 SE140106.001
TRH C6-C9	mg/kg	20	<20
Benzene (F0)	mg/kg	0.1	<0.1
TRH C6-C10	mg/kg	25	<25
TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25

TRH (Total Recoverable Hydrocarbons) in Soil [AN403] Tested: 5/6/2015

PARAMETER	UOM	LOR	SS1 SOIL - 1/6/2015 SE140106.001
TRH C10-C14	mg/kg	20	<20
TRH C15-C28	mg/kg	45	<45
TRH C29-C36	mg/kg	45	<45
TRH C37-C40	mg/kg	100	<100
TRH >C10-C16 (F2)	mg/kg	25	<25
TRH >C10-C16 (F2) - Naphthalene	mg/kg	25	<25
TRH >C16-C34 (F3)	mg/kg	90	<90
TRH >C34-C40 (F4)	mg/kg	120	<120
TRH C10-C36 Total	mg/kg	110	<110
TRH C10-C40 Total	mg/kg	210	<210

PAH (Polynuclear Aromatic Hydrocarbons) in Soil [AN420] Tested: 5/6/2015

PARAMETER	UOM	LOR	SS1 SOIL - 1/6/2015 SE140106.001
Naphthalene	mg/kg	0.1	<0.1
2-methylnaphthalene	mg/kg	0.1	<0.1
1-methylnaphthalene	mg/kg	0.1	<0.1
Acenaphthylene	mg/kg	0.1	<0.1
Acenaphthene	mg/kg	0.1	<0.1
Fluorene	mg/kg	0.1	<0.1
Phenanthrene	mg/kg	0.1	<0.1
Anthracene	mg/kg	0.1	<0.1
Fluoranthene	mg/kg	0.1	<0.1
Pyrene	mg/kg	0.1	<0.1
Benzo(a)anthracene	mg/kg	0.1	<0.1
Chrysene	mg/kg	0.1	<0.1
Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1
Benzo(k)fluoranthene	mg/kg	0.1	<0.1
Benzo(a)pyrene	mg/kg	0.1	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1
Dibenzo(a&h)anthracene	mg/kg	0.1	<0.1
Benzo(ghi)perylene	mg/kg	0.1	<0.1
Carcinogenic PAHs, BaP TEQ <LOR=0*	TEQ	0.2	<0.2
Carcinogenic PAHs, BaP TEQ <LOR=LOR*	TEQ (mg/kg)	0.3	<0.3
Carcinogenic PAHs, BaP TEQ <LOR=LOR/2*	TEQ (mg/kg)	0.2	<0.2
Total PAH	mg/kg	0.8	<0.8

OC Pesticides in Soil [AN400/AN420] Tested: 5/6/2015

PARAMETER	UOM	LOR	BH6 0.05 SOIL - 1/6/2015 SE140106.004
Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1
Alpha BHC	mg/kg	0.1	<0.1
Lindane	mg/kg	0.1	<0.1
Heptachlor	mg/kg	0.1	<0.1
Aldrin	mg/kg	0.1	<0.1
Beta BHC	mg/kg	0.1	<0.1
Delta BHC	mg/kg	0.1	<0.1
Heptachlor epoxide	mg/kg	0.1	<0.1
o,p'-DDE	mg/kg	0.1	<0.1
Alpha Endosulfan	mg/kg	0.2	<0.2
Gamma Chlordane	mg/kg	0.1	<0.1
Alpha Chlordane	mg/kg	0.1	<0.1
trans-Nonachlor	mg/kg	0.1	<0.1
p,p'-DDE	mg/kg	0.1	<0.1
Dieldrin	mg/kg	0.2	<0.2
Endrin	mg/kg	0.2	<0.2
o,p'-DDD	mg/kg	0.1	<0.1
o,p'-DDT	mg/kg	0.1	<0.1
Beta Endosulfan	mg/kg	0.2	<0.2
p,p'-DDD	mg/kg	0.1	<0.1
p,p'-DDT	mg/kg	0.1	<0.1
Endosulfan sulphate	mg/kg	0.1	<0.1
Endrin Aldehyde	mg/kg	0.1	<0.1
Methoxychlor	mg/kg	0.1	<0.1
Endrin Ketone	mg/kg	0.1	<0.1
Isodrin	mg/kg	0.1	<0.1
Mirex	mg/kg	0.1	<0.1

OP Pesticides in Soil [AN400/AN420] Tested: 5/6/2015

PARAMETER	UOM	LOR	BH6 0.05 SOIL - 1/6/2015 SE140106.004
Dichlorvos	mg/kg	0.5	<0.5
Dimethoate	mg/kg	0.5	<0.5
Diazinon (Dimpylate)	mg/kg	0.5	<0.5
Fenitrothion	mg/kg	0.2	<0.2
Malathion	mg/kg	0.2	<0.2
Chlorpyrifos (Chlorpyrifos Ethyl)	mg/kg	0.2	<0.2
Parathion-ethyl (Parathion)	mg/kg	0.2	<0.2
Bromophos Ethyl	mg/kg	0.2	<0.2
Methidathion	mg/kg	0.5	<0.5
Ethion	mg/kg	0.2	<0.2
Azinphos-methyl (Guthion)	mg/kg	0.2	<0.2

pH in soil (1:2) [AN101] Tested: 10/6/2015

PARAMETER	UOM	LOR	BH1 1.5 SOIL - 1/6/2015 SE140106.003
pH (1:2)	pH Units	-	**5.1**

Conductivity (1:2) in soil [AN106] Tested: 10/6/2015

PARAMETER	UOM	LOR	BH1 1.5 SOIL - 1/6/2015 SE140106.003
Conductivity (1:2) @25 C*	µS/cm	1	**63**
Resistivity (1:2)*	ohm cm	-	**16000**

Soluble Anions in Soil from 1:2 DI Extract by Ion Chromatography [AN245] Tested: 5/6/2015

PARAMETER	UOM	LOR	BH1 1.5 SOIL - 1/6/2015 SE140106.003
Chloride	mg/kg	0.25	**10**
Sulphate	mg/kg	0.5	**36**

Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest [AN040/AN320] Tested: 10/6/2015

PARAMETER	UOM	LOR	SS1 SOIL - 1/6/2015 SE140106.001	SS2 SOIL - 1/6/2015 SE140106.002	BH1 1.5 SOIL - 1/6/2015 SE140106.003	BH4 0.1 SOIL - 1/6/2015 SE140106.005	BH5 0.1 SOIL - 1/6/2015 SE140106.006
Arsenic, As	mg/kg	3	<3	<3	<3	<3	<3
Cadmium, Cd	mg/kg	0.3	**0.8**	**0.7**	**0.7**	**0.9**	**1.1**
Chromium, Cr	mg/kg	0.3	**7.7**	**8.6**	**9.3**	**8.0**	**9.7**
Copper, Cu	mg/kg	0.5	**140**	**59**	**200**	**150**	**140**
Lead, Pb	mg/kg	1	**35**	**22**	**10**	**27**	**140**
Nickel, Ni	mg/kg	0.5	**8.8**	**6.1**	**12**	**8.6**	**9.6**
Zinc, Zn	mg/kg	0.5	**140**	**82**	**55**	**110**	**260**

Mercury in Soil [AN312] Tested: 10/6/2015

PARAMETER	UOM	LOR	SS1 SOIL - 1/6/2015 SE140106.001	SS2 SOIL - 1/6/2015 SE140106.002	BH1 1.5 SOIL - 1/6/2015 SE140106.003	BH4 0.1 SOIL - 1/6/2015 SE140106.005	BH5 0.1 SOIL - 1/6/2015 SE140106.006
Mercury	mg/kg	0.01	**0.10**	**0.04**	**0.07**	**0.08**	**0.09**

Fibre Identification in soil [AN602] Tested: 10/6/2015

PARAMETER	UOM	LOR	BH6 0.05 SOIL - 1/6/2015 SE140106.004
Asbestos Detected	No unit	-	No
Estimated Fibres*	%w/w	0.01	<0.01

Moisture Content [AN002] Tested: 5/6/2015

PARAMETER	UOM	LOR	SS1 SOIL - 1/6/2015 SE140106.001	SS2 SOIL - 1/6/2015 SE140106.002	BH1 1.5 SOIL - 1/6/2015 SE140106.003	BH6 0.05 SOIL - 1/6/2015 SE140106.004	BH4 0.1 SOIL - 1/6/2015 SE140106.005
% Moisture	%	0.5	23	17	31	22	27

PARAMETER	UOM	LOR	BH5 0.1 SOIL - 1/6/2015 SE140106.006
% Moisture	%	0.5	27

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN040	A portion of sample is digested with Nitric acid to decompose organic matter and Hydrochloric acid to complete the digestion of metals and then filtered for analsysis by ASS or ICP as per USEPA Method 200.8.
AN040/AN320	A portion of sample is digested with nitric acid to decompose organic matter and hydrochloric acid to complete the digestion of metals. The digest is then analysed by ICP OES with metals results reported on the dried sample basis. Based on USEPA method 200.8 and 6010C.
AN088	Orbital rolling for Organic pollutants are extracted from soil/sediment by transferring an appropriate mass of sample to a clear soil jar and extracting with 1:1 Dichloromethane/Acetone. Orbital Rolling method is intended for the extraction of semi-volatile organic compounds from soil/sediment samples, and is based somewhat on USEPA method 3570 (Micro Organic extraction and sample preparation). Method 3700.
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:2 and the pH determined and reported on the extract after 1 hour extraction (pH 1:2) or after 1 hour extraction and overnight aging (pH (1:2) aged). Reference APHA 4500-H+.
AN106	Conductivity : Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:2 and the EC determined and reported on the extract basis after the 1 hour extraction (EC(1:2)) or after the 1 hour extraction and overnight aging (EC(1:2) aged). Reference APHA 2520 B.
AN245	Anions by Ion Chromatography: A water sample or extract is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO2, NO3 and SO4 are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B
AN312	Mercury by Cold Vapour AAS in Soils: After digestion with nitric acid, hydrogen peroxide and hydrochloric acid, mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500
AN400	OC and OP Pesticides by GC-ECD: The determination of organochlorine (OC) and organophosphorus (OP) pesticides and polychlorinated biphenyls (PCBs) in soils, sludges and groundwater. (Based on USEPA methods 3510, 3550, 8140 and 8080.)
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36 and in recognition of the NEPM 1999 (2013), >C10-C16 (F2), >C16-C34 (F3) and >C34-C40 (F4). F2 is reported directly and also corrected by subtracting Naphthalene (from VOC method AN433) where available.
AN420	(SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols (etc) in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).
AN433/AN434	VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC`s are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.
AN433/AN434/AN410	VOCs and C6-C9/C6-C10 Hydrocarbons by GC-MS P&T: VOC`s are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.
AN602	Qualitative identification of chrysotile, amosite and crocidolite in bulk samples by polarised light microscopy (PLM) in conjunction with dispersion staining (DS). AS4964 provides the basis for this document. Unequivocal identification of the asbestos minerals present is made by obtaining sufficient diagnostic `clues`, which provide a reasonable degree of certainty, dispersion staining is a mandatory `clue` for positive identification. If sufficient `clues` are absent, then positive identification of asbestos is not possible. This procedure requires removal of suspect fibres/bundles from the sample which cannot be returned.

FOOTNOTES

*	Analysis not covered by the scope of accreditation.	-	Not analysed.	UOM	Unit of Measure.
		NVL	Not validated.	LOR	Limit of Reporting.
**	Indicative data, theoretical holding time exceeded.	IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		
^	Performed by outside laboratory.				

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.sgs.com.au/~/media/Local/Australia/Documents/ Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

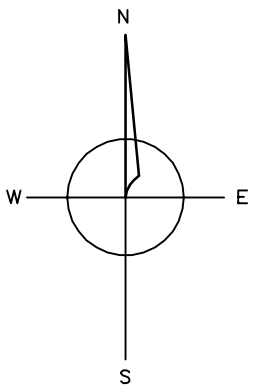
APPENDIX 3

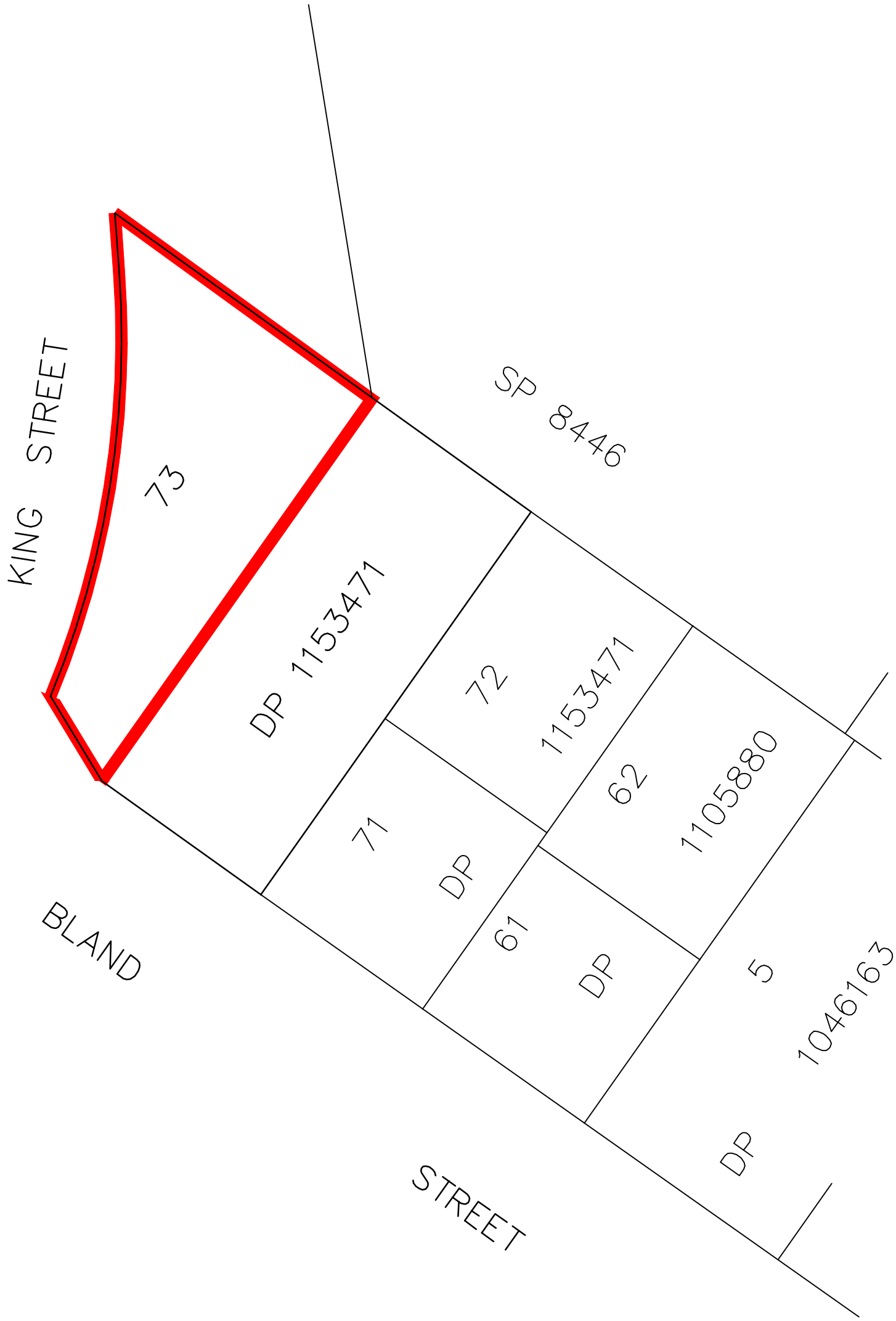
MAPS

REF. No. 103244
DATE: 17/08/2015

SKETCH PLAN
SHOWING SUBJECT SITE
PART LOT 73 DP 1153471
CORNER OF KING STREET & BLAND STREET, KIAMA
FOR: KIAMA MUNICIPAL COUNCIL

REDUCTION RATIO 1:400 AT A3 SIZE





BEWARE – Damage to telephone cables can disrupt communication services and cost you money. For prompt location of telephone cables ring – 1100

DIAL 1100 BEFORE YOU DIG

Calls to this number are free.

WARNING NOTE:
THE INFORMATION SHOWN ON THIS PLAN (OR THE DATA TRANSMITTED HEREWITH) IS CORRECT AS AT 17/08/2015 AND HAS BEEN PREPARED IN ACCORDANCE WITH THE REQUIREMENTS OF KIAMA MUNICIPAL COUNCIL.

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ABN 15 617 504 208

SURVEYING | ENGINEERING | TOWN PLANNING

REF. No. 103244
DATE: 17/08/2015

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SKETCH PLAN SHOWING
AERIAL MAP OVER SUBJECT SITE
ENTIRE LOT 73 DP 1153471
CORNER OF KING STREET &
BLAND STREET, KIAMA
FOR: KIAMA MUNICIPAL COUNCIL

REDUCTION RATIO 1:400 AT A3 SIZE

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REF. No. 103244
DATE: 17/08/2015

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SKETCH PLAN SHOWING CURRENT ZONING OVER SUBJECT SITE PART LOT 73 DP 1153471 CORNER OF KING STREET & BLAND STREET, KIAMA

FOR: KIAMA MUNICIPAL COUNCIL

REDUCTION RATIO 1:400 AT A3 SIZE

B1	Neighbourhood Centre
B2	Local Centre
B3	Commercial Core
B4	Mixed Use
B5	Business Development
B7	Business Park
E1	National Parks and Nature Reserves
E2	Environmental Conservation
E3	Environmental Management
E4	Environmental Living
IN1	General Industrial
IN2	Light Industrial
IN4	Working Waterfront
R1	General Residential
R2	Low Density Residential
R3	Medium Density Residential
R5	Large Lot Residential
RE1	Public Recreation
RE2	Private Recreation
RU1	Primary Production
RU2	Rural Landscape
RU3	Forestry
RU4	Primary Production Small Lots
RU5	Village
SP1	Special Activities
SP2	Infrastructure
SP3	Tourist
W1	Natural Waterways
W2	Recreational Waterways
W3	Working Waterways
DM	Deferred Matter
JE	Shoalhaven LEP (Jerberra Estate) 2014

KING STREET
SP2
73
R2
SP 8446
DP 1153471
72
1153471
62
1105880
71
DP
61
DP
5
1046163
DP
BLAND
STREET

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REF. No. 103244
DATE: 17/08/2015

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SKETCH PLAN SHOWING PROPOSED ZONING OVER SUBJECT SITE PART LOT 73 DP 1153471 CORNER OF KING STREET & BLAND STREET, KIAMA

FOR: KIAMA MUNICIPAL COUNCIL

REDUCTION RATIO 1:400 AT A3 SIZE

B1	Neighbourhood Centre
B2	Local Centre
B3	Commercial Core
B4	Mixed Use
B5	Business Development
B7	Business Park
E1	National Parks and Nature Reserves
E2	Environmental Conservation
E3	Environmental Management
E4	Environmental Living
IN1	General Industrial
IN2	Light Industrial
IN4	Working Waterfront
R1	General Residential
R2	Low Density Residential
R3	Medium Density Residential
R5	Large Lot Residential
RE1	Public Recreation
RE2	Private Recreation
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RU2	Rural Landscape
RU3	Forestry
RU4	Primary Production Small Lots
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SP1	Special Activities
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SP3	Tourist
W1	Natural Waterways
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W3	Working Waterways
DM	Deferred Matter
JE	Shoalhaven LEP (Jerberra Estate) 2014

SP2

KING STREET

73

R2

SP 8446

R2

DP 1153471

72

1153471

62

1105880

71

DP

61

DP

5

1046163

DP

BLAND STREET

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APPENDIX 4

PHOTOMONTAGE

Figure 1: View to the south-east from King Street overlooking the subject site.

Figure 2: View of subject site from the corner of King Street and Bland Street.

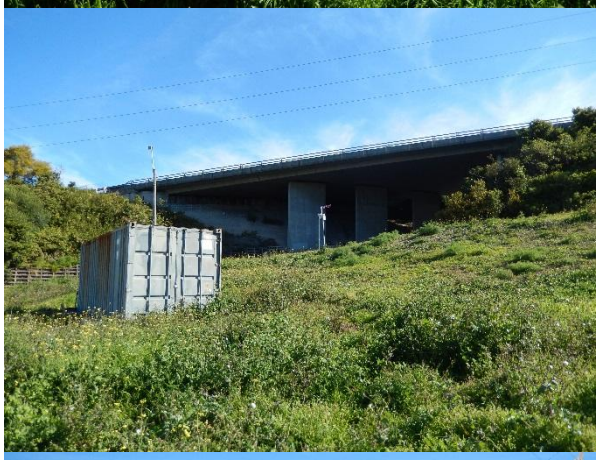

Figure 3: View of subject site from rear eastern corner.

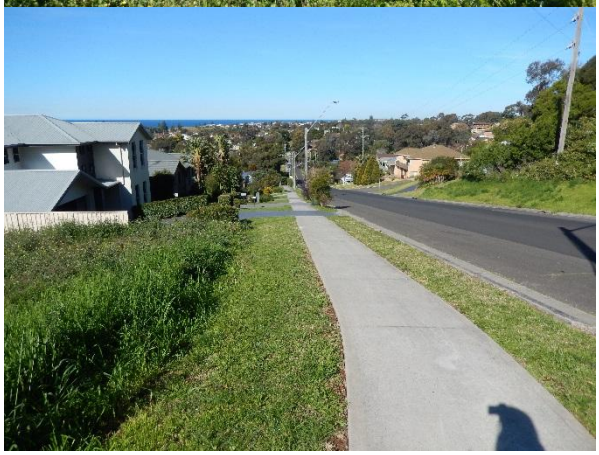

Figure 4: Frontage to Bland Street.

Figure 5: Frontage to Bland Street.