ENGINEERING REPORT

Proposed Tourist Accommodation
Lot 1 on DP1168904
Kirkwood Road, South Tweed Heads

for Proportional Property Investments Pty Ltd

28 August 2013

File No: K1868-0060-A

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Synopsis:	This report examines the existing infrastructure and future engineering impacts for the proposed development of the site.

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1.0 INTRODUCTION

1.1 Background

Knobel Consulting Pty Ltd has been commissioned by Proportional Property Investments Pty Ltd to prepare an *Engineering Report* to support a Material Change of Use Application for a 355 dwelling tourist accommodation development. The site is identified within the Tweed Shire Council Planning Documents which outline desirable land uses, infrastructure and general planning requirements for the area.

The purpose of this report is to demonstrate that the proposed development can comply with the current Tweed Shire Council Planning Scheme. Appendix A shows the proposed Tourist Accommodation Development, *Site Plan* (Ref: SD-A01/09) prepared by Paul Ziukelis Architects.

The subject site consists of an area of 17.23Ha, with details as summarised in Table 1 below and as located in Figure 1. A portion of the lot equating to 7.68Ha will be developed with the remainder to be retained as environmental area or dedicated to council for the Kirkwood Road extension.

This report has been updated in response to Council's Information Request dated 22 March 2013.

Table 1: Site Description

Developer/Consultant	Property and Location	
Owner/Developer	**Lot and Property Description**	**Address**
Proportional Property Investments Pty Ltd	*Lot 1 on DP1168904*	*Kirkwood Road, Tweed Heads South*

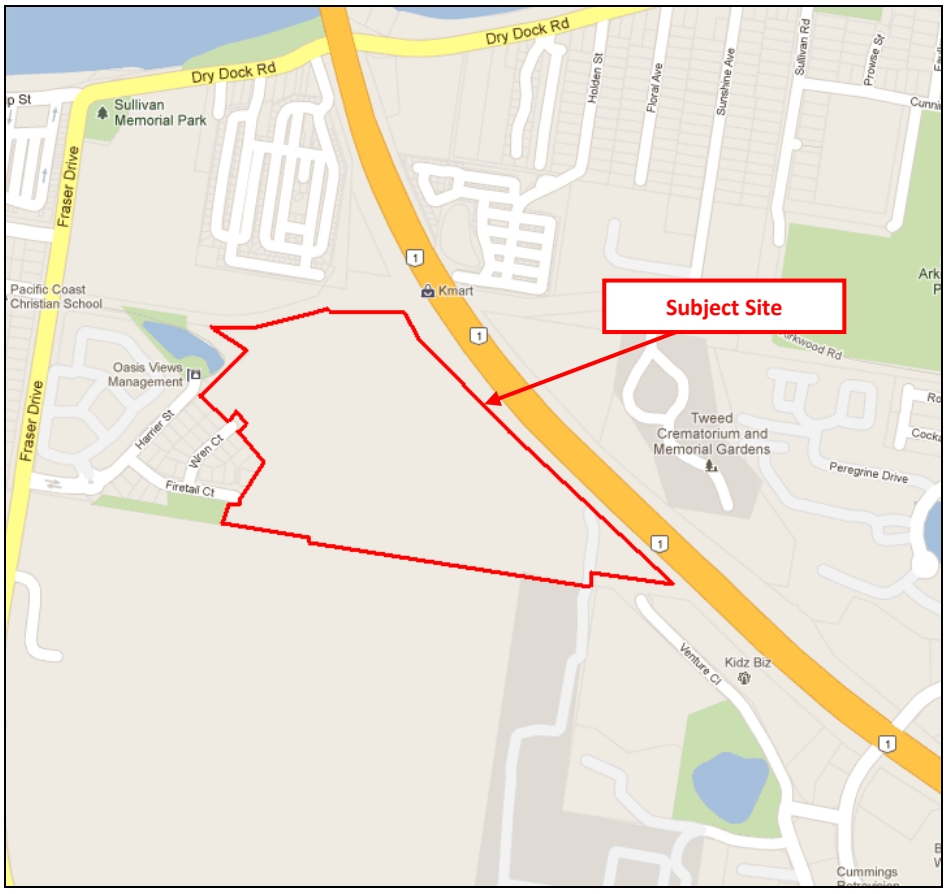

Figure 1: Site Location Plan (Modified from www.maps.Google.com)

1.1.1 Site Topography

The subject site consists of a ridge at approximately 40.5 m AHD that runs from the South West to the North East through the middle of the site. The ridge grades to 1.75 m AHD in the North West and 1.50 m AHD in the South East. There is currently no vehicular access to the site however the Tweed Shire Council has plans to extend Kirkwood Road to run along the Northern boundary.

1.1.2 Vegetation and Land Use

The subject site predominantly consists of tree cover with areas of average grass cover. There is an access from the end of Firetail Court that leads to some minor existing structures in the South Eastern portion of the site.

An aerial photo of the site is displayed in Figure 2 below.

Figure 2: Aerial Photograph of the Site (Google Earth)

2.0 EARTHWORKS

A preliminary bulk earthworks design across the site has been produced and is shown in Knobel Consulting Pty Ltd, *Preliminary Bulk Earthworks Layout Plan Sheets 1 and 2* (Ref: K1868/P018-P019/I), *Preliminary Earthworks Cross Sections Sheets 1-6* (Ref: K1868/P021/D-P022-P024/C, P025-P026/D), *High Constraint Area Cross Sections* (Ref: K1868/P039/D) and *Bulk Earthworks Cut and Fill Plan* (Ref K1868/P043/A) included as Appendix B. A pre and post slope analysis has also been completed and is shown in Knobel Consulting Pty Ltd, *Existing Surface Slope Analysis Plan* (Ref: K1868/P040/B) and *Design Surface Slope Analysis Plan* (Ref: K1868/P041/B) within Appendix B.

The proposed earthworks involve major cutting and minor filling for the site to achieve road and allotment levels. Typically cut depths are up to approximately 30 m through the middle of the site and fill depths are up to approximately 6m in the South Eastern portion of the site. This does not comply with the Tweed Shire Council's D6 specification due to the need for the proposed development to tie in to the Kirkwood Road extension design contours which also involve major earthworks with approximately 19 m of cut in some sections. The cross sections layout and relevant cross sections for the Kirkwood Road Extension can

be seen in Tweed Shire Council, *Kirkwood Road Extension* (Ref: ED 06004-02) , *Proposed Kirkwood Road Extension* (Ref: ED 06004-05) and *Cross-Sections – Kirkwood Road* (Ref: ED 06004C-08) *Cross-Sections – Kirkwood Road* (Ref: ED 06004B-09), *Cross-Sections – Kirkwood Road* (Ref: ED 06004B-10), *Cross-Sections – Kirkwood Road* (Ref: ED 06004B-11), *Cross-Sections – Kirkwood Road* (Ref: ED 06004B-12) included as Appendix C.

The proposed earthworks are not anticipated to create any adverse impacts on the adjacent development to the West as proposed levels of the development are generally lower and boundary levels integrating well back to existing. A 10 m buffer strip that contains established vegetation separating the proposed development from the existing development to the West has also been applied to ensure the proposed earthworks will integrate into the existing developments levels.

The environmental constraints in the southern portion of the lot have influenced the proposed extent of earthworks. All earthworks are proposed to be outside of the 100 m setback from the SEPP14 wetland, 88B Restriction and High Constraint Area with only batters to encroach within the 30 m setback from the High Constraint Area. A summary of the proposed site earthworks against Tweed Shire Council Design Specifications has been made in Tables 2 and 3 below. It is noted that although Development Design Specification D6 does not strictly apply as there will not be any land subdivision, Council has requested assessment against this code.

Table 2: Development Design Specification Section A5 – D6 Site Regrading

Earthworks Component	TSC Standard	Site Compliance Assessment
Mass Landform Change	A maximum of 10% of the site can change the finished surface levels by greater than 5m in depth.	A large proportion of the site will be changing the existing ground levels by greater than 5m. There will not be any adverse impacts from the landform change as the earthworks integrate to existing levels at the boundaries, there will be no alterations to defined drainage paths and the position of the site ensures there will not be any amenity issues for neighbouring properties. This has been addressed further in a Visual Impact Report that accompanies the Response to Information Request submission.
Shape/Surface Criteria	Finished landform should mimic existing	Extensive cut and fill is proposed to create bulk landform for the development and match to the proposed Kirkwood Road extension. The site earthworks will not adversely impact on neighbouring properties or create amenity issues. This has been further addressed in a Visual Impact Report that accompanies the Response to Information Request submission.
	Batters and retaining walls not permitted to terrace lots. Max height wall of 1.2m but not for repeated benching	No terracing of lots is proposed. The buildings are to be pier construction (apart from the community facility and duplex lots) with ground levels to be sloped below buildings.
Cut/Fill Batters	1:2 generally acceptable but dependant on soil type	Batters will be a maximum slope of 1:2. The underlying soil for the large cut batters is rock.
Overland flow paths	No impedance or redirection permitted	No overland flow paths internal or external to the development will be affected.

Table 3: Tweed DCP – Section A1 Part B – Residential and Tourist Code

Earthworks Component	TSC Standard	Site Compliance Assessment
Building Construction	Dwellings must not be slab on ground if ground has a slope greater than 10%. Design to be pole and pier construction.	Finished ground slopes are below 10% however buildings shall also be pier construction (apart from the community facility and duplex lots) to minimise retaining walls within the development footprint.
Cut and Fill	The maximum cut and fill is 1 m unless within the confines of a building or driveway for the purpose of entry to a basement garage.	Extensive cut and fill is proposed to create bulk landform and match to the proposed Kirkwood Road extension. The site earthworks will not adversely impact on neighbouring properties or create amenity issues.
Retaining Walls	Maximum height of 1.2 m.	Minimal retaining walls are proposed in the development and can achieve a maximum of 1.2m height. A larger wall greater than 1.2m is only proposed for a short distance at the Southern portion of the site to ensure no encroachment into the Setback From SEPP14 Wetland.
Cut/Fill Batters	Max slope 1:2 unless geotechnical report provided.	Batters will be a maximum slope of 1:2.

A cut and fill analysis has been undertaken over the site to accurately determine the percentage of the site that is being affected by earthworks. The below table 4 provides additional detail on the cut and fill depths over the site in comparison to the overall site area.

Table 4: Earthworks Cut and Fill Depths

Earthworks Cut and Fill					
Cut Depth (m)	Area (m^2)	% of site area	Fill Depth (m)	Area (m^2)	% of site area
0+	70,357	41	0+	13,202	8
5+	54,296	32	5+	1,730	1
10+	41,349	24			
15+	29,209	17			
20+	17,964	10			
25+	6,632	4			
30+	252	0.1			

The above areas of cut and fill are shown in Knobel Consulting Pty Ltd, *Bulk Earthworks Cut and Fill Plan* (Ref: K1868/P043/A)

Although the earthworks are substantial in parts of the site it can be seen that 33% of the site is proposed to be altered by greater than 5m in height from the natural ground level. A significant area of the site will have no construction or the earthworks will be under 5m in height. The area affected by excavation dramatically decreases as the height of excavation increases such that only 10% of the site has changes in levels of greater than 20m. Although exceeding the requirements of Section A5 – D6 Site Regrading Code there are no anticipated adverse impacts as a result of the proposed earthworks.

The proposed development and earthworks has been investigated by a specialist consultant LVO Pty Ltd with regard to the visual impact with their findings detailed in their 'Visual Impact Report' which accompanies the Response to Information Request submission. This report has determined that the impact of the development and earthworks will be minimal and is in keeping with the surrounding area and consistent with the intended use of the site.

In terms of geotechnical considerations as a result of the earthworks, the development is overwhelmingly in cut with maximum batters of 1:2, predominately into rock material. There are not anticipated to be any slope stability issues and the earthworks design is consistent with geotechnical reporting over the site. We can not see any engineering issues that would restrict the proposed earthworks being completed.

3.0 ROADWORKS

Access to the proposed development in the short term will be from Fraser Drive. It is proposed to construct a portion of the proposed extension of Kirkwood Road to provide access to the proposed development.

Council has obtained approval for the construction of the Kirkwood Road - Pacific Motorway overpass and Eastern approach works. However, the timing of the construction of the Western approach is uncertain with obtaining funding a key constraint. The proposed site access from Fraser Drive is proposed to be constructed in accordance with Council's design however only a portion of the works will be constructed to accommodate traffic demand for the proposed development. Essentially it is proposed to construct approximately half width of the ultimate design. It is intended that when the full construction is commenced by Council the remaining full width construction works can be completed. Council has indicated that if works (or a portion of the works) were completed to the Council design for the Kirkwood Road extension, the cost of those works would be creditable against the payment of infrastructure contributions for the development.

A future possible connection through to Venture Close and Enterprise Avenue is shown on the plans. This is shown to demonstrate that a connection is possible with the proposed development's design levels, however it is not proposed to construct this road as part of the development works with construction to be restricted to the frontage of the developable area.

A Traffic Report has been completed by CRG addressing access and traffic items associated with the development.

A schematic of the proposed access arrangement from Fraser Drive is shown in Knobel Consulting Pty Ltd, *Temporary Kirkwood Road Access Plan Sheets 1 and 2* (Ref: K1868/P008/A-P009/C) is included in Appendix D.

Internal roadworks are shown in Knobel Consulting Pty Ltd, *Preliminary Roadworks Layout Plan Sheets 1 and 2* (Ref: K1868/P028-P029/C) and *Preliminary Roadworks Longitudinal Sections Sheets 1-5* (Ref: K1868/P030-P034/A) is included in Appendix E.

The road widths have been designed to ensure that a fire truck can traverse the site in accordance with *Planning for Bushfire Protection 2006.* The design has 6 m wide internal roads with trafficable edge restraint increasing the total width to 6.6 m with an 8 m width possible around all corners through the implementation of trafficable 'grass cel' paving blocks outside of the pavement in areas that a fire truck may utilise when turning. An 8m wide fire truck circuit road fronts the vegetated area along the East of the site.

4.0 SEWERAGE

The site is not currently serviced by sewerage infrastructure. The site has a crest that divides the site which runs from the South West to the North East. The highest point is at RL16.6 with the lowest point in the South East of the site at RL 6.6 and in the North West corner at RL5.0. The northern portion of the site has enough fall to implement a gravity sewer system. The southern portion of the site will grade towards a sag in the southern corner where the proposed private pump station will be located. The pump station will be connected to a rising main that will run from the low point and join to the internal gravity system.

Tables 5 below show the proposed development's demand on the sewerage system.

Table 5: Sewer Equivalent Person for Lot Types

Land Use	Total Lots	Dwellings per Lot	Total Dwellings	Loading	Unit Conversion (EP)	EP per Dwelling	Total EP
One Bedroom Dwelling	*71*	*2*	*142*	*0.4*	*3.2*	*1.28*	*182*
One Bedroom Dwelling (RV)	*22*	*2*	*44*	*0.4*	*3.2*	*1.28*	*56*
Two Bedroom Dwelling	*32*	*2*	*64*	*0.6*	*3.2*	*1.92*	*123*
Two Bedroom Dwelling (RV)	*7*	*2*	*14*	*0.6*	*3.2*	*1.92*	*27*
Two Bedroom Dwelling (Alternative)	*16*	*2*	*32*	*0.6*	*3.2*	*1.92*	*61*
One Bedroom Disabled Dwelling	*5*	*1*	*5*	*0.4*	*3.2*	*1.28*	*6*
Two Bedroom Duplex Dwelling	*9*	*6*	*54*	*0.6*	*3.2*	*1.92*	*104*
Communal Facility	*915 m^2*	*1*	*1*	*0.006*	*3.2*	*0.0192*	*18*
							577

Table 6: Planned Sewer Demand for Whole Site

Land Use	Total EP
Whole Site	577

The Sewerage Code of Australia Part 1 has been used to calculate the Design Flow from the proposed development.

Design Flow = Peak Dry Weather Flow (PDWF) + Ground Water Infiltration (GWI) + Inflow and Infiltration (IIF).

PROPOSED DEVELOPMENT

PDWF CALCULATION

Where PDWF = d x ADWF

ADWF = 0.0021 x EP

From the demand from Table 2 above ADWF = 1.21 l/s

The proposed site would fall into the catchment known as 'East of Fraser Drive' that will contribute to Sewerage Pump Station 3022.

$d = 0.01(\log 7.68)^4 - 0.19(\log 7.68)^3 + 1.4(\log 7.68)^2 - 4.66\log A + 7.57$

Based on the site area of 7.68Ha d = 4.42

PDWF = 5.35 L/s

GWI CALCULATION

As the proposed sewer network is not located below the groundwater table or seawater level it is not proposed to include additional allowance for Ground water Infiltration.

IIF CALCULATION

Where IFF = 0.028 x A_{Eff} x C x I

$A_{Eff} = 7.68\ (70.31/150)^{0..5}$

$A_{Eff} = 5.25$

An IIF leakage severity coefficient C of 0.4 has been adopted as the site typically involves substantial cut into the underlying rock strata.

$I_{1,2}$ = 52mm/hr

Factor $_{size}$ = $(40/7.68)^{0.12}$

Factor $_{size}$ = 1.22

Factor $_{containment}$ = 1.3 (assume desirable 5 year ARI overflow event)

I = 52 x 1.22 x 1.3

I = 82.47

IFF = 0.028 x 5.25 x 0.4 x 82.47 = 4.85/s

Design Flow = 5.35 + 4.85 = 10.20 L/s

In discussions with Tweed Shire Council the one in two year containment has also been calculated as being desirable for the network down to the existing pump station.

The proposed development flow from the site using a Factor $_{containment}$ = 1.0 will be equal to 9.08 L/s.

The proposed connection point for the site sewerage is an existing 150 mm diameter line that is located in an easement that runs along Harrier Street. Details of this main are shown below:

Size: 150 mm dia
USIL: RL2.61
DSIL: RL1.81
Grade: 1%

This main drains down the roundabout on Harrier Street where the main increases to a 225 mm diameter to cater for additional flows from the community title development at the corner of Fraser Drive and Harrier Street. Assessment of the 150 mm diameter main down to this point shows a minimum as constructed grade in the receiving network of 1:217.

This network also caters for the existing 32 residential allotments. The existing demand from this catchment has been calculated below:

EXISTING ADJACENT 32 LOT RESIDENTIAL DEVELOPMENT TO THE WEST

PDWF CALCULATION

Where PDWF = d x ADWF

ADWF = 0.0021 x 102.4

ADWF = 0.215 l/s

The proposed site would fall into the catchment known as 'East of Fraser Drive' that will contribute to Sewerage Pump Station 3022.

$d = 0.01(\log 7.68)^4 - 0.19(\log 7.68)^3 + 1.4(\log 7.68)^2 - 4.66\log A + 7.57$

Based on the site area of 3.02Ha d = 5.6

PDWF = 1.20 L/s

GWI CALCULATION

As the proposed sewer network is not located below the groundwater table or seawater level it is not proposed to include additional allowance for Ground water Infiltration.

IIF CALCULATION

Where IFF = 0.028 x A_{Eff} x C x I

A_{Eff} = 3.02 $(33.91/150)^{0..5}$

A_{Eff} = 1.44

An IIF leakage severity coefficient C of 0.4 has been adopted as the site typically involves substantial cut into the underlying rock strata.

$I_{1,2}$ = 52mm/hr

Factor $_{size}$ = $(40/3.02)^{0.12}$

Factor $_{size}$ = 1.36

Factor $_{containment}$ = 1.0 (assume desirable 2 year ARI overflow event)

I = 52 x 1.36 x 1.0

I = 70.72

IFF = 0.028 x 1.44 x 0.4 x 70.72 = 1.14/s

Design Flow = 1.20 + 1.14 = 2.34 L/s

Therefore a maximum flow in the 150mm diameter pipeline in Harrier Street will be 12.54L/s. This would equate to a full depth of flow in the minimum grade pipe (1:214) that exists for a length of approximately 36 metres. We note that this system was designed using previous sizing methods different to that used now which has resulted in a higher design flow.

The 131 three bedroom units community title development joins to the sewer system at the roundabout on Harrier Drive where the main size increases to 225mm diameter. This will add an additional 419.2EP.

EXISTING 131 UNIT COMMUNITY TITLE DEVELOPMENT

PDWF CALCULATION

Where PDWF = d x ADWF

ADWF = 0.0021 x 419.2

ADWF = 0.880 l/s

The proposed site would fall into the catchment known as 'East of Fraser Drive' that will contribute to Sewerage Pump Station 3022.

d = $0.01(\log 7.68)^4$ -$0.19(\log 7.68)^3$ + $1.4(\log 7.68)^2$ – 4.66log A + 7.57

Based on the site area of 4.29Ha d = 5.2

PDWF = 4.58 L/s

GWI CALCULATION

As the proposed sewer network is not located below the groundwater table or seawater level it is not proposed to include additional allowance for Ground water Infiltration.

IIF CALCULATION

Where IFF = 0.028 x A_{Eff} x C x I

A_{Eff} = 3.02 $(97.72/150)^{0..5}$

A_{Eff} = 2.43

An IIF leakage severity coefficient C of 0.4 has been adopted as the site typically involves substantial cut into the underlying rock strata.

$I_{1,2}$ = 52mm/hr

Factor $_{size}$ = $(40/4.29)^{0.12}$

Factor $_{size}$ = 1.31

Factor $_{containment}$ = 1.0 (assume desirable 2 year ARI overflow event)

I = 52 x 1.31 x 1.0

I = 68.12

IFF = 0.028 x 2.43 x 0.4 x 68.12 = 1.85/s

Design Flow = 4.58 + 1.85 = 6.43 L/S

The total flow that will be contributing to the system will be 18.64L/s. The existing 225 mm diameter main connecting the contributing catchments to the pump station can convey the design flow at 65% capacity based on a minimum as constructed grade of 1:333. No as constructed records were available for the

remaining lengths to Pump Station 3022 however on the assumption that grades are not less than the above (which is flatter than the recommended minimum grade in Water Services Association - WSA), the existing network can cater for the development's flows.

There is an existing pump station on Fraser Drive which the will need to cater for the proposed development PWWF. The details of the existing pump station are summarized below as per correspondence with the Tweed Shire Council.

Table 7: Fraser Drive Pump Station Details

Pump Station	SPS3022
Pump Type	Flygt CP3152.181MT 430
Design Duty	55L/s @ 12m head
Well Diameter	3.02 m
Surface Level	2.045 m AHD
Invert Level Depth	4.49 m
Duty Pump Stop Depth	5.215 m
Standby Pump Stop Depth	4.965 m
Duty Pump Start Depth	4.215 m
Standby Pump Start Depth	3.715 m
High Level Alarm Depth	3.465 m
Overflow Depth	0.745 m

Recent pump tests by Council of Pump Station 3022 indicate that Pump 1 is operating at 52.3L/s and Pump 2 at 57.2 L/s.

Preliminary advice from Tweed Shire Council has indicated the theoretical spare PWWF capacity of the pump station is 7 L/s. Therefore, the proposed development demand being 10.20L/s with the application of a containment factor of 1.3, or 9.08L/s with the application of a containment factor of 1.0, indicate the proposed development may exceed the current pump design duty. It is noted however that the above calculations have been completed using the WSA Sewerage Code of Australia method, which typically produce higher flow estimates than those used in Council's current calculations. Further, the proposed development flow rates fall within the Ultimate planned demand for the catchment flowing to pump station 3022.

Further pump tests should be conducted by Council to confirm spare capacity of the pump station and determine if any upgrades are required. There is a section of existing 150 mm diameter main that will be flowing full with the addition of the development flows. This is for an isolated section of the system that was sized using previous design methods.

A preliminary internal sewerage layout and proposed connection point is shown on Knobel Consulting Pty Ltd, *Preliminary Sewer Plan* (Ref: K1868/P016/C) included as Appendix F.

5.0 WATER RETICULATION

A 150 mm potable water supply is located in an easement on the Eastern side of Harrier Street. This main may not be able to service the development as suggested in Table 3.1, *Water Supply Code of Australia, Part 1: Planning and Design*.

Council records show that there is an existing 200 mm water main that runs along the Western side of Fraser Drive. The proposed development will likely need to connect to this main via a new main along the proposed Kirkwood Road extension.

A water network analysis will be required to confirm servicing provision for the site with consideration of the surrounding planned demand for the South Tweed area. The proposed site levels will be lower than the existing subdivision levels to the South West. The maximum proposed ground level for dwellings will

be approximately RL17. This suggests that the water pressure from the existing system will be adequate to service the proposed levels of the new development. A total of 6.12L/s has been calculated for the Peak Demand for the development. Tables 8, 9 and 10 below show the details of the proposed development's demand on the water reticulation system.

Table 8: Water Reticulation Equivalent Person for Lot Types

Land Use	Total Lots	Dwellings per Lot	Total Dwellings	Loading	Unit Conversion (EP)	EP per Dwelling	Total EP
One Bedroom Dwelling	*71*	*2*	*142*	*0.75*	*2.8*	*2.1*	*298*
One Bedroom Dwelling (RV)	*22*	*2*	*44*	*0.75*	*2.8*	*2.1*	*92*
Two Bedroom Dwelling	*32*	*2*	*64*	*0.75*	*2.8*	*2.1*	*134*
Two Bedroom Dwelling (RV)	*7*	*2*	*14*	*0.75*	*2.8*	*2.1*	*29*
Two Bedroom Dwelling (Alternative)	*16*	*2*	*32*	*0.75*	*2.8*	*2.1*	*67*
One Bedroom Disabled Dwelling	*5*	*1*	*5*	*0.75*	*2.8*	*2.1*	*11*
Two Bedroom Duplex Dwelling	*9*	*6*	*54*	*0.75*	*2.8*	*2.1*	*113*
							744

Table 9: Peak Water Reticulation Demand for All Lots

Land Use	Total EP	Density Conversion	Peak Demand
All Lots	744	700L/EP/d	6.02L/s

Table 10: Peak Water Reticulation Demand for Communal Facility

Land Use	Total EP	Density Conversion	Peak Demand
Communal Facility	0.0915	700L/EP/d	0.1L/s

Knobel Consulting Pty Ltd drawing, *Preliminary Water Plan* (Ref: K1868/P017/C) attached as Appendix G shows the proposed connection point and preliminary internal potable water network.

6.0 STORMWATER

Knobel Consulting Pty Ltd has prepared a *Preliminary Stormwater Management Plan* (PSWMP) which details Legal Points of Discharge, stormwater quality and quantity measures. This PSWMP ensures that there will be no increase in peak flows as a result of the development and that water quality treatment devices are implemented to protect the health of downstream receiving waterways.

7.0 ELECTRICAL AND TELSTRA

Electricity and Telecommunications are currently available within Fraser Drive and Harrier Street to service the development. Load requirements and any necessary upgrades will need to be investigated by an electrical consultant as part of the detailed design for the subdivision.

8.0 CONCLUSIONS

This Engineering Report has detailed the existing infrastructure and the impact of the proposed 355 dwelling tourist accommodation development on Council services. This report has demonstrated the ability for the site to be serviced by sewer, water, electricity and telecommunications along with proposed vehicle access. Detailed design and modelling of the services will need to occur at Construction Certificate stage in conjunction with Council to determine if any upgrades are required.

APPENDIX

A

Paul Ziukelis Architects

Site Plan

(Ref: SD-A01/09)

LAYOUT LEGEND

TYPE A	1 BED DWELLING - 2 STOREYS
TYPE RV A	1 BED RV SPACE DWELLING - 2 STOREYS
TYPE B	2 BED DWELLING - 2 STOREYS
TYPE RV B	2 BED RV SPACE DWELLING - 2 STOREYS
TYPE C	2 BED DWELLING (ALTERNATIVE DESIGN) - 2 STOREYS
TYPE D	1 BED DISABLED DWELLING - 1 STOREY
TYPE E	2 BED DUPLEX DWELLING - 3 STOREY
B2	ROOFED REFUSE STORE / PICK-UP

DEVELOPMENT DATA

LOT Type	LOT no.s	Dwellings Per Lot	Total
Type A	71	2	142
Type B	32	2	64
Type C	16	2	32
Type D	5	1	5
Type RV-A	22	2	44
Type RV-B	7	2	14
Type E	9	6	54
		TOTAL	355

TYPICAL BIN ENCLOSURE

RIVER HEIGHTS - TOURIST ACCOMODATION

KIRKWOOD RD, TWEED HEADS NSW

Paul Ziukelis.architects
Phone 55701 388
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PO Box 9208, Gold Coast MC Qld 9726

SITEPLAN

1:1500 @ A3	JUNE 2013	Concept Design	SD - A01	09

APPENDIX

B

Knobel Consulting Pty Ltd

Preliminary Bulk Earthworks Layout Plan Sheets 1 and 2

(Ref: K1868/P018-P019/I)

Preliminary Earthworks Cross Sections Sheets 1-6

(Ref: K1868/P021/D, P022-P024/C), P025-P026/D

High Constraint Area Cross Sections

(Ref: K1868/P039/D)

Existing Surface Slope Analysis Plan

(Ref: K1868/P040/B)

Design Surface Slope Analysis Plan

(Ref: K1868/P041/B) and

Bulk Earthworks Cut and Fill Plan

(Ref: K1868/P043/A)

ISSUE No.	DATE	AMENDMENT
I	29-08-13	NOTE ADDED
H	20-07-12	LAYOUT AMENDED
G	09-07-12	ARCHITECTURAL LAYOUT AMENDED
F	22-05-12	ACCESS TRACKS AND GRASS-CEL ADDED
E	10-05-12	EARTHWORKS SECTIONS ADDED

Knobel Consulting Pty Ltd

KNOBEL CONSULTING PTY LTD

ENGINEERS - PROJECT MANAGERS

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CLIENT: PROPORTIONAL PROPERTY INVESTMENTS PTY LTD

PROJECT: TOURIST ACCOMMODATION
KIRKWOOD ROAD, TWEED HEADS SOUTH, NSW

DESIGN	DRAWN	APPROVED
TP	AA/EL/NF	

TITLE: PRELIMINARY BULK EARTHWORKS LAYOUT PLAN
SHEET 1 OF 2

SCALE 1:500 AT A1, 1:1000 AT A3 (0 10 20 30 40 50m)

PROJECT NO. K1868

DWG NO. P018

ISSUE I

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