



Our Ref: 1731C/PJ/07112014a

7 November 2014

Mr Mike Young
Department of Planning & Environment
GPO Box 39
SYDNEY NSW 2001

Attention: Carl Dumpleton

Dear Mike

Re: Response to Submissions for Proposed Expansion of Tinda Creek Sand Quarry

Submissions were received from:

1. Commonwealth Department of the Environment
2. NSW Department of Planning & Environment
3. NSW Department of Primary Industries
4. NSW Environment Protection Authority
5. NSW Office of Environment & Heritage
6. NSW Department of Trade & Investment (Resources & Energy)
7. NSW Rural Fire Service
8. Hawkesbury City Council
9. Greater Blue Mountains World Heritage Area Advisory Committee
10. Colong Foundation for Wilderness
11. Neville Diamond

Matters raised in each of the submissions are addressed in **Sections 1 to 11**.

1.0 NSW Department of Planning & Environment

Department of Planning & Environment in its submission of 5 September 2014 requested that the proponent prepare a report responding to the submissions received. Responses to the submissions received are provided in **Sections 2 to 11**. In addition the department has requested that further information and clarification be provided in regard to a number of other matters. These are addressed in **Sections 1.1 to 1.6**.

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1.1 Final Landform

As set out in Section 4.15.1 of the EIS, the sensitive nature of the area surrounding Tinda Creek quarry requires a final landform that blends with the surrounding environment and is stable and sustainable in the long term. The design parameters for the conceptual final landform at Tinda Creek take into account the impact of topography on the hydrogeology and ecology of the surrounding landscapes so as to assist in the regeneration of vegetation communities. It was considered that achieving a naturally shaped landform and viable ecological communities would be best achieved by using key characteristics of local drainage systems in the design of the rehabilitated landscape.

To achieve this, the GeoFluv™ approach to innovative landform design has been used for Tinda Creek conceptual final landform using Natural Regrade software. The design has used Natural Regrade software to develop naturally shaped landscapes that are stable against erosion, enable sustainable land development and in turn promote biodiversity.

Historically post quarrying and mining landforms have been designed to be linear or regular surfaces based on maximum permissible slope angles and lengths, or a subjective assessment of a landform that is considered to blend in with the environment. By contrast, natural landforms are driven by fluvial geomorphic principles, with the erosive forces of water shaping the landscape until it is in a stable hydrologic equilibrium. Natural systems are typically dendritic, stream gradients flatten moving downstream, and the creeks are compound in nature, using the flood plain to manage more extreme flood events.

Understanding the natural systems and landscapes that are relevant to the site is the first step in final landform planning, bearing in mind that the soils and vegetation on rehabilitated areas will generally be different to those in the natural creeks system.

Natural Regrade® creates a landscape design that mimics the functions of the natural landscape at the site that would evolve over time under the physical and climatic conditions present at the site. This enables the water and sediment from the land surface to be conveyed in a stable hydrologic equilibrium.

The essence of the approach is to identify the type of drainage network i.e. stream channels and valleys, which would tend to form over a long time given the site's earth materials, relief and climate to achieve a stable landform, and to design and build that landform. This tends to be very much based on the range of forms of the existing channels and drainage lines on-site and in the surrounding area. In designing the landform, the resulting slopes and stream channels are designed using Natural Regrade software to be in balance with these conditions and therefore stable. The Natural Regrade design process allows an alternative to uniform slopes with terraces and down-drains.

In planning the final landform, the following aspects were considered:

- The overall gradient from the lower (western) end of the proposed extraction area up to the north-eastern corner (Domain 3) or south-eastern corner (Domain 7) of the proposed quarry area is approximately 1%, that is, 1 metre vertical fall for every 100 metres measured horizontally. However, the overall slope is typically concave with flatter gradients of 0.5% just upslope of where Tinda Creek flows under Putty Road.
- Slopes over the area proposed for extraction are typically around 5%, but with some localised steeper slopes of up to 20%. The steeper slopes are typically found on the weathered residual sandstone material.
- It was noted that there are no well defined natural creek lines over the proposed extraction area, with wide and flat profiles in the clayey sand alluvium and very natural limited channel development over the weathered residual material.
- Excavated faces within the extraction area are inherently stable, with near vertical faces remaining intact for extended periods of time. The stability of the excavated faces is due to the clayey content of the materials, and competent nature of the weathered residual material.

It is estimated that between 1.5 million tonnes and 4 million tonnes of ENM and VENM will be back loaded to the site and will be incorporated into the final landform. The volume that will be back loaded will depend on market conditions over the next 30 years and therefore the final landform design needs to provide for between 1.5 million tonnes and 4 million tonnes being incorporated into the landform.

Characteristics of the natural landform that are taken into consideration in using Natural Regrade software for the design process include the drainage density, the sinuosity of creek lines, typical distances from ridge lines to the start of creek lines, and various other parameters.

Analysis of the natural landforms surrounding the project area resulted in the development of the following key design parameters for use in Natural Regrade[®] software as listed in **Table 1**.

Table 1 – Natural Regrade Key Design Input Parameters

Parameter	Input Units	Input Value
Maximum North or East Line Slope	%	20
Maximum Straight Line Slope	%	33
Target Drainage Density	m/Ha	60
Target Drainage Density Variance	%	20
A-channel Reach	m	30
Maximum distance from ridgeline to channel's head	m	30
2-year, 1 hour storm	mm	28.5
50 year, 6 hour storm	mm	122.4

For Tinda Creek the software package Natural Regrade[®] has been used to generate profiles and landforms that emulate key characteristics of the natural catchment as set out in **Table 1**. The programme uses the 2 year and 50 year flood events to assist with flow computations, and simplifies some of the complex calculations associated with non-linear landforms.

The overall shape of the conceptual final landform for the site was then designed using a free-draining profile. To provide flexibility in regard to the volume of ENM and VENM that is back loaded to the site, the free draining landform was then modified to include ponds, ensuring that the pond extents were consistent with the parameters of the existing approval. Outside of the pond areas there were no modifications made to the shape of the Natural Regrade[™] designed landform to ensure the integrity of the design process was maintained.

Using these parameters, a final landform envelope has been developed for Tinda Creek quarry which provides for a final landform that can be varied depending on how much ENM and VENM is back loaded to the site by varying the size and the depth of the ponds.

Perspective 3D views of the conceptual final landform including ponds for extraction within Domain 3 and Domain 7 are shown in Figures 4.10a and Figure 4.10b of the EIS respectively. Plan views of the Domain 3 extraction and Domain 7 extraction conceptual final landforms are shown on **Figures 1 and 2** respectively.

The final landform has been designed to comprise a series of ponds and naturally graded drainage channels. The system has also been designed to minimise the potential for sediment export off-site and to provide a stable landform in the long term that reflects the existing landform of the area surrounding the project.

The extraction of sand is a highly dynamic and variable activity, and the actual rate of production and the availability of VENM and ENM over the life of the Project will be influenced by several factors ranging from the actual geology to market conditions. As discussed it is anticipated that between 1.5 million tonnes and 4 million tonnes of ENM and VENM will be back loaded to site over the life of the quarry.

Key aspects of conceptual landform design developed for Tinda Creek are:

- The design is flexible, in response to the variability of the final voids, which is dependent on the final quantity of material imported to the site over the life of the Project. Side batters of the residual ponds below top water level will be no steeper than 1 Vertical in 3 Horizontal with areas shaped with batters of 1 Vertical in 4 Horizontal or flatter to enable access for animals and humans.
- As far as is practical, the transitions from undisturbed land to rehabilitated areas will be smooth, and will be designed using Natural Regrade or similar procedures to derive a landform that is consistent with the slopes of the surrounding existing landform.
- The conceptual final landform has been designed to have a gradual transition on the main drainage line involving slopes not exceeding 3%, flattening out to very flat slopes of 0.2% just upslope of Putty Road. The use of convex profiles that become flatter with increasing catchment area is a key component of the design.
- Although designed to limit the risk of erosion within alluvial materials, the transitions into and out of the ponds within the rehabilitated landform will involve a change in grade and may require some additional erosion protection in the initial stages when the ponds are not full.
- Two options exist for the voids remaining within the rehabilitated landscape within Domain 6 and Domain 1. These are either:
 - off channel voids or impoundments, with the primary drainage line connecting to the existing Tinda Creek watercourse that is located immediately north of the voids. This will reduce the catchment to the voids and potential changes to flows in Tinda Creek. This could be readily achieved once the existing dredge pond is back filled sufficiently to free draining to the Tinda Creek and drainage lines have been revegetated and stabilised; or
 - in channel voids or impoundments that would fill with water over time and would overspill back to Tinda Creek just upslope of Tinda Creek culvert on Putty Road. This option, if it was to be adopted would be best implemented when dredging in Domain 6 and Domain 1 was completed and the ponds were backfilled to the final level that would be achieved over the life of the quarry. It is envisaged that until this time, surface drainage would be in accordance with Option 1. A variation on this once dredging has ceased would be to establish the drainage in accordance with Option 1 with a weir or high level overflow structure in the drainage line that allowed flows into the voids in Domain 6 and Domain 1 during periods of high flow.
- It should be noted that the flat profile of the rehabilitated landscape is intended to cater for the scenario where only the minimum volume of VENM and ENM imported to the site. Some localised ponding and sediment collection can be expected on these lower gradients, however, they correspond to the areas targeted for the main ponds.
- If substantial amounts of ENM/VENM are available during the life of the quarry, the landform can be reshaped to a free draining system with limited ponds along the alignment of drainage system.

It is proposed that the western dredge pond (Domain 1) will be left open to provide an accessible water resource for ongoing fire-fighting purposes. This pond will effectively replace the existing dredge pond which has been used by Rural Fire Service for fire fighting purposes in the past. The final landform will have an open water pond area of 16 hectares or less with the ultimate size of the ponds depending on the volume of ENM/VENM that is back loaded to the site.

If quarrying is undertaken in Domain 3 rather than Domain 7, it is proposed that quarrying would progress from the existing dredge pond to Domain 6 and Domain 2, followed by Domain 1. Once dredging is completed in Domain 1, the dredge would be disassembled and moved to Domain 3 which would be the last area to be quarried. As shown on Figure 4.10a and **Figure 1**, ponds would be created in Domain 6 and Domain 1, with the Domain 3 progressively backfilled to form a valley that drained to a pond within the existing quarry area. The pond within the existing quarry could be shaped to either discharge to the existing alignment of Tinda Creek or

overflow to the pond in Domain 6. The size and depth of the ponds would be varied depending on the volume of ENM and VENM that is back loaded to the site.

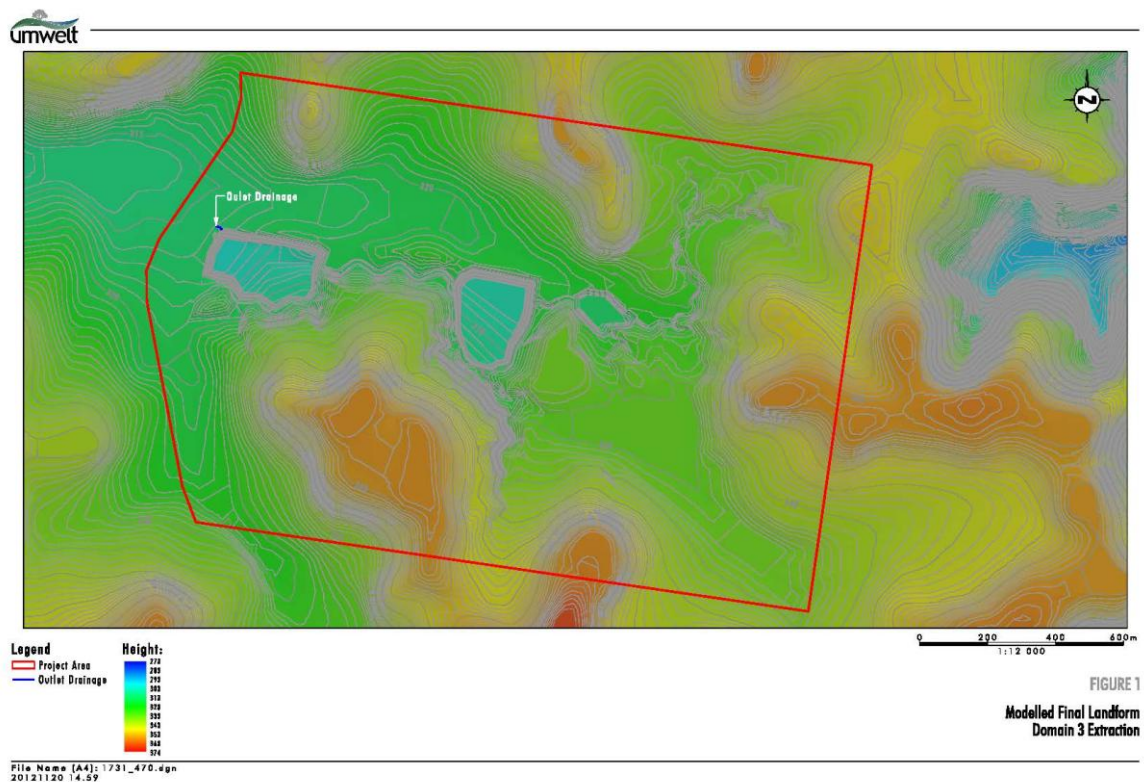


Figure 1 – Modelled Final Landform Domain 3 Extraction

If quarrying is undertaken in Domain 7 rather than Domain 3, it is proposed that quarrying would progress from the existing dredge pond to Domain 7 which would be the progressively back filled using silt and clay from the dredging operation and ENM and VENM to form a central valley. Quarrying would move from Domain 7 to Domain 6 and Domain 2, followed by Domain 1 from where the dredge would be disassembled and decommissioned. As shown on Figure 4.10b and **Figure 2**, ponds would remain in the existing quarry area and in Domain 6 and Domain 1. The size and depth of the ponds would be varied depending on the volume of ENM and VENM that is back loaded to the site. If sufficient ENM and VENM are available, the pond within the existing extraction area would be progressively backfilled to form a free draining landform. If further ENM and VENM are available the size of the ponds in Domain 6 and Domain 1 would be reduced.

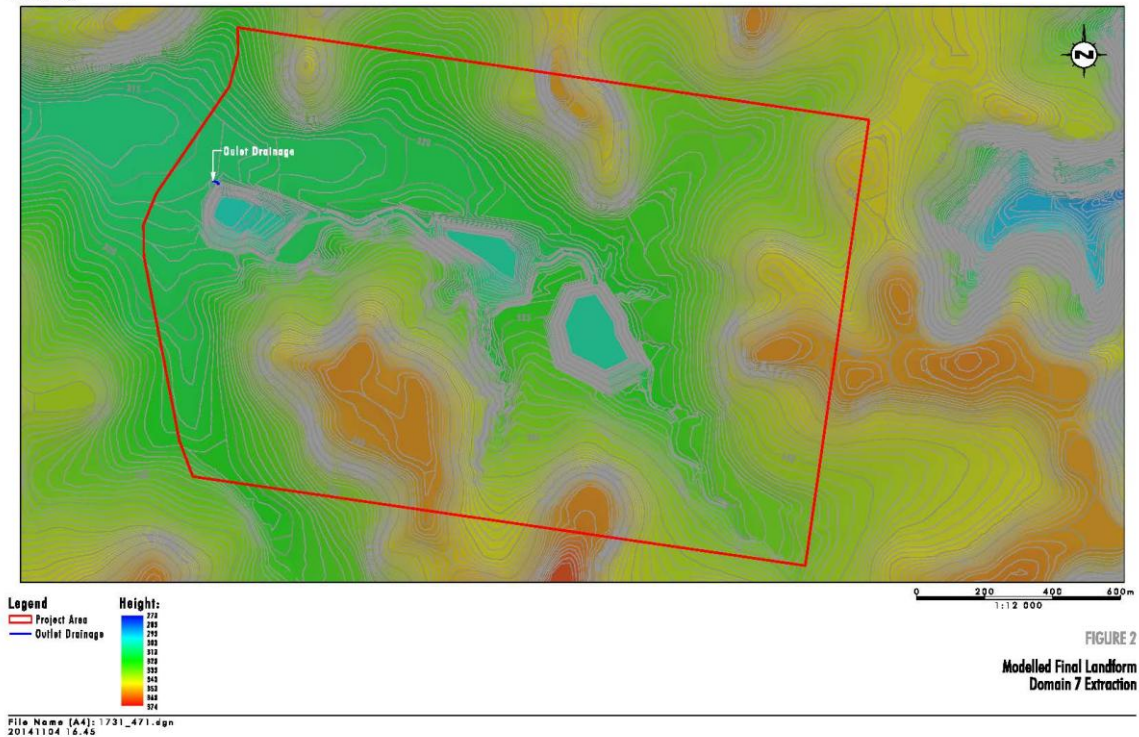


Figure 2 – Modelled Final Landform Domain 7 Extraction

It is proposed that the final alignment of Tinda Creek will follow the alignment of the Southern Diversion as shown on Figure 4.3b of the EIS and then follow the existing alignment of Tinda Creek from the Southern Diversion west leaving those parts of the central (existing quarry) and western ponds (Domains 6 and 1) that have not been backfilled as off line storages.

As discussed above, flexibility has also been provided in the conceptual final landform design if sufficient material is available for back loading to the site, for the final alignment of Tinda Creek to flow through the central and western dredge ponds once the site is rehabilitated and stabilised.

The extent of backfilling within Domain 6, Domain 1 and the existing quarry area will be dependent on the amount of ENM and VENM that is back loaded to the site over the next 30 years.

The backfilling and rehabilitation process will be undertaken as described in Section 4.15.1 of the EIS and will be regularly reviewed and revised in accordance with the Natural Regrade design principles set out above. Progress and any revisions to the design will be reported as part of annual reporting for the quarry.

A detailed final landform and closure plan will be developed at least 2 years in advance on planned closure of the quarry. At the completion of extraction operations all equipment, materials, hardstand areas and infrastructure other than roads and dams will be removed. The area from which the material has been removed will then be ripped to a depth of approximately 0.5 metres to reduce compaction and increase infiltration capacity. The area will then be planted with either pasture or native tree and shrub species depending on what the intended ongoing land use will be at the time of quarry closure. A detailed Landscape and Vegetation Management Plan outlining the species to be planted and the planting and maintenance regime will be submitted as the final land use is determined and at least six months prior to the planned closure of the quarry.

It is envisaged that reshaping and replanting of the final landform will take approximately two years to complete after extraction has ceased. The reshaped quarry will be maintained for a further period of five years to ensure that a stable and self sustaining native vegetation cover is achieved.

1.2 Gibba Swamp

As shown on **Plate 1** which is an excerpt below from Figure 1.1 of 'Results of Ecological Condition Assessment and Monitoring, Tinda Creek' (Umwelt May 2008), there is a large swamp (denoted Site 8 at its western end on **Plate 1**) approximately 2 kilometres by road north of the quarry entrance off Putty Road. This swamp is sign posted on Putty Road as Gibba Swamp whereas the signposting on the creek crossing just north of the quarry entrance says Tinda Creek. In regard to Site 8, Umwelt (2008) states:

Directly above the culvert under Putty Road at Site 8, the tributary comprises a broad open channel densely vegetated with emergent macrophytes such as cumbungi (*Typha orientalis*) as well as a diversity of introduced plant species. No substantial build-up of sediment was observed at the culvert. Approximately 200 metres upstream of the culvert the channel becomes more defined and is drier, the vegetation is more complex and there are fewer introduced species. The floodplain of the channel is characterised by a sedgeland similar to that occurring at Sites 1 and 2. It is estimated that this sedgeland occupies an area of approximately 80 hectares.

The sedgeland shown to the east of Site 8 on the excerpt below is extensive (80 hectares) and is believed to be the Gibba Swamp referred to in ecology surveys of the area not the area immediately downstream of the Tinda Creek culverts on Putty Road as shown on the Land and Property Information 1:25,000 series topographic series maps which form the base data for the excerpt shown in **Plate 1**.

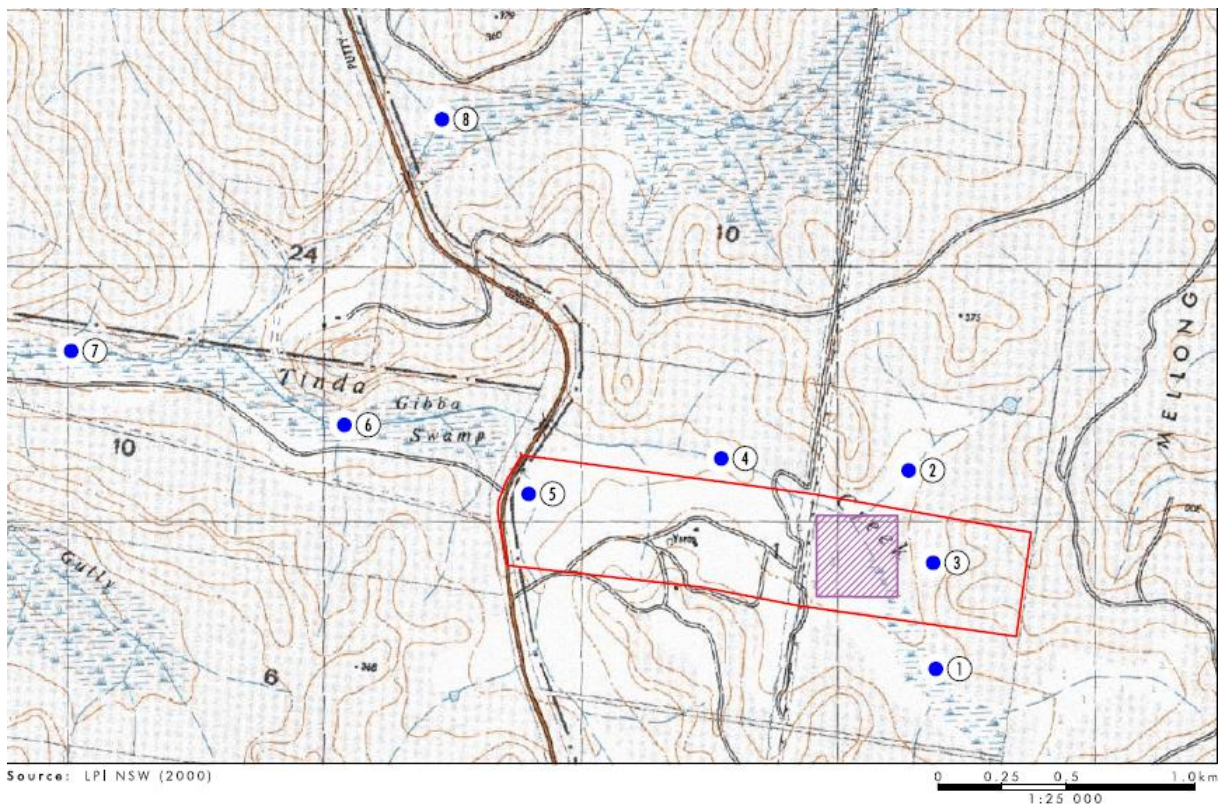


Plate 1 – Drainage and Swamps Near Tinda Creek Quarry

1.3 Site Water Balance

The quarry operates a closed water management system that comprises a series of dredge ponds from which sand is extracted as slurry containing approximately 40% sand/silt/clay and 60% water. The slurry is then pumped at a rate of approximately 1200 m³/hour to the processing plant. The sand is separated from the silt, clay and water using a cyclone. Sand is stockpiled and excess water from the stockpiles drains back to the dredge pond.

With the sand removed the remaining silt, clay and water slurry is then piped from the cyclone to a silt pond where the silt and clay settles. Water pumped to the silt pond drains back to the dredge pond within a few hours. Sand exported from the site contains approximately 4% to 5% moisture which at a production level of 125,000 tonnes per year equates to a net export of water from the site of approximately 6 ML/year. An additional 8 ML per year to 10 ML per year is required for dust suppression.

The dredge pond is typically 6 metres or more deep and occupies an area of approximately 3.5 hectares. As a result the pond contains in excess of approximately 200 ML (200,000 m³) of water. During wet periods runoff from the closed water system catchment flows to the dredge pond which has a surcharge capacity of approximately 280 ML. This is the equivalent to the volume of runoff from approximately 2 metres of rainfall.

Assuming it takes 4 hours for water pumped from the dredge pond as a slurry to drain back to the dredge pond from the silt pond, the volume of water required to sustain the pumping component of the dredging process would be approximately 2880 m³ (i.e. 1200 m³*60%*4 hours) or approximately 0.14% of the volume of water in the dredge pond. It should be noted that the dredge only operates approximately 8 to 10 hours per day meaning that any surplus water temporarily contained in the silt pond would drain back to the dredge pond over night.

The existing quarry closed water management system has a catchment area of approximately 22 hectares of which approximately 6.2 hectares is dredge pond and silt pond/sediment dam. As set out in Table 4.14 of the EIS, annual rainfall during dry and wet years ranges from approximately 400 mm/year to approximately 900 mm/year with average annual rainfall approximately 650 mm/year. The percentage of annual runoff draining to the dredge pond would range from approximately 20% during dry years to 40% in average rainfall years to in excess of 60% during wet years with runoff equalling 100% of rainfall onto the surface of the dredge pond and silt pond during dry and wet periods.

Based on the above assumptions, annual surface runoff to the dredge pond in a dry year (i.e. 400 mm of rainfall) would be approximately 38.4 ML. Annual evaporation from the pond surface at the quarry site is estimated to be approximately 1050 mm/year or approximately 65.3 ML from the surface of dredge and silt ponds. On this basis during a dry year there would be a net water loss from site storage of approximately 42.9 ML (i.e. 26.9 ML net evaporation loss, 6 ML in product export and 10 ML dust suppression). This would equate to a reduction in dredge pond level of approximately 1.2 metres.

During an average rainfall year (i.e. 650 mm of rainfall) it is estimated inflow to the existing dredge pond would be approximately 82.5 ML. Taking into account evaporation from dredge ponds and silt ponds of 65.3 ML/year, 6 ML/year of water exported in product and 8 ML/year used for dust suppression, net water make in the dredge pond during wet year would be approximately 3.2 ML.

During a wet year (i.e. 900 mm of rainfall) it is estimated inflow to the existing dredge pond would be approximately 142.2 ML. Taking into account evaporation from dredge ponds and silt ponds of 65.3 ML/year, 6 ML/year of water exported in product and 8 ML/year used for dust suppression, net water make in the dredge pond during wet year would be approximately 62.9 ML which is approximately 22% of the typical available surcharge capacity of the pond of 280 ML.

As quarrying progresses, the dredge pond and silt pond area will increase to approximately 16 hectares. The volume of water stored in the dredge pond and silt pond is likely to increase over the 30 year operation life from the current volume of approximately 200 ML to approximately 500 ML with the dredge pond and silt pond having a surcharge capacity of in excess of 300 ML. The catchment area of the closed water management system will increase to approximately 40 hectares. As the quarry reaches full production of 300,000 tonnes per

year, water exported in product will increase to approximately 14.4 ML/year and dust suppression will remain at approximately 8 ML to 10 ML/year.

During a dry year (400 mm of rainfall) annual surface runoff to the dredge pond would be approximately 85 ML and annual evaporation would be 168 ML/year. On this basis during a dry year there would be a net water loss from site storage of approximately 99 ML (i.e. 83 ML net evaporation loss, 14.4 ML in product export and 10 ML dust suppression). This would equate to a reduction in dredge pond level of approximately 0.62 metres.

During an average rainfall year (650 mm of rainfall) annual surface runoff to the dredge pond would be approximately 166.4 ML and annual evaporation would be 168 ML/year. On this basis during an average year there would be a net water loss from site storage of approximately 24 ML (i.e. 1.6 ML net evaporation loss, 14.4 ML in product export and 8 ML dust suppression). This would equate to a reduction in dredge pond level of approximately 0.15 metres.

During a wet year (i.e. 900 mm of rainfall) it is estimated inflow to the dredge pond would be approximately 274 ML. Taking into account evaporation from dredge ponds and silt ponds of 168 ML/year, 14.4 ML/year of water exported in product and 8 ML/year used for dust suppression, net water make in the dredge pond during wet year would be approximately 83.6 ML which is less than 28% of the available surcharge capacity of in excess of 300 ML.

Based on the above and taking into account that the site currently holds groundwater licenses permitting extraction of up to 55 ML/year, it is considered that there will be sufficient water available on-site and storage capacity to meet the operations needs of the quarry during dry and wet periods over its proposed 30 year life.

1.4 Surrounding Groundwater Bores

As shown on **Plate 2** which is extracted from the NSW Natural Resources Atlas, there are 7 registered groundwater bores in proximity of Tinda Creek quarry. Bores labelled 1 to 4 (GW 110882, GW 110881, GW 110879 and GW 110880 respectively) on **Plate 2** are quarry production bores. The bore labelled 5 (GW 071916) is located off Slip Rails Trail approximately 2.7 kilometres from the western extent of the proposed quarry. Bores labelled 6 (GW 104020) and 7 (GW 111885) are located approximately 1.5 kilometres west of the proposed quarry extension.

Table 2 – Groundwater Bore Details

Bore Number	Plate 2 Label	Final Depth	Standing Water Level (metres Below Ground)	Yield (L/s)
GW 110882	1	40	N/A	N/A
GW 110881	2	10	N/A	N/A
GW 110879	3	90	18	4
GW 110880	4	120	N/A	3.5
GW 071916	5	114.50 m	21	1
GW 104020	6	61	N/A	N/A
GW 111885	7	72	28	2.5

From the available groundwater bore information, the regional groundwater level is between 18 and 28 metres below the ground surface with the greatest yield coming from the two production bores at the quarry site (GW 110879 (4 L/s) and GW 110880 (3.5 L/s)). Groundwater bore GW 111885 which is approximately 1.5 kilometres west of the proposed quarry has a reported standing groundwater level of 28 m below ground level and a yield of 2.5 L/s. No ground water level or yield information was available for groundwater bore GW 104020 indicating that it is possibly dry. Groundwater bore GW 071916 is approximately 2.7 kilometres west of the proposed quarry, has a reported standing groundwater level 21 metres below ground level and a low yield of 1 L/s.

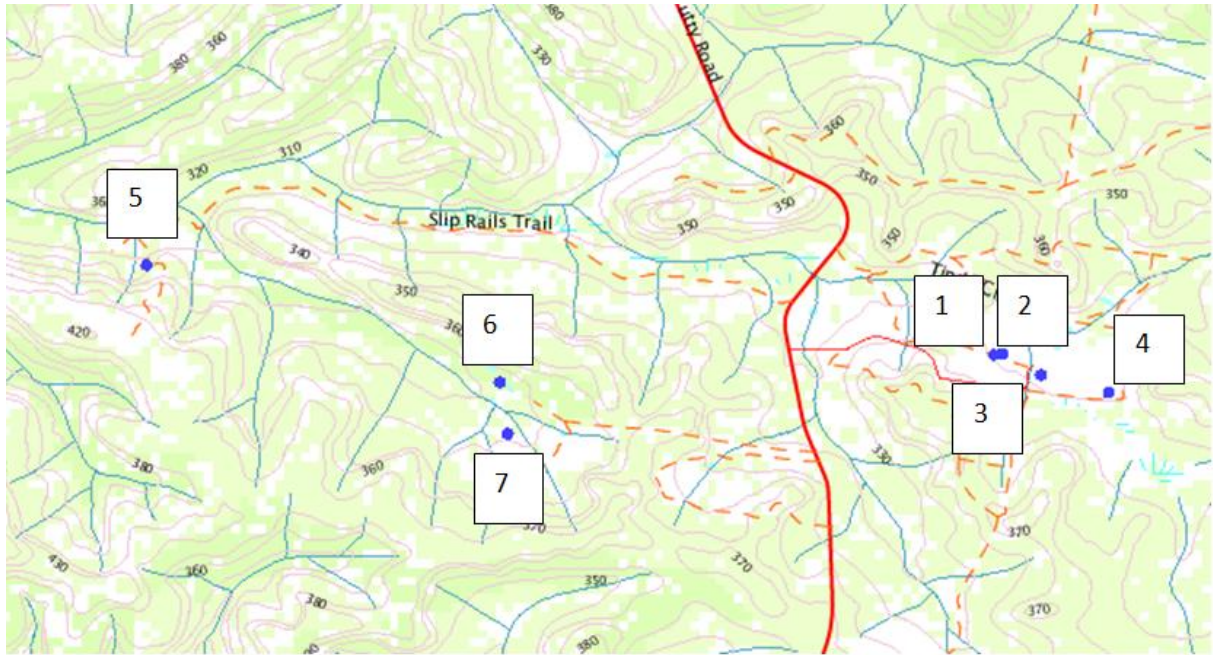


Plate 2 – Groundwater Bore Locations

Groundwater bores GW 071916, GW 104020 and GW 111885 are in a different catchment to the quarry operations on Tinda Creek and upstream of the confluence of Rising Fast Gully (see **Figure 3**) with Tinda Creek and are therefore unlikely to be influenced by the minor changes in flow that are predicted for Tinda Creek.

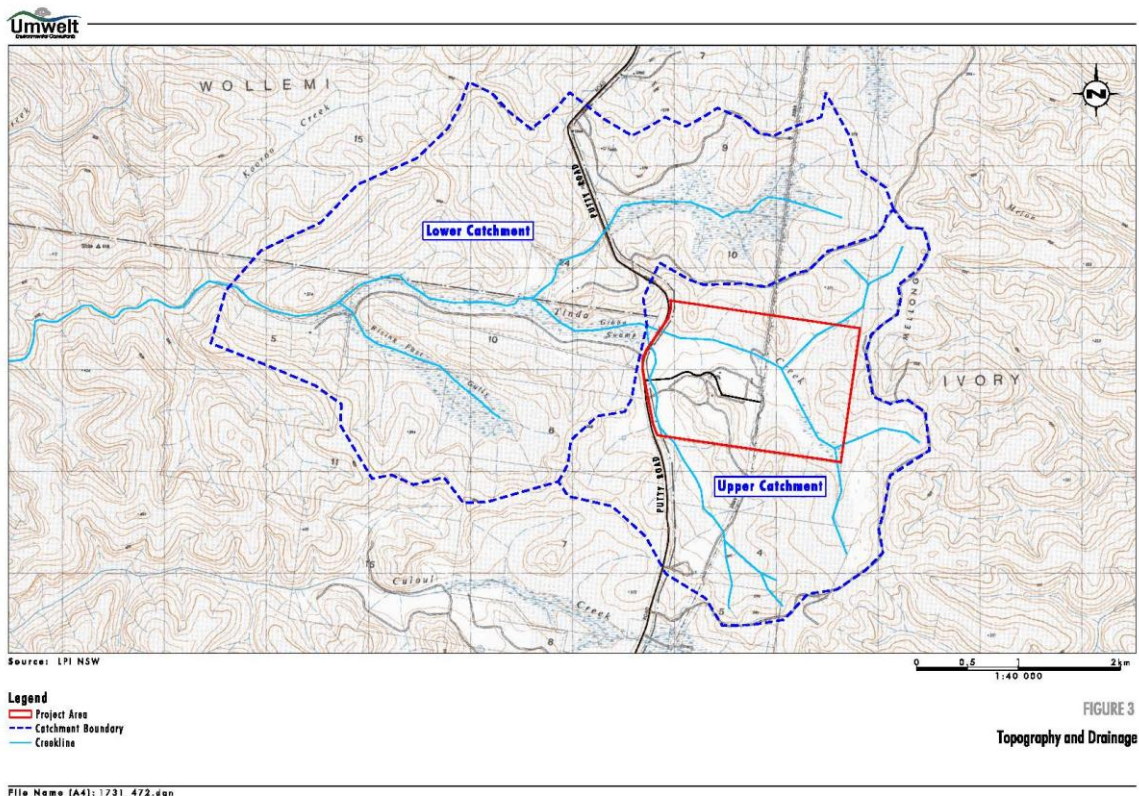


Figure 3 - Topography and Drainage

Based on the groundwater modelling provided in Figure 4.7 of the EIS, these bores are outside the zone of influence of the quarry and not expected to be impacted by quarry operations which will be confined to the lower permeability alluvium associated with Tinda Creek.

1.5 Surface Water Catchment and Changes to Catchment Yield

The Upper catchment shown on **Figure 3** has an area of 870 ha at Putty Road with average annual runoff of 785 ML/yr (assuming annual runoff off 0.9ML/ha (DNR Farm Dams calculator). From Table 4.3 (2nd) of Appendix 4 of the EIS reduction in base flow (groundwater flow) to the Upper catchment of Tinda Creek during an average rainfall year is 8.9 ML (70.3 ML – 61.4 ML) if Existing and North Pits are backfilled or 7.4 ML if Existing, Central and North Pits are backfilled. This equates to approximately 0.9% to 1.1% of flow in Tinda Creek.

The total catchment (Upper and Lower) which extends approximately 4.5 kilometres downstream of Putty Road as shown on **Figure 3**, has an area of 2320 ha with average annual runoff of 2090 ML.

From Table 4.3 (2nd) of Appendix 4 of the EIS reduction in base flow (groundwater flow) to the total catchment of Tinda Creek during an average rainfall year is 10.4 ML (118.9 ML – 108.5 ML) if Existing and North Pits are backfilled or 8.8 ML if Existing, Central and North Pits are backfilled. This equates to approximately 0.4% to 0.5% of annual flow in Tinda Creek at this location.

As can be seen from these calculations the percentage impact on annual flows is halved by the time the catchment area increased from 870 ha to 2320 ha (i.e. by 4.5 kilometres downstream). At the confluence of Tinda Creek and Mellong Creek which is approximately 10 kilometres downstream of Putty Road, the catchment area has increased to approximately 17,000 ha. At this point the average annual runoff would be approximately 15,300 ML. At this location the predicted reduction in average annual flow would be reduced to 0.07% of catchment flow.

Groundwater modelling that has been done for this project takes evaporation from the pit into consideration but does not include water used for dust suppression or lost in product which is estimated to be less than 16 ML/year for the existing operation. At maximum proposed production of 300,000 tonnes per year water

exported in product and used for dust suppression is estimated to increase to 22.4 ML/year to 24.4 ML/year approximately.

Water demand for processing and dust suppression can be met from surface runoff from the closed water management system and groundwater licences held by the quarry and represent approximately 0.16% of the average annual flow in Tinda Creek downstream of its confluence with Mellong.

Combined reductions in baseflow and estimated water demand at maximum production discussed above would result in reduction in average annual flow in Tinda Creek at its confluence with Mellong Creek of approximately 0.23%.

1.6 Revised Locality and Regional Maps

As requested Figure 1.1 Regional Map included in the EIS has been revised and a provided as **Attachment A**.

2.0 Department of the Environment

Department of Environment in its response of 2 September 2014 stated that its main concern was the adequacy of the assessment of indirect impacts on *Grevillea parviflora* and the detail of the information provided on erosion control. The department also requested information on management of the proposed offset sites and confirmation that the proposed tenure of offset for Domain 3 would be accepted by NSW Government.

It is proposed that indirect impacts on *Grevillea parviflora* will be avoided by establishing a suitable buffer distance between the disturbance area and known plant locations which have been mapped using GPS. The distance between disturbance areas and plant locations will be mapped as part of delineating the buffer area. This information will be shown on a detailed Soil and Water Management Plan that will be prepared and submitted to DP&E for approval prior to commencement of any works within Domain 3 or Domain 7 whichever is to be quarried. The minimum buffer distance between the quarry and known plant locations will be 10 metres with the final width being determined by detailed survey of the site.

A detailed management plan for the offset areas will be prepared in consultation with relevant agencies and will be submitted to DP&E for approval. The plan will detail ongoing weed management controls, funding, extent of clean up works and rubbish removal to be undertaken and mechanisms for ensuring that the offset area is appropriately protected and not subject to future development activities.

3.0 NSW Department of Primary Industries

3.1 Fisheries NSW

In its submission of 2 September 2014, NSW Fisheries stated that it had no objections provided sediment and water quality controls are conducted as proposed.

3.2 NSW Office of Water

NSW Office of Water raised a number of matters in its submission. These are discussed in **Sections 6.3.1 to 6.3.6** below.

3.2.1 Surface and groundwater Usage

NSW office of Water requested clarification as to the volume of surface and groundwater that will be taken, volumes to be licensed and baseflow losses. This is addressed in **Sections 1.3 to 1.5** above.

3.2.2 Aquatic Ecology

The eight aquatic survey reference sites established in 2007 and discussed in NSW Office of Water's submission are shown on **Plate 1**. The site is located at the top of Tinda Creek catchment. Creek and drainage lines on the site and the surrounding area are intermittent and flow for very short durations after rainfall. As a result, there

is limited aquatic habitat on the project area with the swamp and sedgeland areas also drying out during periods of low rainfall.

As set out in 'Results of Ecological Condition Assessment and Photo Monitoring, Tinda Creek' (Umwelt May 2008) and in Appendix 7 of the EIS, Site 8 (see **Plate 1**) which is approximately 2 kilometres north of the quarry site and outside of Tinda Creek catchment was used as a reference site. Analysis showed no significant variance between similar habitats surveyed in Tinda Creek and Site 8 (Gibba Swamp).

A copy of 'Results of Ecological Condition Assessment and Monitoring, Tinda Creek' (Umwelt May 2008) has been provided to DPE separately to this response. The results of the 2011 aquatic survey monitoring are included in Appendix 7 of the EIS.

3.2.3 Groundwater Dependent Ecosystems

NSW Office of Water has requested additional information in regard to Groundwater Dependent Ecosystems on and adjacent to the project area. As set out in Appendix 7 of the EIS, Mellong Sandmass Swamp Woodland and Mellong Sandmass Sedgeland occur within the project area. Extensive field surveys of these areas were undertaken as part of the numerous ecological surveys that have been undertaken for this project. During the course of these field inspections, close attention was given to the condition and status of the swamp and sedgeland vegetation immediately adjacent to the existing quarry operations which was then compared with the condition and status of the swamp and sedgeland vegetation away from the quarry. The entire swamps and sedgelands on the site were inspected and no discernible change in the condition or status of the vegetation could be detected.

As discussed in the EIS and in **Section 1.4** above the regional groundwater table is approximately 15 to 30 metres below the ground surface and unlikely to have any real influence on the shallow rooted vegetation observed in the swamp and sedgelands on the site. Field observations at the site over a number of years have confirmed that groundwater or moisture in the upper metre or so of the organic clayey soil on which the swamps and sedgelands have established, is derived from rainfall, surface runoff and shallow seepage from the surrounding sandstone ridges. Typically after wet periods the upper metre or so of the soil profile can be very moist to saturated, with the soil profile at depths greater than approximately 1 metre typically much drier.

As a result any drawdown of the regional aquifer that may occur as a result of quarry activities is unlikely to impact on moisture availability to swamp and sedgeland vegetation. This is consistent with the ecologists who undertook the field surveys observations, that showed no difference in the swamp and sedgeland vegetation adjacent to the quarry areas where an impact would otherwise be expected and further from the quarry where no or minimal impact would be expected.

In addition, detailed groundwater modelling undertaken for the project indicates that quarrying is unlikely to have a significant impact on regional groundwater levels outside the project area including the areas to the west of Putty Road.

3.2.4 Groundwater Monitoring

NSW Office of Water requested clarification as to future groundwater monitoring. As stated in Section 4.9.3.5 of the EIS additional bores will be established towards the western boundary of the site and north east corner of the site.

Two additional monitoring bores will be established on the western boundary of the site. One adjacent to western boundary of the proposed Domain 1 dredge pond and immediately to the west of drill hole TP 31 (see Figure 4.7 of the EIS) with an additional bore approximately 30 metres further due west of Domain 1 pond between the dredge pond and Putty Road.

In addition, if Domain 3 is extracted and not part of the biodiversity offset area, two additional bores will be established with one adjacent to the northern boundary of Domain 3 Extraction area and the second approximately 30 metres north. If Domain 3 is not quarried, no additional bores will be established in this area as the existing groundwater bores TP 20 and TP 21 (see Figure 4.7 of the EIS) will be able to be used to monitor changes in groundwater level in this area as a result of quarrying.

Groundwater quality information is provided as part of the Annual Report for the quarry. Copies of the Annual Reports have been provided separately to DPE.

3.2.5 Backfilling with ENM and VENM

NSW Office of Water in its submission recommended that a consent condition or commitment be placed on the applicant that requires to backfill the site with sandstone, siltstone and clay shales from across the Sydney Basin. This is accepted by the applicant.

3.2.6 Rehabilitation of Watercourses and Final Void

NSW Office of Water in its submission raised matters in regard to impact on downstream watercourses as a result of quarrying in Domain 3. It is proposed that Domain 3, if quarried will be backfilled to be free draining and as far as possible to replicate existing alignment.

NSW Office of Water also recommended that rehabilitation of watercourses be done in a way that mimics natural systems in the area. This is consistent with the Natural Regrade approach that has been used to develop conceptual landform designs for the quarry as discussed in **Section 1.1** and the EIS.

Additional information in regard to rehabilitation of the final void and water courses as requested by NSW Office of Water is provided in **Section 1.1**.

3.2.7 Statement of Commitments

NSW office of Water in its submission raises a number of suggested conditions in regard to the following:

- Environmental Management, Monitoring and Reporting
- Ecology
- Surface Water and Groundwater
- Rehabilitation and Closure

It is suggested that the requirements raised in regard to the above matters are interlinked and could be incorporated into a Landscape and Vegetation Management Plan that guided future rehabilitation of the quarry site and the management of biodiversity offset areas.

4.0 NSW Environment Protection Authority

EPA in its submission dated 20 August 2014 states that it has reviewed the information provided and is able to issue a licence variation for the proposal subject to conditions as provided in Attachment A to the submission.

The proponent has reviewed the conditions and notes the proposed condition regarding waste not allowing waste generated outside the premise to be brought to the site. The proponent notes that the development involves the ongoing back loading of ENM and VENM as part of rehabilitation but understands that this would not be restricted by the proposed waste condition.

On this basis all proposed conditions as set out in Attachment A to EPA's submission are agreed to by the proponent.

5.0 NSW Office of Environment & Heritage

In its submission dated 26 August 2014, NSW Office of Environment & Heritage raised a number of matters. The matters raised are set out in bold italics with responses provided in the following section in plain text.

5.1 Biodiversity

Adequacy of Assessment

The Environmental Impact Statement (EIS) states that no Endangered Ecological Communities (EECs) were identified within the project area. However, the Ecological Assessment (EA) confirms the 4.6ha of Mellong Sandmass Sedgeland within the project area conforms to the descriptions of Sydney Hinterland Sandstone Upland Swamp in the reference Native Vegetation of Yengo and Parr Reserves and Surrounds (DEC 2008) study. This vegetation community is included in the Coastal Upland Swamp in the Sydney Basin Bioregion EEC. All (or some) of this EEC vegetation will be impacted by the proposal. This has not been recognised in the EIS.

Section 4.1.5.1 describes the vegetation communities identified in the Project Area in comparison to TECs listed under the NSW TSC Act and the Commonwealth EPBC Act and an assessment of similarity with scientific determinations and listing advice of relevant TECs. Regional mapping identified the presence of Freshwater Wetlands on Coastal Floodplains of the North Coast, Sydney Basin and South East Corner Bioregions EEC (Freshwater Wetland EEC) and River-flat Eucalypt Forest on Coastal Floodplains of the North Coast, Sydney Basin and South East Corner Bioregions EEC (River-flat Eucalypt Forest EEC), however an assessment of the floristic and structural components of the vegetation communities mapped in the Project area concluded that none of the identified vegetation communities identified through regional mapping conformed to any listed TECs. The following approach was used to verify the community vegetation community mapping in relation to TECs:

- comparison with published species lists, including lists of 'important species' as identified on the listing advice provided by OEH scientific committees;
- comparison with habitat descriptions and distributions for listed TECs;
- assessment using guidelines published by the NSW OEH; and
- comparison with other assessments of Freshwater Wetlands EEC and River-flat Eucalypt Forest on Coastal Floodplains EEC in the region.

Analysis of floristic data and comparison against scientific committee determinations of EECs mapped at a regional scale determined that Freshwater Wetland EEC and River-flat Eucalypt Forest EEC do not occur in the Project Area.

The delineation of vegetation communities in the Project area was based on the collection of targeted floristic data from 25 quadrats and 21 rapid assessments. As part of this process, vegetation communities identified were compared to the scientific committee determinations of the range of freshwater wetland EEC descriptions that occur in the Sydney Basin Bioregion, including Coastal Upland Swamp Forest in the Sydney Basin Bioregion.

5.2 Coastal Upland Swamp Forest in the Sydney Basin Bioregion Matters For Consideration

It is acknowledged that the Scientific Determination for Coastal Upland Swamp Forest in the Sydney Basin Bioregion notes that Sydney Hinterland Sandstone Upland Swamp (DECC 2008) is included as part of the EEC, which broadly conform to Mellong Sandmass Sedgeland within the Project Area. While the Mellong Sandmass Sedgeland within the Project Area shares some floristic similarities with the community (14% species in common with the Determination species list), the Scientific Committee determination states that the EEC occurs as far west as the Great North Road in Yengo National Park, which occurs to the east of the Project Area. Additionally, the Hawkesbury Local Government Area (LGA), where the Project Area occurs, is not included in the Scientific Determination as one of the LGAs where the EEC is known from. The closest LGA where it is known occurs approximately 30 km to the southeast of the Project Area. Additionally, the Scientific Determination notes that the EEC occurs in areas where annual rainfall generally exceeds 950mm. The average annual rainfall received within the Project Area is approximately 582mm (based on rainfall measurements from Putty (the Gibba) station approximately 5 km from the Project Area between the years 2001 and 2014) and the highest annual rainfall measurement was 895mm recorded in 2005.

Although Mellong Sandmass Sedgeland is not considered to conform to the Scientific Determination for Coastal Upland Swamp Forest in the Sydney Basin Bioregion EEC, it has been identified as being of high conservation value and has been considered in the proposed offset strategy.

The EA referenced Native Vegetation of Yengo and Parr Reserves and Surrounds study also shows an area of Hunter Range Flats Paperbark Thicket vegetation community on the western boundary of the project area. This community is equivalent to the River-flat Eucalypt Forest on Coastal Floodplains EEC which may be impacted by the proposal. The EIS maps this area as the non-EEC Mellong Sandmass Swamp Woodland (figure 4.1). The EIS should have included reference to the mapping of this area as an EEC and provided justification as to why it was considered not to be the listed community. In the absence of this discussion, the Department of Planning and Environment (DPE) will need to determine if there is adequate information in the EIS to be satisfied that the vegetation mapping is correct and that the EEC is not present.

Regional mapping undertaken by DECC (2008) included mapping of the Project area. Floristic data was not collected within the boundary of the Project area as part of the regional study and the Project area and vegetation communities were predicted based on aerial photography analysis.

Section 3.1 of the Ecological Assessment refers to the communities that were predicted to occur based on the DECC (2008) Native Vegetation of Yengo and Parr Reserves and Surrounds regional vegetation mapping report. Section 4.1.5.1 of the Ecological Assessment identifies that both *Freshwater Wetlands on Coastal Floodplains of the North Coast, Sydney Basin and South East Corner Bioregions EEC* and *River-flat Eucalypt Forest on Coastal Floodplains of the North Coast, Sydney Basin and South East Corner Bioregions EEC* were recorded in the Project area based on regional mapping (DECC 2008).

The collection of targeted floristic data from 25 quadrats and 21 rapid assessments allowed for a thorough comparison between the mapped vegetation communities and the regional mapping data and EEC Scientific Committee determinations and the Project area. The area mapped as Hunter Range Flats Thicket by DECC (2008) was considered to conform more closely to Mellong Sandmass Swamp Woodland based on the interpretation of site specific floristic data and therefore does not comprise River-flat Eucalypt Forest EEC. The area mapped as Hunter Range Flats Paperbark Thicket will not be impacted as a result of the Project.

OEH recommends the presence of EECs within the project area be reviewed and, if necessary, be appropriately addressed in a revised biodiversity assessment and offsetting package to address and unavoidable biodiversity impacts of the development.

As discussed above and in the Ecological Assessment, Umwelt is of the view that the Project Area does not contain communities that conform to scientific committee determinations of listed EECs.

In addition, OEH notes the statement at 4.9 of the EIS that extraction operations will be setback from the Greater Blue Mountains World Heritage Area (GBMWH) by a 'minimum of 237, and Yengo National Parks (YNP) by '40m if domain 7 is quarried' which does not correlate with figure 4.1 indicating a 14m setback. The potential impacts on the values of the GBMWH and YNP arising from this significantly reduced setback have not been addressed in the EIS.

OEH recommends the setback of proposed operations from the GBMWH and YNP be clarified. Extractive operations should be restricted by way of an appropriate buffer to ensure the values of these areas are not impacted.

Hy-Tec has incorporated a minimum 40 m buffer zone (associated with the Alternative Project and Biodiversity Offset Strategy; 237 m buffer is included in the Proposed Project) between the Project components and the National Park boundaries in order to minimise the potential for in-direct impacts to the conservation and recreational value of Wollemi and Yengo National Parks. Figure 4.1 of the EIS shows one buffer labelled as 14 metres rather than 40 metres. This is an error and has been corrected as shown on the revised Figure 4.1 which is provided at **Attachment B** to this Response to Submissions.

Hy-Tec will manage sediment and erosion within the site's closed water management system and will incorporate a weed and feral animal monitoring schedule to minimise the potential for weed ingress from the site into the National Parks.

5.3 Biodiversity Offsetting Strategy

OEH notes that the Director General's Environmental Assessment Requirements (DGRs) for this development stipulate that a 'comprehensive offset strategy to ensure the development maintains or improves the terrestrial and aquatic biodiversity values of the region in the medium to long term' (emphasis added).

OEH recommends the DPE clarifies its requirements in relation to the biodiversity DGR for this project. Should the DPE consider its requirement to 'maintain or improve' equates to a Tier 1 outcome then the proposed and alternative offset area proposals will need to be revised as neither comply in their current form.

We note that OEH is seeking a Scenario 1 offset under the Offset Policy however the OEH submission to the Department of Planning and Environment provide for either a Scenario 1 or Scenario 2 offset and did not specify which Tier was required. The letter (Ewins undated) from OEH to inform the DGRs states that the Project can utilise either *Scenario 1 - Where a proposal is assessed using the BioBanking Assessment Method (BBAM)*; or a *Scenario 2 - Where a proposal is assessed outside the BioBanking Assessment Method*. Due to the identification of suitable land-based offsets within the Project Area and the development of a like-for-like offset to clearing ratio of greater than 2:1, a Scenario 2 offset, that is, a Tier 3 Mitigated Net Loss outcome is considered appropriate to offset the residual impacts of the Project and is considered to meet the 'maintain' standard required by the DGRs.

The EIS states that on-site offsets are proposed in order to allow for a 'like-for-like' offset to be implemented. The proposed offset has been determined in accordance with the OEH (2013b) NSW Offset Principles for Major Projects (state significant development and infrastructure). In developing a 'like-for-like' offset package vegetation communities and fauna habitats have been used as the main drivers for developing offset areas. The area of vegetation communities and the ratios derived as part of the offset strategy have been used as surrogates for fauna habitat and therefore, the proposed offset strategy provides a like-for-like' offset for threatened fauna habitat proposed to be impacted as a result of the Project.

The proposed offset strategy is considered to adequately compensate for the residual significant impacts of the Project, including impacts to threatened fauna species and their habitat.

As stated by OEH, the option of quarrying of Domain 7 and the implementation of the Alternative Biodiversity Offset Strategy provides for a greater level of 'like-for-like' offset in the medium to long term. Hy-Tec is willing to work with OEH in order to manage potential edge impacts and implement the appropriate mechanisms necessary to restore and protect the ecological values of the Project Area in the long term.

6.0 NSW Department of Trade & Investment (Resources & Energy)

NSW Department of Trade and Investment in its submission of 14 August 2014 states that it considers that the EIS includes an adequate assessment of the resource in the area. NSW Department of Trade and Investment also considers that access to valuable extractive resources should be maintained over the subject area and that its preference would be for a proposal to establish biobanking sites rather than dedicating the offset areas to the National Park Estate.

7.0 NSW Rural Fire Service

NSW Rural Fire Service in its submission of 1 August 2014 requested that an updated Bush Fire Emergency Evacuation Plan be prepared.

8.0 Hawkesbury City Council

Hawkesbury City Council did not provide comment on the exhibited EIS but did resend comments that were made on 23 January 2013> These comments were provided as part of the adequacy review of the EIS before it was placed on public exhibition. These matters related to Traffic Impact, Noise and Vibration, Residential Amenity, Impact on National Parks, Quarry Layout/Development Extent, Plan Details and Site Rehabilitation and were addressed and included in the EIS before it was placed on public exhibition.

9.0 Greater Blue Mountains World Heritage Area Advisory Committee

The Greater Blue Mountains World Heritage Area (GBMWA) Advisory Committee has made comment on the proposed Tinda Creek Sand Quarry Expansion – Application Number SSD 4978. The Advisory Committee currently objects to the proposal. For each issue raised, an extract from the submission is noted in bold, followed by a response in normal type below.

The EIS sets out two alternatives for the proposed mining expansion but does not stipulate a preferred option. It appears that quarrying is planned to occur in either of the areas identified in the EIS as Domain 3 or Domain 7, but not both. Both Domain 3 and Domain 7 contain areas of significant vegetation in apparently good condition, however the alternative of not quarrying in both Domain 3 and Domain 7 is not appraised in the EIS. It is uncertain whether the area to be retained (Domain 3 or Domain 7) will be conserved in perpetuity.

Following receipt of adequacy comments from the Office of Environment and Heritage (OEH) and the Commonwealth Department of the Environment (DoE) and on-site consultation with the NSW National Parks and Wildlife Service (NPWS), an alternative project design was considered as part of the Project, with the final offset area to be determined in consultation with OEH and DoE. As a result the proposed Tinda Creek Project either involves the development of Domains 1, 2, 3 and 6 with the offset area being the remaining land within Lot 1, or the alternative quarry layout which involves the development of Domains 1, 2, 6 and 7 with the entirety of Lot 1 and the eastern sections of Lots 2 and 3 being included in the offset strategy.

The proposed alternative quarry layout would result in quarrying in Domain 7 rather than in Domain 3. This results in a small increase in the area of impact from 45.1 ha to 46.9 ha whilst providing access to a similar resource volume and provides a substantial increase in the area proposed for biodiversity offsetting from 71.5 ha to 106.2 ha. The decision to proceed with either project design will be undertaken in consultation with the relevant government authorities.

It is proposed to conserve the preferred offset strategy in-perpetuity following consultation with state and commonwealth agency representatives. The most appropriate mechanism for in-perpetuity conservation will be determined during the consultation process.

As stated in the EIS, Domain 3 contains approximately 2.3 million tonnes of sand resource while Domain 7 contains 2.64 million tonnes. This represents approximately 33% and 38% respectively of the total 7 million tonnes of sand resource that has been identified for extraction. Not quarrying Domain 3 and Domain 7 as suggested by GBMWA Advisory Committee would have a significant impact on the viability of the project and would result in the sterilisation of a substantial quantity of identified and proven valuable sand resource. It is considered that the project involving the extraction of either Domain 3 or Domain 7 results in an appropriate balance between conservation and utilisation of our natural resources.

The EIS states that no threatened ecological communities occur in the study area. However, the EIS notes that while Office of Environment and Heritage (OEH) vegetation mapping (DECC 2008) of the study area describes the sedgeland in the study area as 'Hunter Range Flats Freshwater Wetland', they found that these sedgelands do not fit the description of 'Hunter Range Flats Freshwater Wetland'. The EIS describes the sedgeland in the study area as Mellong Sandmass Sedgeland and states that this vegetation community "conforms to the description of Sydney Hinterland Sandstone Upland Swamp". The EIS does not recognise that Sydney Hinterland Sandstone Upland Swamp (DECC 2008) is included in the endangered ecological community 'Coastal Upland Swamp in the Sydney Basin Bioregion', which is listed under the NSW TSC Act (NSW Scientific Committee 2012) and Commonwealth EPBC Act (Department of the Environment 2014a).

Section 4.1.5.1 of the EIS describes the vegetation communities identified in the Project area in comparison to TECs listed under the NSW TSC Act and the Commonwealth EPBC Act and an assessment of similarity with scientific determinations and listing advice of relevant TECs. Regional mapping identified the presence of Freshwater Wetlands on Coastal Floodplains of the North Coast, Sydney Basin and South East Corner Bioregions EEC (Freshwater Wetland EEC) and River-flat Eucalypt Forest on Coastal Floodplains of the North Coast, Sydney Basin and South East Corner Bioregions EEC (River-flat Eucalypt Forest EEC), however an assessment of the floristic and structural components of the vegetation communities mapped in the Project area concluded that none of the identified vegetation communities identified through regional mapping

conformed to any listed TECs. The following approach was used to verify the vegetation community mapping in relation to TECs:

- comparison with published species lists, including lists of 'important species' as identified on the listing advice provided by OEH scientific committees;
- comparison with habitat descriptions and distributions for listed TECs;
- assessment using guidelines published by the NSW OEH; and
- comparison with other assessments of Freshwater Wetlands EEC and River-flat Eucalypt Forest on Coastal Floodplains EEC in the region.

Analysis of floristic data and comparison against scientific committee determinations of EECs mapped at a regional scale determined that Freshwater Wetland EEC and River-flat Eucalypt Forest EEC do not occur in the Project Area.

The delineation of vegetation communities in the Project area was based on the collection of targeted floristic data from 25 quadrats and 21 rapid assessments. As part of this process, vegetation communities identified were compared to the scientific committee determinations of the range of freshwater wetland EEC descriptions that occur in the Sydney Basin Bioregion, including Coastal Upland Swamp Forest in the Sydney Basin Bioregion.

It is acknowledged that the Scientific Determination for Coastal Upland Swamp Forest in the Sydney Basin Bioregion notes that the EEC conforms to Sydney Hinterland Sandstone Upland Swamp (DECC 2008), which broadly conform to Mellong Sandmass Sedgeland within the Project Area. While the Mellong Sandmass Sedgeland within the Project Area shares some floristic similarities with the community (14% species in common with the Determination species list), the Scientific Committee determination states that the EEC occurs as far west as the Great North Road in Yengo National Park, which occurs to the east of the Project Area. Additionally, the Hawkesbury Local Government Area (LGA), where the Project Area occurs, is not included in the Scientific Determination as one of the LGAs where the EEC is known to occur. The closest LGA where it is known to occur is approximately 30 km to the southeast of the Project Area. Additionally, the Scientific Determination notes that the EEC occurs in areas where annual rainfall generally exceeds 950mm. The average annual rainfall received within the Project Area is approximately 582mm (based on rainfall measurements from Putty (Gibba station approximately 5 km from the Project Area between the years 2001 and 2014) and the highest annual rainfall measurement was 895mm recorded in 2005.

Although Mellong Sandmass Sedgeland is not considered to conform to the Scientific Determination for Coastal Upland Swamp Forest in the Sydney Basin Bioregion EEC, it has been identified as being of high conservation value and has been considered in the proposed offset strategy.

The listing of Coastal Upland Swamps in the Sydney Basin Bioregion as an EEC under the EPBC Act was determined 17 July 2014, after the completion of the Ecological Assessment for the Project and therefore an assessment of this community against the scientific committee determination for this community was not undertaken at that time.

The Native Vegetation of Yengo and Parr Reserves and Surrounds (DECC 2008) indicates the presence of an endangered ecological community 'Hunter Range Flats Paperbark Thicket' (a component of 'River-flat Eucalypt Forest on Coastal Floodplains', an endangered ecological community listed under the NSW TSC Act), at the western end of the site spanning Lots 1 and 2 and immediately upstream of Gibba Swamp. This endangered ecological community is not discussed in the EIS.

Regional mapping undertaken by DECC (2008) included mapping of the Project area. Floristic data was not collected within the boundary of the Project area as part of the regional study and the Project area and vegetation communities were predicted based on aerial photography analysis.

The collection of targeted floristic data from 25 quadrats and 21 rapid assessments allowed for a thorough comparison between the mapped vegetation communities and the regional mapping data and EEC Scientific

Committee determinations and the Project area. The area mapped as Hunter Range Flats Thicket by DECC (2008) was considered to conform more closely to Mellong Sandmass Swamp Woodland based on the interpretation of site specific floristic data and therefore does not comprise River-flat Eucalypt Forest EEC. The area mapped as Hunter Range Flats Paperbark Thicket will not be impacted as a result of the Project.

Estimates of the abundance of threatened fauna species in the study area are not provided in the EIS.

A comprehensive fauna assessment was undertaken in accordance with the DEC (2004) Threatened Species Survey Guidelines and with consideration of State and Commonwealth threatened species survey guidelines.

A comprehensive discussion on the threatened fauna species recorded and with potential to occur within the Project area is provided in the assessments of significance under the EP&A Act and EPBC Act within Appendices D and E of the Ecological Assessment. This includes discussion on the number of individuals recorded and the extent and type of likely habitat occurring within the Project area and surrounds.

The Director General's requirement, that offsets must maintain or improve biodiversity, dictates that the 'improve or maintain' standard of the BBAM – the Tier 1 standard – must be adopted. However, the EIS has elected (EIS 7.1.2.1) to adopt the least preferred Tier 3 'mitigated net loss', the weakest offsetting option available, but provides no justification as to why this least preferred option is considered appropriate. According to the OEH Interim Policy, Tier 3 cannot be applied to flora or fauna species, such as Grevillea parviflora ssp. parviflora, Koala, New Holland Mouse (all recorded in study area), listed under EPBC Act when the proposed development is a controlled action nor can it be used to compensate clearing of endangered ecological communities. The Advisory Committee submits that in light of the additional potential impact on the GBMWha, deviation from the normal Tier 1 standard cannot be justified.

The Project is seeking a Tier 3 Mitigated Net Loss offset scenario due to the lack of suitable credits required by the Project being on the market and the availability of suitable BioBanking offset sites in the region. Due to the identification of suitable land-based offsets within the Project approval timeframe and the development of an offset to clearing ratio of greater than 2:1, a Tier 3 Mitigated Net Loss outcome is considered appropriate to offset the residual impacts of the Project.

Threatened species listed under the EPBC Act have been considered separately in Section 7.3.2 and 7.4 in accordance with the Commonwealth Environmental Offset Policy (2012) and are not subjected to a Tier 3 offset assessment.

The Advisory Committee does not understand why the BioBanking Assessment Methodology, including using the BBAM credit calculator to determine the number of ecosystem and species credits required to be offset, has not been applied in the EIS. This is now the standard approach in NSW for objectively assessing biodiversity impacts and offsetting requirements.

The letter (Ewins undated) from OEH to inform the DGRs for the project states that the Project can utilise either *Scenario 1 - Where a proposal is assessed using the BioBanking Assessment Method (BBAM)*; or a *Scenario 2 - Where a proposal is assessed outside the BioBanking Assessment Method*. Due to the identification of suitable land-based offsets within the Project Area and the development of a like-for-like offset to clearing ratio of greater than 2:1, a Scenario 2 offset, that is, a Tier 3 Mitigated Net Loss outcome has been adopted to offset the residual impacts of the Project and is considered to meet the 'maintain' standard required by the DGRs.

The EIS states that offsets must be achieved on site, but provides no justification as to why this is so. The EIS makes some attempt to provide offsets for loss of vegetation communities but does not show how loss of threatened fauna habitat will be offset. The Advisory Committee does not consider it acceptable that offsets are not provided to compensate for loss of fauna, particularly threatened fauna habitat.

The EIS states that on-site offsets are proposed in order to allow for a 'like-for-like' offset to be implemented. The proposed offset has been determined in accordance with the OEH (2013b) NSW Offset Principles for Major Projects (state significant development and infrastructure). In developing a 'like-for-like' offset package vegetation communities and fauna habitats have been used as the main drivers for developing offset areas.

The area of vegetation communities and the ratios derived as part of the offset strategy have been used as surrogates for fauna habitat and therefore, the proposed offset strategy provides a 'like-for-like' offset for threatened fauna habitat proposed to be impacted as a result of the Project.

The proposed offset strategy is considered to adequately compensate for the residual significant impacts of the Project, including impacts to threatened fauna species and their habitat.

The EIS does not make it clear how the site will be revegetated following mining. Replacement of the original high conservation value vegetation is desirable, but is in no way guaranteed. The original vegetation grows on deposits of sand above a lower clayey layer. When the underlying sand has been removed by mining to a depth of 15m and the surface contours, drainage and ground water have been altered, it is highly unlikely that the original vegetation can be restored, even in the long term.

The proponent proposes to rehabilitate the extraction area by using native seed mix that has been recommended for use at the quarry by NPWS. Rehabilitation works will continue to be undertaken on an ongoing basis as the quarry develops and extraction in areas is completed. The final landform design will take account of the impact of topography on the hydrogeology and ecology of the surrounding landscapes so as to assist in the regeneration of vegetation communities. It was considered that achieving a naturally shaped landform and viable ecological communities would be best achieved by using key characteristics of local drainage systems in the design of the rehabilitated landscape.

The post-mining areas will be rehabilitated to derived native grassland and self-sustaining native vegetation communities, in accordance with the general principles of the rehabilitation strategy set out in the EIS. Seed and tube stock of local provenance will be used as much as possible in rehabilitation.

The EIS claims that there are currently no offsite impacts from the existing mining operation owing to surface run-off from the site or alterations to ground water. The evidence for such claims is lacking in the EIS. It is also questionable whether an apparent lack of impacts from the existing mining operation can be extrapolated to conclude that no impacts will result from a much expanded operation.

As discussed in the EIS, the quarry operates and will continue to operate a closed water management system which provides excess storage and surcharge capacity for any surface runoff from the quarry area. As a result, there has not been a need in the past to discharge from the site. As quarrying progresses the available surcharge capacity for runoff from the site will also increase ensuring that the need to discharge does not occur during future operations. This is discussed further in **Section 1.3** above.

In regard to groundwater, as shown on Figure 2.4 of the EIS, quarrying will be above the regional groundwater level which is in excess of 15 metres below the ground surface and will be confined to the upper less permeable layer of sandy clay alluvium that has infilled the valley of Tinda Creek. The low permeability of the sandy clay layer that is proposed to be quarried means that drawdown effects of quarrying on shallow groundwater levels are negligible. This is confirmed by groundwater level observations in the paired monitoring bores that have been located around the perimeter of the current dredging operations and by ecological fieldwork looking at the condition and status of the vegetation communities surrounding the quarry.

In 2007 and in 2011 as discussed in Appendix 7 of the EIS and in **Sections 6.2.2** and **6.2.3**, ecological monitoring of the adjoining and surrounding swamps, sedgeland and creek system showed that after 30 years of quarrying at the site that there was no detectable difference in the condition or status of areas adjacent to, or downstream of, the quarry when compared to control areas away from potential impact of the quarry operations.

Two areas (dependent on whether Domain 3 or 7 were quarried) are proposed as possible offsets in the EIS, together with the suggestion of their possible subsequent inclusion in Yengo National Park. The value of each of these offsets, as offered post mining, will be much diminished by their lengthy and irregular perimeters and the lack of buffers between them and the highly disturbed area of mining.

A direct, 'Like-for-like' biodiversity offset is proposed as part of the Project to compensate for the residual impacts of the Project in accordance with State and Commonwealth offsetting policy. The Tinda Biodiversity Offset Site is located in Lot 1 of the Project area (within Lot 1 and partially within Lots 2 and 3 for the

Alternative Tinda Biodiversity Offset Site). These areas of vegetation and habitats are immediately adjacent the existing Yengo National Park and Greater Blue Mountains World Heritage Area and contain equivalent vegetation and habitat quality and value. Some existing disturbances around the current quarry area are evident through edge effects from tracks and the transmission easement, which also occur within the National Park and World Heritage Area.

The Tinda Biodiversity Offset Area is expected to be transferred into the reserve system to ensure long term protection of the area. Further consultation with NPWS will be undertaken as part of the approval process to determine an appropriate long term management strategy. The Biodiversity Offset Strategy was developed for the Project in a manner consistent with Commonwealth and State offsetting policies and is expected to provide an appropriate and valuable offset to compensate for the residual impacts of the Project on ecological values.

As part of the Project, biodiversity and other environmental monitoring is proposed to monitor the impact of expanded operations on adjacent habitats. The survey and assessment of land adjacent to existing operations identified minimal adverse impacts as a result of existing quarry operations and therefore the proposed continuation of existing quarrying methods is not expected to result in adverse impacts on adjacent habitats. Proposed monitoring will consider the impact of edge effects on proposed biodiversity offset areas and adaptive management will ensure that adverse impacts identified during monitoring are remediated.

10.0 Colong Foundation for Wilderness

Colong Foundation in its submission dated 18 August 2014 stated that it objects to the proposed expansion of sand mining and that it “considers that the potential for turbid mine discharges from an enlarged sand dredging proposal will increase the harm caused to the health of the Gibba Swamp wetland and the Tinda and Wollemi Creeks and Wollemi National Park”.

As discussed in the EIS and in this Response to Submissions, the quarry currently operates and will continue to operate a closed water management system with no off-site discharges of “turbid mine water”.

As discussed in **Section 1.2**, there is some confusion into the actual location of Gibba Swamp as referred to in ecological literature with the area referred to likely to be approximately 2 kilometres north of the quarry and in a different catchment, not on Tinda Creek downstream of the quarry as stated in Colong Foundation’s submission.

The Colong Foundation also considers that the minimum width of a World Heritage buffer to an open-cut mine should be one kilometre.

The Colong Foundation raises concerns in regard to water quality and rehabilitation which have been addressed in the EIS and **Section 1** of this response.

The Colong Foundation also raises concerns in regard to vegetation and fauna protection and the location of EEC’s in the study area. These issues have been covered in the EIS and further information is provided in **Sections 5** and **9** of this Response to Submissions.

11.0 Neville Diamond

Neville Diamond in his submissions of 26 August 2014, 1 September 2014 and 2 September 2014 raises a broad range of matters in regard to the project and past handling of the project.

In his submissions he states that there was no consultation undertaken. As set out in Section 1.3 of the EIS, consultation was undertaken with relevant government agencies, surrounding landholders and the Aboriginal community in regard to the project.

Mr Diamond also states that Crown Lands consent has not been obtained for any activities below 15.24 m below the ground surface. As set out in the EIS, not extraction is proposed below 15 metres below the surface and therefore the development will not be undertaken on Crown Land.

If you would like to discuss any aspect of the submissions received in regard to Tinda Creek Sand Quarry EIS, please do not hesitate to contact me on (02) 4950 5322.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Peter Jamieson'. The signature is fluid and cursive, with the first name 'Peter' and last name 'Jamieson' clearly distinguishable.

Peter Jamieson
Director

Attachment A

Figure 1.1 - Regional Map



Image Source: Google Earth (2009)
Data Source: Geoscience Australia (2001)

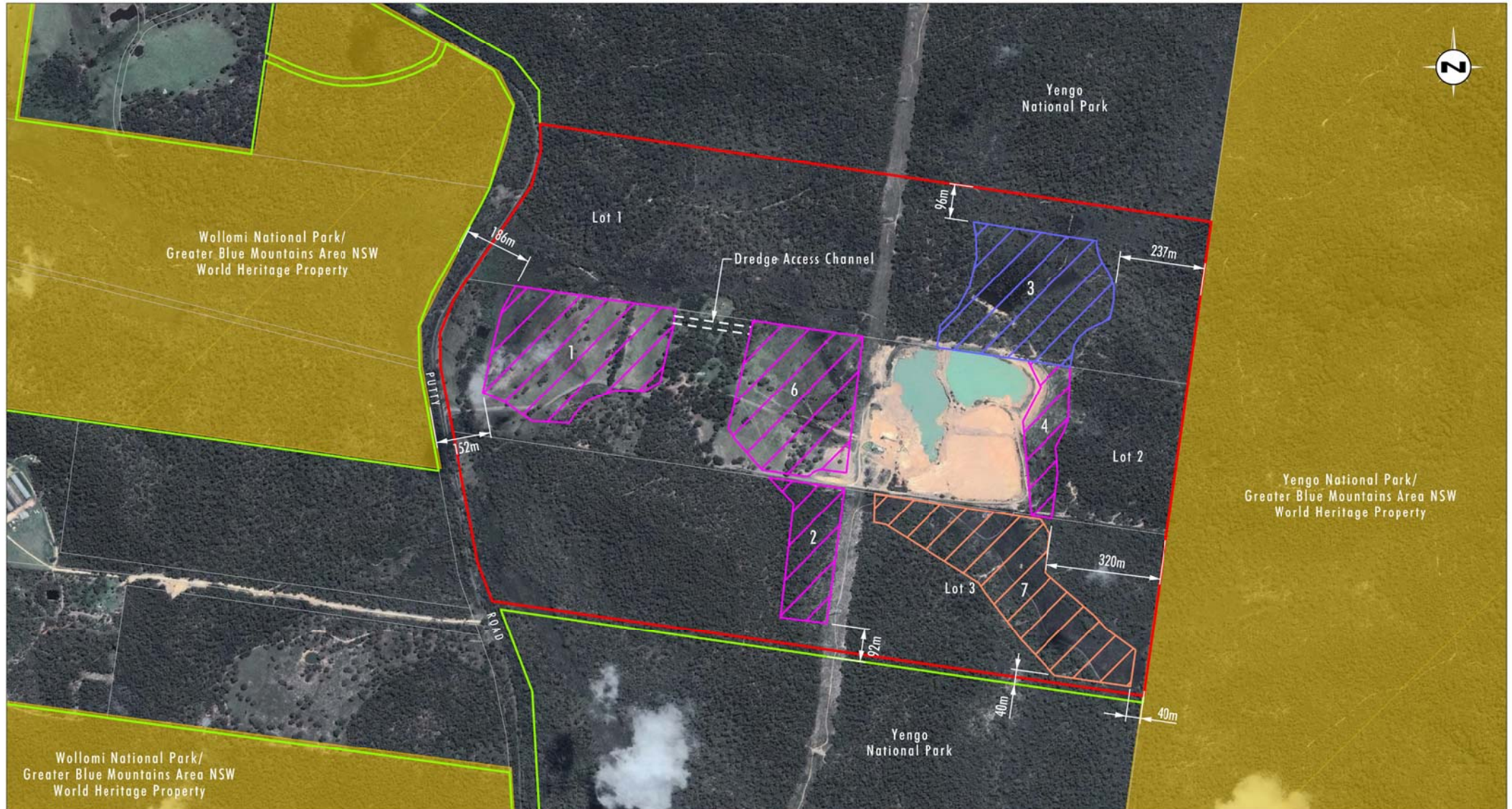
Legend

Project Area

FIGURE 1.1
Regional Map

Attachment B

Figure 4.1 - Proximity of Project Area to World Heritage Area and National Park



Source: Google Earth (2012), LPI NSW (2007), Australian Government Department of the Environment - Water - Heritage and the Arts (2007)

0 250 500 750m
1:15 000

Legend

- Project Area
- Proposed Extraction Area
- Domain 3 Extraction Area
- Domain 7 Extraction Area
- National Park Boundary
- Greater Blue Mountains Area NSW World Heritage Property

File Name (A4): R14_V1/1731_393.dgn

FIGURE 4.1

Proximity of Project Area to
World Heritage Area and National Park