PROJECT

CONTAMINATION ASSESSMENT AND SUMMARY REPORT KINGS FOREST STAGE 1 PROJECT APPLICATION KINGS FOREST NEW SOUTH WALES

PREPARED FOR

PROJECT 28 PTY LTD

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GILBERT SUTHERLAND

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SYNOPSIS This report summarises contamination assessments undertaken for the entirety of the Kings Forest Stage 1 Project Application area. The report details the findings of a preliminary contamination assessment and a more detailed soil and radiation assessment completed on a portion of the site. This report addresses the Environmental Assessment Requirements specified by the Director General of the NSW Department of Planning (DGRs) in relation Kings Forest Development.

REVISION HISTORY

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SUMMARY

Project 28 Pty Ltd commissioned Gilbert & Sutherland Pty Ltd (G&S) to undertake appropriate contamination assessments in support of the Stage 1 Project Application for the proposed development of the Kings Forest site at Cudgen, New South Wales.

G&S prepared a preliminary site contamination report considering the entire Kings Forest site in support of the Kings Forest Concept Plan Application (the 'March 2008 Preliminary Contamination Report').[1] Prepared in accordance with SEPP 55 to provide sufficient information to the planning authority to enable an informed planning decision to be made, the report reviewed a series of site contamination investigations undertaken for the Kings Forest site between 1992 and 2003. A number of potentially contaminating former landuses have been found to have occurred on the site and immediately adjacent to the site.

Based on the information obtained from previous investigations there are areas adjacent to and on the site that needed further detailed investigation and/or remediation prior to the development of the site. These include:

- Council's Bogangar Landfill (adjacent to the site).
- Sugar cane and small cropping.
- Banana plantations (adjacent to the site).
- A fuel storage area and former nursery.
- A former orchard.
- A former cattle dip site.

Clearing associated with sand mining activities. Supplementary to the March 2008 Preliminary Contamination Report, G&S undertook detailed assessments of areas potentially influenced by neighboring banana plantations, a former nursery/orchard premise/plot, a diesel above ground storage tank (AST) and historical sand mining activities identified across and adjacent to the site. Locations of historical sand mining activities were identified within the Cudgen/Kingscliff area and potentially occurring across parts of the site.

[1] Gilbert & Sutherland Pty Ltd, March 2008 (updated December 2008), 'Soil Survey, Acid Sulfate Soils, Assessment and Management Plan, Geotechnical Review and Contamination Assessment, Kings Forest Concept Plan'.

G&S assessed the radiation potential of historical sand mining activities through a detailed radiation soil survey assessing the presence/absence of potentially radioactive mineral sands. The detailed contamination radiation investigation looking at potentially radioactive mineral sands included:

- A desktop investigation conducted in October and November, 2009.
- A site inspection and surface survey on 4 November, 2009.
- A subsurface investigation (drilling program) on 10 November, 2009.

The conclusions drawn from the 2009 detailed contamination radiation investigation were as follows:

- No surface radiation levels were recorded in the assessed areas above natural radiation background levels of 0.2 $\mu Sv.h^{-1}$.
- No sub surface derived gross radiation levels were recorded above the NSW Department of Environment Climate Change and Water (DECCW) remediation trigger value of 0.7 $\mu Gy.h^{-1}$ (equivalent to 0.7 $\mu Sv.h^{-1}$).
- No further radiation assessment, remediation and/or management strategies are required for potential mineral sands across the entire Kings Forest Development area.

To better inform the client of potential contamination existing on the site associated with those activities identified within previous reports G&S conducted a contamination assessment across areas identified to have had potentially contaminating activities occurring on them or adjacent to the site boundary (banana plantations). The contamination assessment included:

- A site inspection and subsurface soil-sampling program conducted during January and February 2011.

The conclusions drawn from the 2011 subsurface contamination assessment were as follows:

- No heavy metals concentrations exceeding the NSW Health-Based Investigation Levels (HILs) for urban residential sites in NSW (column 1) were recorded in samples associated with agricultural, horticultural and fuels storage activities . Arsenic was recorded above the EIL (Environmental Investigation Levels) in surface samples extracted from BH37, BH39 and BH42.
- No pesticides (organochlorine/organophosphorus) were recorded above the HILs across the assessed areas. BH22 (0-0.15m)

displayed results exceeding the laboratory's limit of reporting LOR for DDD (0.07mg/kg) and endosulfan (0.33mg/kg).

- Total Petroleum Hydrocarbons exceeding the HILs were recorded in samples from BH3 (0.15m & 0.2-0.3m) and BH4 (0.15m & 0.2-0.3m). TPH C_{10}-C_{36} concentrations ranged from 1,010mg/kg to 16,700mg/kg in samples extracted from directly below the AST.

In addition to the detailed investigations, the impact of groundwater occurring beneath the capped Bogangar Landfill (North of and adjacent to the proposed development) was also assessed. Results indicate that the groundwater associated with the capped landfill will have no significant impact on the proposed development due to the following considerations:

- Groundwater flows in a westerly direction from the proposed development towards the landfill and through to the western side of the landfill. Under the developed case, groundwater would flow to the west and southwest of the site.
- The land use adjacent to the landfill will be community infrastructure and the risk of groundwater extraction and possible leachate would be manageable.

The potentially contaminated areas associated with former land uses, both on-site and adjacent to the site boundary, as identified within the 2008 assessment are considered manageable, for the purposes of the Stage 1 Project Application. Further remediation of these areas prior to development is achievable and would render these areas suitable for their intended end use. Remedial work would be particularly relevant to the area immediately under the diesel AST which recorded TPH C_{10}-C_{36} constituents above the applicable HILs for the development and the former livestock dip located in the southwest corner of the site.

For the purpose of the Stage 1 Project Application, the level of contamination investigation already undertaken is considered appropriate to facilitate a planning decision. Remediation and validation sampling of the AST footprint and former livestock dip can then be undertaken in support of construction certificate applications. Provided the remediation occurs prior to any bulk earthworks within these two areas the risk to human health and the environment from contamination would be minimised.

Based on the results of the 2008 Preliminary Site Contamination Assessment and considering the results from this contamination and radiation assessment no additional recent or historical

contamination has been identified that would render the site unsuitable for the intended use or otherwise prevent the proposed development of the Kings Forest Stage 1 Project Application Area.

This report forms a Stage 2 investigation under the relevant DGR's, 6.1 and 6.9 identifying and classifying contamination and potential radiation levels associated with historical site uses.

CONTENTS

LIST OF FIGURES

GLOSSARY

TERM	MEANING
AGS	Above ground surface
AST	Above ground storage tank
BH	Borehole
BTEX	Benzene, Toluene, Ethylbenzene and total Xylene
DGR	Director General requirement
EIL	Environmental investigation level
EPA	Environmental Protection Authority
HIL	Health-based investigation level
mBGS	Metres below ground surface
NATA	National association of testing authorities
NEPM	National Environmental Protection Measure, issued by the National Environment Protection Council
OC/OP pesticides	Organochlorine and organophosphorus pesticides
PAH	Polycyclic aromatic hydrocarbons
pH	The degree of acidity or alkalinity measured on a scale of 1 to 14, with 7 as neutral. From 1 to 7 is acidic; from 7 to 14 is alkaline.
QA/QC	Quality assurance/quality control
RAP	Remediation action plan
RPD	Relative percentage difference
SEPP	State environmental planning policy
TPH	Total petroleum hydrocarbons

1 Introduction

Project 28 Pty Ltd commissioned Gilbert & Sutherland Pty Ltd (G&S) to undertake further quantitative assessments in support of a Project Application for the Stage 1 Project Application of the proposed Kings Forest development at Kings Forest, New South Wales.

The Director General of the Department of Planning issued amended Environmental Assessment Requirements (DGRs) for the project application on 10 September 2010. The DGRs require that specialist advice be provided to address the following Key Issues:

- Key Issue 6.1: Identify any contamination on site and appropriate mitigation measures in accordance with the provisions of SEPP 55 – Remediation of land.
- Key Issue 6.9: Identify the presence and extent of radiation levels on site and where relevant mitigation measures. Include consideration of the extent, distribution and depth of cut and fill.

In support of the Concept Plan application for the site, Gilbert & Sutherland completed a review of previous environmental investigations for the site. That review concluded that sufficient information was available to support the Concept Plan application. The proponent committed to undertaking additional investigations of the identified potentially contaminating activities in support of future project applications.

This report provides an assessment of the likely disturbance of identified potentially contaminated areas and potentially radioactive mineral sands occurring within the bounds of the cut and fill and earthworks program proposed as part of the Stage 1 Project Application.

1.1 The project application

The approved Kings Forest Concept Plan proposes the creation of a residential community inclusive of associated educational, social, commercial, sporting and recreational amenities. The development is to be completed in stages. The Kings Forest Stage 1 Project Application seeks approval for a rural retail development in Precinct 1, residential development in Precinct 5 and bulk earthworks within the balance of the site. The Stage 1 development area and concept plan is shown on Drawing No. 10468.7.1

The proposed development would include:

- Subdivision to create new lots/land parcels for future development.
- Construction of the entrance road to the site and associated works for the intersection with Tweed Coast Road, as well as a new connecting road to the Tweed Shire Council's former waste tip.
- Subdivision and associated infrastructure works for the first stage of urban development (Precinct 5).
- Bulk earthworks and planting for the future golf course.
- A rural retail development (commercial site) on the developable land east of Tweed Coast Road.
- Bulk earthworks as required in all precincts.

1.2 Objectives

The objectives of this investigation were:

- To assess the presence, severity and extent of any radiation contamination associated with the proposed Kings Forest Stage 1 Project Application.
- To assess the presence, severity and extent of any contamination resulting form identified historical potentially contaminating activities.
- To establish whether any further contaminating activities have occurred on site beyond those previously identified within the preliminary contamination assessment.

1.3 Scope of report

This report provides a summary of G&S' desktop research and field investigations concerning

- historical, potentially contaminating activities that occurred on the site during its use for agricultural purposes
- the presence of radioactive mineral sands in areas of disturbance which were, or may have been, mined

- those areas within the site identified as being potentially affected by historical potentially contaminating activities.

To assess the Kings Forest Stage 1 Project Application area for the presence of radioactive mineral sands and other potentially contaminating activities associated with the use of the site as a rural agricultural property, the following tasks were undertaken:

- A review of relevant site history relating to the Stage 1 Project Application development area, including the *Preliminary Contamination Assessment Report* (G&S March, 2008)[2]
- A preliminary surface radiation soil survey targeting areas potentially affected by sand mining activities.
- A preliminary subsurface radiation soil assessment targeting areas potentially affected by sand mining activities.
- A shallow soils investigation targeting areas previously identified to have had potentially contaminating activities.

As such, this report forms a Stage 2 assessment under the Director General's Requirements.

[2] Gilbert & Sutherland Pty Ltd, March 2008 (updated December 2008), 'Soil Survey, Acid Sulfate Soils, Assessment and Management Plan, Geotechnical Review and Contamination Assessment, Kings Forest Concept Plan'.

2 Historical desktop assessment

2.1 Background

The DGR's require that specialist advice be provided with respect to site contamination in accordance with the provisions of the State Environmental Planning Policy 55 (SEPP 55).

SEPP 55 requires that a proponent provide to the planning authority sufficient site contamination information to enable an informed planning decision to be made. In support of this requirement G&S prepared a preliminary site contamination report considering the entire Kings Forest site for the Kings Forest Concept Plan (the 'March 2008 Preliminary Contamination Report').[3]

The March 2008 Preliminary Contamination Report reviewed a series of contamination investigations undertaken for the Kings Forest site between 1992 and 2003. It found that a number of potentially contaminating former land uses had occurred on and immediately adjacent to the site and concluded that contamination, if any, from these activities would be manageable. Further detailed investigations and/or remediation actions were recommended prior to the development of the site.

A series of site contamination investigations were undertaken for the Kings Forest site between 1992 and 2003 and a number of potentially contaminating former landuses have been found to have occurred on the site and immediately adjacent to the site.

The areas identified by previous investigations as subject to potentially contaminating activities are overlaid on the Stage 1 Project Application plan in Drawing No. 10468.7.5.

2.2 Previous investigations

Seven (7) previous environmental assessments have been completed on the site. The following documents were reviewed by G&S to facilitate the desktop assessment of historical contaminating activities occurring on-site.

- Kings Forest – Cattle Tick Dip Site – May 1992.[4]
- Preliminary Site Contamination Assessment – October 1999.[5]
- Detailed Site Contamination Assessment (Stage 2) – Proposed Methodology for Bogangar Landfill Site – March 2001.[6]
- Remedial Action Plan (Stage 3) – Duranbah Cattle Dip – March 2001.[7]
- Bogangar Road Landfill – Assessment of Remediation Options and Remediation Action Plan – June 2003.[8]
- Assessment of Disturbance from Historical Aerial Photo Record, Stage 2-Kings Forest-August 2005.[9]
- Preliminary Contamination Assessment Report (G&S March, 2008).

A number of historical potentially contaminating activities were identified within these reports. The following activities that have the potential to contaminate the site have occurred in isolated areas of the Kings Forest Site, or immediately adjacent to the site:

- Council's Bogangar Landfill.
- Sugar cane and small cropping.
- Banana plantations adjacent to the site.
- A fuel storage area and former nursery.

[3] Gilbert & Sutherland Pty Ltd, March 2008 (updated December 2008), 'Soil Survey, Acid Sulfate Soils, Assessment and Management Plan, Geotechnical Review and Contamination Assessment, Kings Forest Concept Plan'.

[4] Sinclair Knight (May 28, 1992) Correspondence re *Kings Forest – Dip Site*.

[5] Philip Bell and Partners Pty Ltd (October 1999) *Preliminary Site Contamination Assessment – Draft - Proposed Kings Forest Development Cudgen, New South Wales*. Prepared for Narui Gold Coast Pty Ltd.

[6] Philip Bell and Partners Pty Ltd (March 19, 2001) Detailed Site Contamination Assessment (Stage 2) – *Proposed Methodology for Old Bogangar Road Landfill Site (Issue 2) - Kings Forest Development Cudgen, New South Wales*. Prepared for Narui Gold Coast Pty Ltd.

[7] Philip Bell & Partners Pty Ltd (March 19, 2001) *Remedial Action Plan (Stage 3) – Duranbah Cattle Dip, Kings Forest Estate*. Issue 2. Prepared for Narui Gold Coast Pty Ltd.

[8] Coffey Geosciences (June 30, 2003) *Depot Road Landfill, Cudgen – Assessment of Remediation Options and Remediation Action Plan*. Prepared for Tweed Shire Council.

[9] Aspect North Ltd. (August 2005). *Assessment of Disturbance from Historical Aerial Photo Record, Stage 2-Kings Forest*. Prepared for Project 28 Pty Ltd.

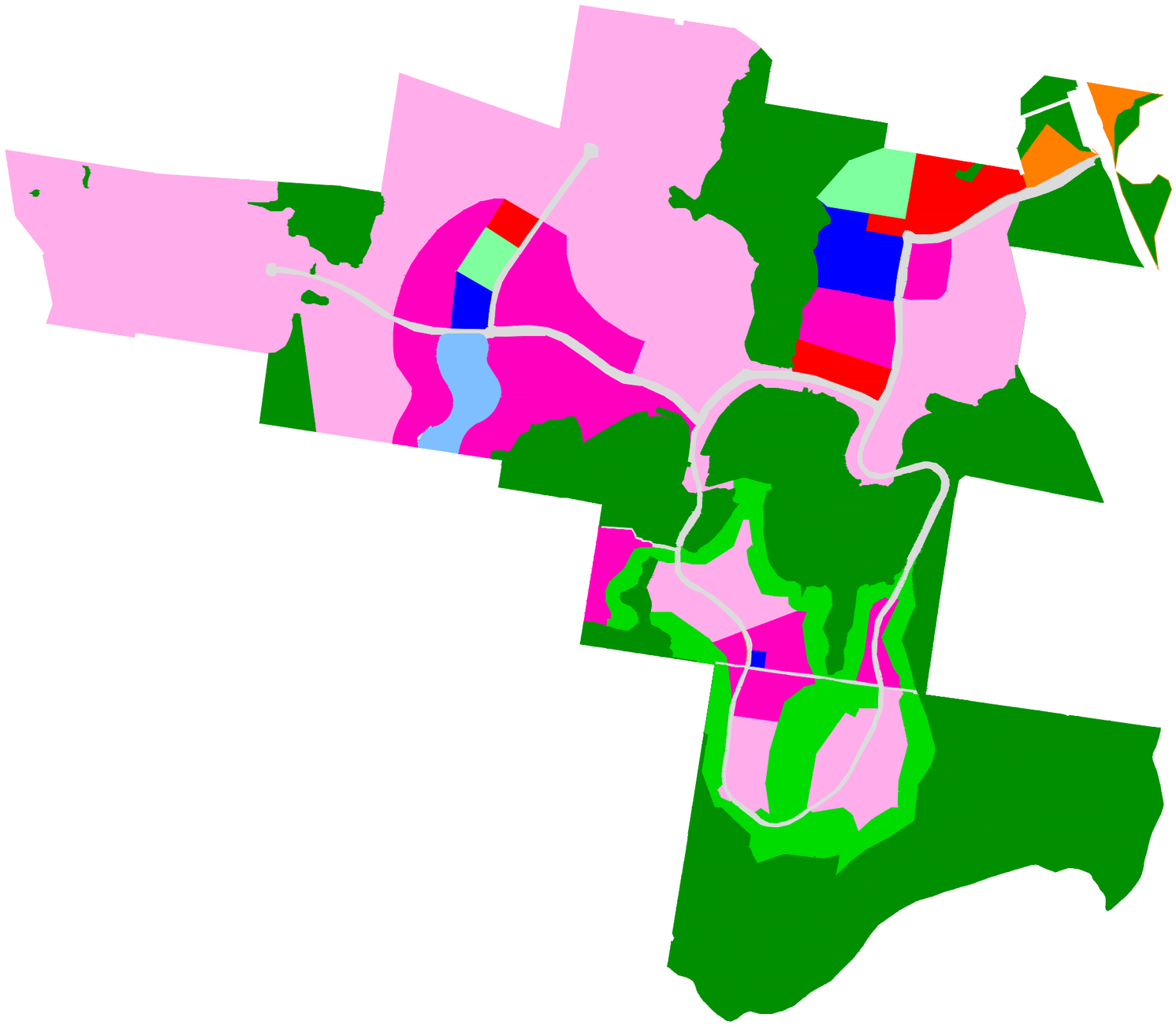
200 400 600 800 1000
metres

SCALE
1:20 000

ORIENTATION
NORTH

LEGEND

- Stage 1 Development Area
- Town Centre/Village Centre
- Medium Density Residential
- Low Density Residential
- Community Facilities
- Business Park
- Golf Course
- Active Open Space
- Environmental Protection Area
- Lake



SOURCES
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AGRICULTURE WATER ENVIRONMENT

GILBERT SUTHERLAND

PROJECT
KINGS FOREST STAGE 1
PROJECT APPLICATION

CLIENT
PROJECT 28 PTY LTD

DRAWING
DEVELOPMENT AREA AND
CONCEPT PLAN

DATE	DRAWN	PROJECT NO
14/02/2011	AJS	10468
SCALE	**CHECKED**	**DRAWING NO**
1:20 000	NG	10468.7.1

- A former orchard.
- A former cattle dip site.
- Clearing associated with sand mining activities.

Drawing No. 10468.7.5 provides the locations of the known areas of potential contamination overlaid on the current Kings Forest Stage 1 Application plan.

2.3 Radiation assessment historical review

A review of supplementary environmental assessments relating to the Stage 1 Project Application in particular the Aspect North Ltd *Assessment of Disturbance from Historical Aerial Photo Record, Stage 2 Kings Forest*, August, 2005 – revealed evidence of exploration and potential sand mining activity on the site. Clearing activities and disturbance, possibly associated with sand mining operations are visible in aerial photographs from 1962 and 1972, in the vicinity of the former Bogangar Landfill and in two areas to the south-east of the former landfill where extensive clearing had occurred.

A copy of the Aspect North Ltd historical aerial photograph from 1962 showing 'extensive disturbance associated with sand mining' is provided in Appendix 2. It is notable that it was Aspect North's interpretation of this photo that evidence of sand mining was present. However the Geological Survey of NSW mapping does not agree with Aspect North's interpretation and shows only the area of the Bogangar Landfill as being subject to sand mining.

Typically the on-site processing of mineral sands results in a concentration of mineral ore wastes that may exhibit radiation levels higher than background. It is understood from discussions with Queensland Health's Health Physics Unit that the processing of sands occurred on the eastern side of Cudgen Creek in the vicinity of the Casuarina Township. This is supported by the Geoscience NSW Mapping. Despite this, it was considered prudent to investigate the identified areas of disturbance, which were divided into four (4) distinct areas. These areas were subjected to further quantitative radiation assessments.

Separate and to the north of the proposed development site is the capped Bogangar Landfill site. The landfill operated between the 1960's and the mid 1980's when it was closed to public disposal of general waste. Soil and other hard fill was deposited at the site up to 2004, when the landfill was decommissioned and capped by Tweed Shire Council.

The proximity of the landfill suggests that the impacts of the capped site on the proposed Stage 1 Project Application development area require assessment.

250 500 750 1000 1250
metres

SCALE
1:25 000

ORIENTATION
NORTH

LEGEND

- Site boundary
- Approximate mineral sand processing location
- Areas mapped as mined for mineral sand (Geological Survey of New South Whales)
- Disturbed areas (based on aerial photo review)

SOURCES

Google Earth, 2009.

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AGRICULTURE WATER ENVIRONMENT

GILBERT SUTHERLAND

PROJECT
KINGS FOREST STAGE 1
PROJECT APPLICATION

CLIENT
PROJECT 28 PTY LTD

DRAWING
AREAS POSSIBLY AFFECTED
BY MINERAL SAND MINING

DATE	DRAWN	PROJECT NO
14/02/2011	AJS	10468
SCALE	**CHECKED**	**DRAWING NO**
1:25 000	NG	10468.7.2