Australian Government
Department of the Environment and Energy

Title of Proposal - Bird in Hand Gold Project

Section 1 - Summary of your proposed action

Provide a summary of your proposed action, including any consultations undertaken.

1.1 Project Industry Type

Mining

1.2 Provide a detailed description of the proposed action, including all proposed activities.

This referral relates to a proposal by Terramin Exploration Ltd (Terramin) to recommence mining of the Bird-in-Hand (BIH) gold deposit located approximately 2.7 kilometres east of Woodside in the Adelaide Hills, South Australia.
The proposed operational site of the Project is 192 Pfeiffer Road, Woodside, known as Goldwyn. The property is a former farm comprising of introduced cattle pasture, planted agroforestry trees, and scattered paddock Eucalypt trees.
The property adjacent, CT 5292/32, encompasses the historic BIH mine site workings, contains remnant vegetation with high biodiversity values, as well as a Native Vegetation Heritage Agreement (NVHA) area of 13.8 hectares (HA1555). CT 5292/32 falls within Mineral Claim 4421 and proposed Mining Lease but due to the underground mine design there are no surface works proposed on CT 5292/32 and no clearance of the remnant vegetation.
Since acquiring Goldwyn, Terramin has progressed a program of endemic native revegetation, both riparian and woodland. Part of the rehabilitation focus is around existing isolated paddock Eucalypt trees and a patch of remnant Eucalypts remaining onsite. The objective of revegetation works within Goldwyn is to provide additional habitat for fauna within the historic BIH remnant vegetation area, and in the long term build the populations of these species.
The Project will involve:
• Construction of BIH site infrastructure development, ? 12 months
• 5.5 years of mining (includes the 12 months of site infrastructure development), based on known BIH Resource
• Underground mining by conventional drill and blast utilising mechanised cut and fill stoping
• Gold bearing ore transported off site to Terramin’s existing processing facility 40km south at Strathalbyn in trucks with covered loads
• Crushing and grinding of the ore at AZM (Angas Zinc Mine) followed by gravity separation and flotation to respectively produce gold dore and gold concentrate
• Gold and silver products sold and freighted to domestic and/or international markets
Terramin recognises the high biodiversity value of the Mount Lofty Ranges, and the unique role the it plays as a biodiversity hot spot and indicator for biodiversity management and health in Australia. Terramin commits that the Project will be managed so that no clearance of remnant native vegetation or any negative impacts to biodiversity values due to the Project will occur. In order to achieve this, mining specific infrastructure has been designed to reduce potential impacts to the community and environment from project aspects associated with noise, dust, vibration and visual amenity. To further manage potential environmental impacts, boundary

vegetation buffer zones, corridors and vegetated earth bunds have been included in the site design. The planting of 60 000 native trees, shrubs and sedges and direct seeding of native perennial grass to date are providing improved biodiversity zones currently and will be well established to provide buffer zones and corridors for the planned Project. Terramin will continue to revegetate Goldwyn as the Project progresses.

Examples of design modifications include;

• The mine has been designed to utilise underground mining techniques to access the gold ore 150m below the surface, diminishing a surface footprint that would be associated with an opencut mine to a small tunnel and shaft access

• The underground mine design has been modified to avoid contact with the main fractured rock aquifers to reduce impact to groundwater

• Surface infrastructure required is reduced by not requiring ore processing facilities or tailings storage at BIH due to the proximity to the established Angas Zinc Mine (AZM)

• Installation of enclosed Run Of Mine (ROM) ore silo instead of a traditional ROM ore pad that would be exposed to the atmosphere and therefore a potential source of dust that may impact species)

• Designing the locations of the openings of underground ventilation shafts to ensure buffer zones from remnant vegetation

• Site integrated into the landscape through use of a landscape architect to blend into the existing environment.

The portal (entrance) to the underground mine will be positioned in solid rock. To do this a “boxcut” will be excavated into the ground to expose the rock face. A pre-fabricated BEBO structure (concrete tunnel) will be installed in the box cut and then backfilled to minimise exposed excavations. The backfilled area will be incorporated into the operating area of the mine, which further reduces the overall footprint. Sections of the backfilled area not able to be utilised as hardstand will be revegetated.

From the portal to the orebody, a decline (tunnel) will be constructed by conventional drill and blast mine development. The broken rock (mullock) is removed in the process and stockpiled on the surface for later use in backfilling. The proposed method to extract the gold bearing ore is mechanised cut and fill. This involves extracting the ore utilising the same drill and blast process, tunnelling along the strike (horizontal long axis) of the ore body. Once the ore is removed the void is then backfilled with the mullock as either cemented fill or straight rock fill. This provides ground support and allows for the mining to progress on top of the fill. The process is then repeated until all of the ore has been extracted.

Ore will be brought to surface by mine trucks loaded into the ROM silo. Non- economic material mined will be stockpiled temporarily on the surface within an Integrated Mullock Landform (IML) or stored underground for use as backfill in completed ore drives. All tip points will be covered to contain noise and dust generation.

No ore processing will occur at the BIH site with all ore transported via road going trucks to Terramin's existing licensed facility at Strathalbyn (AZM Processing Facility) along existing roads.

Understanding the hydrogeology of the area is critical to the Project. Consequently, detailed hydrogeological investigations have been undertaken to accurately model potential project impacts. For this purpose Terramin engaged Australian Groundwater Technologies to develop a comprehensive investigation into the region’s hydrology. A groundwater model (establishing and using three years of monitoring data from a 72 bore groundwater monitoring network and a series of pump tests) was developed and independently peer reviewed to confirm its suitability

for modelling impact scenarios. The modelling determined that impacts to sensitive receptors can be avoided by using a number of water management techniques.
These techniques include;
• Designing the main decline (tunnel) to avoid the defined water bearing fracture zones,
• Grouting of fractures where they cannot be avoided, and
• Utilising Managed Aquifer Recharge (MAR) to return any intersected groundwater back into the aquifer.
Upon mine closure the mine will be rehabilitated in line with the South Australian mine closure legislative framework, to return the site to a safe and stable landform which removes residual risks which may be associated with the mining activity for any proposed future landuse. It is proposed to be rehabilitated and landscaped so that it will be suitable for boutique primary production, cellar door possibilities with public use area available should the future landowner desire. Revegetated areas created by Terramin will remain.

1.3 What is the extent and location of your proposed action? Use the polygon tool on the map below to mark the location of your proposed action.

Area	Point	Latitude	Longitude
Mineral Claim area	1	-34.954933415115	138.89708405487
Mineral Claim area	2	-34.948074287367	138.90639668457
Mineral Claim area	3	-34.953385764636	138.91223317138
Mineral Claim area	4	-34.955777575786	138.91296273224
Mineral Claim area	5	-34.957114145735	138.91669636718
Mineral Claim area	6	-34.956915032779	138.91833475937
Mineral Claim area	7	-34.962157252074	138.91985854271
Mineral Claim area	8	-34.966131415661	138.90522441032
Mineral Claim area	9	-34.958393928348	138.90282115105
Mineral Claim area	10	-34.958815991949	138.90097579124
Mineral Claim area	11	-34.955439422275	138.89994582298
Mineral Claim area	12	-34.955861501092	138.89805754783
Mineral Claim area	13	-34.954946994242	138.89702757957
Mineral Claim area	14	-34.954911820698	138.89702757957
Mineral Claim area	15	-34.954933415115	138.89708405487
Terramin owned property "Goldwyn"	1	-34.950453451772	138.90318593147
Terramin owned property "Goldwyn"	2	-34.957734449619	138.9055462754
Terramin owned property "Goldwyn"	3	-34.958824784918	138.90095433357
Terramin owned property "Goldwyn"	4	-34.955413042277	138.89992436531
Terramin owned property "Goldwyn"	5	-34.955799948067	138.89799317482

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Area	Point	Latitude	Longitude
Terramin owned property "Goldwyn"	6	-34.954850266959	138.89696320656
Terramin owned property "Goldwyn"	7	-34.95488544053	138.89696320656
Terramin owned property "Goldwyn"	8	-34.950453451772	138.90318593147
Proposed operating area	1	-34.955003411533	138.90078354847
Proposed operating area	2	-34.955005126746	138.90078638557
Proposed operating area	3	-34.955005126746	138.90078370336
Proposed operating area	4	-34.954853440836	138.90057985548
Proposed operating area	5	-34.954701754646	138.9003786898
Proposed operating area	6	-34.954429158468	138.90024994377
Proposed operating area	7	-34.954165354853	138.90015874866
Proposed operating area	8	-34.953958708094	138.90022848609
Proposed operating area	9	-34.953721283515	138.90044306282
Proposed operating area	10	-34.953501445329	138.9007649279
Proposed operating area	11	-34.95334316147	138.90105460647
Proposed operating area	12	-34.953079354359	138.90134428504
Proposed operating area	13	-34.952938656886	138.90141402248
Proposed operating area	14	-34.9526836421	138.90145157341
Proposed operating area	15	-34.952507769372	138.90146766666
Proposed operating area	16	-34.952331896267	138.90142475132
Proposed operating area	17	-34.952160419626	138.90134428504
Proposed operating area	18	-34.951953767812	138.90116725925
Proposed operating area	19	-34.951865830712	138.90129600528
Proposed operating	20	-34.9519361804	138.90137110714

Area	Point	Latitude	Longitude
area			
Proposed operating area	21	-34.952116451198	138.90152131084
Proposed operating area	22	-34.952446213828	138.90166078571
Proposed operating area	23	-34.952705137732	138.90165803101
Proposed operating area	24	-34.953026104404	138.9016258445
Proposed operating area	25	-34.953329482706	138.90145954754
Proposed operating area	26	-34.953566908419	138.90114841129
Proposed operating area	27	-34.953843904216	138.90057441856
Proposed operating area	28	-34.954103312129	138.90037057068
Proposed operating area	29	-34.954463843798	138.90050468113
Proposed operating area	30	-34.954852952416	138.90072462227
Proposed operating area	31	-34.954836337178	138.90127707493
Proposed operating area	32	-34.954792370186	138.90191007626
Proposed operating area	33	-34.954695642721	138.90281129849
Proposed operating area	34	-34.954678055897	138.90329409611
Proposed operating area	35	-34.95468684931	138.903497944
Proposed operating area	36	-34.954704436132	138.90366960537
Proposed operating area	37	-34.954836337178	138.90385199558
Proposed operating area	38	-34.955047378411	138.90409875881
Proposed operating area	39	-34.955214452335	138.90416313183
Proposed operating area	40	-34.955654118929	138.90433479321
Proposed operating area	41	-34.955970677416	138.9044528104
Proposed operating area	42	-34.95630482116	138.90456009876
Proposed operating	43	-34.956454306078	138.90452791226

Area	Point	Latitude	Longitude
area			
Proposed operating area	44	-34.956718102326	138.90427042019
Proposed operating area	45	-34.956806034221	138.90380908024
Proposed operating area	46	-34.956850000132	138.90355158818
Proposed operating area	47	-34.956814827405	138.90340138447
Proposed operating area	48	-34.956621377134	138.90320826542
Proposed operating area	49	-34.956225681975	138.90306879055
Proposed operating area	50	-34.955970677416	138.90296150219
Proposed operating area	51	-34.955873951342	138.90267182362
Proposed operating area	52	-34.95597947069	138.9020710088
Proposed operating area	53	-34.955944297589	138.90150238049
Proposed operating area	54	-34.955610152376	138.90106249821
Proposed operating area	55	-34.955003411533	138.90078354847

1.5 Provide a brief physical description of the property on which the proposed action will take place and the location of the proposed action (e.g. proximity to major towns, or for off-shore actions, shortest distance to mainland).

BIH is located approximately 30km east of Adelaide, 2.7km east of Woodside and 30km north of Terramin's existing mining and processing facilities at the AZM, located near Strathalbyn in South Australia.

Occupying approximately 195.9 hectares of predominantly freehold agricultural land, the Mineral Claim 4421 (MC4421) and proposed Mineral Lease (ML) is bounded by Pfeiffer Road to the north-west, Reefton Road to the north-east, Donoghue Road to the south-east and is intersected by Bird In Hand Road.

The proposed ML site falls largely within the Adelaide and Mount Lofty Ranges (AMLR) Natural Resources Management (NRM) Region (approximately 164 ha, 84%) and is also partially intersected by the South Australian Murray-Darling Basin (SAMDB) NRM Region (approximately 31.9 ha, 16%).

Broad-scale clearance has removed a large proportion of native vegetation within the AMLR Region. Approximately 14% of the pre-European native vegetation cover remaining typically on the steeper faces or the ranges in areas not suitable for agriculture. Small, isolated areas of remnant native vegetation are predominantly surrounded by agricultural land. Located within the proposed ML on CT 5292/32 there is HA1555 a Native Vegetation Heritage Agreement (NVHA) area of 13.8 hectares of native vegetation. Within this area, one national, five state and eight regionally listed flora species have been recorded since 2014 and four State and nine regionally listed fauna species have been recorded during the same period.

Preservation and enhancement of the native environment and visual amenity has been the driving objective behind Terramin's site design on Goldwyn. The selected site design incorporates 30m buffer zones along the boundary of CT 5292/32 and the definition and rehabilitation of riparian zones around the drainage line running through the property. An access road will require the crossing of the drainage line utilising a culvert which is placed to avoid old growth and provide for free drainage flow. All buffer zones are designed to be planted with native tree and shrub species, endemic to the local area. Between 2015 and 2017, over 30 000 native tree and shrub species and 30 000 sedges have been planted within the Project area.

Within the proposed ML, Terramin plans to restrict surface operations within Goldwyn. The 36 Ha parcel of former farmland located off of Pfeiffer Road will be predominantly revegetated. The site infrastructure will utilise approximately 11 Ha for earthworks associated with earth bunds, roads, stockpiles, water storage, offices and water treatment works. Once surface construction has been completed approximately 6 ha of the earthworks will be revegetated with local endemic species. 4.5 Ha remains as the operating area where equipment will be moving. The total area of planned revegetation of the Goldwyn property is approximately 10.5 Ha - See attached site plans.

Impacts outside of Goldwyn will be limited to running of services for remote monitoring, water distribution, power and communications. These services will have a minimal footprint and will be approved as part of the Mining Lease application. Groundwater management infrastructure within the ML will include existing and planned monitoring bores and an estimated eight MAR bores, connecting pipework. Existing pipework is located within the area laid along road verges

and fence lines which are currently cleared. Any proposed additional services will be installed such that no clearance of native vegetation occurs along with existing services.

1.6 What is the size of the proposed action area development footprint (or work area) including disturbance footprint and avoidance footprint (if relevant)?

Terramin own a 36 Ha property, however, 11 Ha is proposed to be disturbed, and the operational area is approximately 4.5 Ha.

1.7 Is the proposed action a street address or lot?

Street Address

Goldwyn

192 Pfeiffer Road
Woodside SA 5244
Australia

1.8 Primary Jurisdiction.

South Australia

1.9 Has the person proposing to take the action received any Australian Government grant funding to undertake this project?

No

1.10 Is the proposed action subject to local government planning approval?

No

1.11 Provide an estimated start and estimated end date for the proposed action.

Start date 12/2019

End date 03/2026

1.12 Provide details of the context, planning framework and State and/or Local government requirements.

The principal legislation for mining regulation in South Australia is the *Mining Act 1971* (SA) (Mining Act), administered by the South Australian Department of the Premier and Cabinet (DPC). In order to proceed with a mining project under the Mining Act, a proponent must apply for and be granted a mining tenement. Mineral production tenements include; mineral claim

(MC), mineral lease (ML), extractive minerals lease (EML), retention lease (RL) and miscellaneous purposes licence (MPL). Once mining tenements are granted, a proponent must submit and gain approval for a Program for Environment Protection and Rehabilitation (PEPR) prior to commencing work.

The Project ML's application must comply with the modified Ministerial "Determination for a Mining Proposal for the Bird-in-Hand Gold Project", published in the South Australian Government Gazette in April 2017. Any subsequent approval to begin construction, operation and closure must be in accordance with Ministerial Determination 005 - "Minimum information required to be provided in a program for environment protection and rehabilitation (PEPR) for a ML and any associated miscellaneous purposes licence (MPL) for metallic and industrial minerals (excluding coal and uranium)". Both documents have been attached in 1.14.1 for reference.

In addition to the primary approval and regulation of mining projects under the Mining Act, there are a number of other South Australian Acts, regulatory processes and planning frameworks that apply to activities associated with mining projects, including:

- Aboriginal Heritage Act 1988

- Controlled Substances Act 1984

- Dangerous Substances Act 1979

- Development Act 1993

- Environment Protection Act 1993 and associated policies (eg Environment Protection (Water Quality) Policy 2015, (Air Quality) Policy 2016)

- Explosives Act 1936- Heritage Places Act 1993

- Mines and Works Inspection Act 1920

- National Parks and Wildlife Act 1972

- Native Vegetation Act 1991 (not applicable to this project as no native vegetation will be cleared)

- Natural Resources Management Act 2004

- Radiation Protection and Control Act 1982

- South Australian Public Health Act 2011

- Work Health and Safety Act 2012

- Adelaide and Mount Lofty Ranges Natural Resources Management Plan / Strategic Plan

- Adelaide Hills Council Development Plan

- No Species Loss: A Nature Conservation Strategy for South Australia 2007-2017

- Regional Recovery Plan for Threatened Species and Ecological Communities of Adelaide and the Mount Lofty Ranges, South Australia (Willson and Bignall 2009)

- South Australia's Strategic Plan

- South Australia's Economic Priorities: Unlocking Our Resources

- Strategic Infrastructure Plan for South Australia

- Water Allocation Plan for the Western Mount Lofty Ranges

The project once approved will be constructed, operated and closed in accordance with requirements and project specific lease conditions set by DPC's Minerals Branch, Environment Protection Authority (EPA), Department of Environment, Water, and Natural Resources (DEWNR), Department of Planning, Transport and Infrastructure (DPTI), and SafeWork SA. The principle will be "Zero Harm" within the stipulation of the legislation listed above, and their associated Regulations, Policies and Guidelines.

1.13 Describe any public consultation that has been, is being or will be undertaken, including with Indigenous stakeholders.

Terramin purchased the Project from Maximus Resources Limited (Maximus) in November 2013. Maximus conducted several community meetings between 2006 and 2009 before they put the Project into care and maintenance. After Terramin purchased the Project a formal introductory letter was sent to affected landholders in February 2014. This included property owners located above or adjacent the proposed underground workings and within the immediate vicinity of BIH. As part of the baseline environmental studies and community engagement initiatives, numerous informal meetings have occurred with many landholders. As the Project concept has been developed additional stakeholders have been identified and engaged as part of the BIH Community Engagement Plan (CEP) (attached). A community engagement summary up until 30th August 2017 has been attached also, which includes neighbours and local residents, stakeholders, local councillors, MPs, and government.

Terramin's first general community meeting was held for BIH in early April 2014. The Inverbrackie Ground Water Focus Group (Group) has introduced itself as a concerned

community group and members were in attendance at this meeting. Members of the Group and other identified stakeholders have been kept informed as BIH planning progresses, through frequent meetings and information days.

Social impact and community engagement surveys have been undertaken by CSIRO and Design4Growth for Terramin. Work is ongoing but a summary table of the current survey results are included as an attachment. These reports are being made public upon their completion, as part of the ML application.

Ongoing community engagement will be undertaken throughout the life of BIH. The terms of reference for a community consultative committee (CCC) are currently being formalised by Terramin and the CCC steering committee and are expected to form the basis of the regional consultative group. The CEP is a live document and continues to evolve as aspects of the Project are developed and exposed to the community. The key consultation aspects are developed to ensure a widespread exposure to community and include:

- Establishment of a WCCC and monthly consultative meetings – open to public attendance

- Quarterly environmental reports on key environmental aspects

- Regular informal meetings with project neighbours- 24 hour community feedback line

- Proactive community group interaction, e.g. schools, shows, special interest groups

- Sponsorship of community programs.

Indigenous stakeholders

Indigenous and cultural heritage studies have been undertaken by EBS Heritage and Dr Phillip Clark from AnthroPAC for Terramin. The Traditional Custodians of the area around BIH were the Peramangk whose traditional lands were primarily located in the Adelaide Hills, stretching to the southern Fleurieu Peninsula. Shortly after the European settlement of the Adelaide Hills, especially in Mount Barker and Hahndorf, the Peramangk had essentially dispersed. It is most likely that they were devastated or wiped out as a result of introduced diseases, but it is also

possible that survivors integrated with the neighbouring Kaurna or Ngarrindjeri tribes.

To date, there has been no registration of Native Title Determination Applications that cover the Project's area. All land in the area is freehold title which means native title has been extinguished.

Both reports have been attached to this submission – "Heritage Assessment for a Mining Lease" and "Cultural Heritage Assessment".

1.14 Describe any environmental impact assessments that have been or will be carried out under Commonwealth, State or Territory legislation including relevant impacts of the project.

This chapter describes the impact assessment methodology that was adopted for the Mining Lease Application for the Project. This has been completed in accordance with the tailored *Ministerial Determination for a Mining Proposal for the Bird-in-Hand Gold Project* (MD), which describes the "minimum information required to be provided in a mining proposal and/or management plan for a mineral lease (ML) and any associated miscellaneous purposes licence (MPL) applications for a project incorporating the Bird-in-Hand Gold Deposit located in Woodside South Australia". The Project will also be subject to the *Minimum information required to be provided in a program for environment protection and rehabilitation (PEPR) for a mineral lease (ML) and any associated miscellaneous purposes licence (MPL) for metallic and industrial minerals (excluding coal and uranium)* (Ministerial Determination 005, DPC, 2015). Both the Project Determination and PEPR determination are in accordance with Regulations 30(3) and 49(3) of the *Mining Regulations 2011*.

The impact assessment for the proposed Project has been undertaken in accordance with the MD and considers the adverse and beneficial environmental (biophysical, social and economic) effects associated with the proposed activities.

In undertaking the impact assessment, the following definitions have been adopted:

Environment: Section 6(4) of the *Mining Act 1971*, states that the environment includes:

- Land, air, water (including both surface and underground water and sea water), organisms, ecosystems, native fauna and other features or elements of the natural environment;

- Buildings, structures and other forms of infrastructure and cultural artefacts;- Existing or permissible land use (includes commercial and community business activities);

- Public health, safety or amenity;

- The geological heritage values of an area; and,

- The aesthetic or cultural values of an area.

Environmental Aspect: Elements of the project that interact with the environment, including land disturbance, discharges to land, atmospheric emissions, releases to water, resource use, waste generation, energy generation and alteration to amenity.

Environmental Element: An element of the environment that may be impacted by mining activities.

Environmental Impact: Any change to the environment wholly or partially, directly or indirectly, caused by mining operations which is confirmed through the presence of a source, pathway and environmental receptor.

Environmental Risk: Actual or potential threat of adverse effects to environmental, community and economic values arising from unexpected or unplanned events associated with the project. Unexpected or unplanned events include failure of environmental controls, measured impacts being greater than predicted impacts and natural disasters such as bushfire.

Environmental Values: Qualities of the environment, an environmental component or receptor that society values and requires protection from the effects (both real and potential) of proposed activities under legislation, government policy or in response to community and stakeholder expectations.

The impact assessment process recognises that, even with controls in place, normal or planned operation of the Project may result in changes to environmental, community and economic values. The aim of the impact assessment was to identify all potential environmental impacts using the steps outlined below:

1. Identification of Environmental Elements Associated with Project Activities

2. Identification of Potential Impact Events

3. Description of Source, Pathway, Receptor

4. Description of Limitations and Uncertainty

5. Confirmation of Impact Events

Faults, failures and unplanned events may occur with the potential to cause environmental impact despite best efforts to avoid or mitigate impacts. Risks may also arise as a result of uncertainties in the assessment of impacts. The effect of these events/uncertainties may be that the actual impact on an environmental value from the project is greater (or less) than expected. For this reason, all uncertainties and assumptions are taken into account through the impact assessment process. Unlike the identification of potential impact events, the risk assessment considers the type and effectiveness of proposed control measures.

Terramin adopts a hierarchy of controls applied in the following order:

1. Elimination (prevention) – Redesign as to eliminate the impact.

2. Design/engineering (physical) controls – Minimise the impact through physical barriers, controls and treatments.

3. Management system (procedure) controls – Manage the risk through procedures and the way the activity is conducted by personnel.

All risks identified for the Project have been categorised as low as reasonably practicable (ALARP).

The impact assessment methodology (final draft prior to DPC submission) for the ML application has been attached in 1.14.1.

1.15 Is this action part of a staged development (or a component of a larger project)?

No

1.16 Is the proposed action related to other actions or proposals in the region?

Yes

1.16.1 Identify the nature/scope and location of the related action (Including under the relevant legislation).

Processing of BIH ore will occur at Terramin's AZM. The proposed action will include road transportation of ore from BIH to AZM.

AZM was placed into Care and Maintenance in October 2013 due to the lack of economic zinc mineralisation. AZM site which contains processing and general site infrastructure that with minor refurbishment and modification, will be suitable for the processing of the BIH ore.

Terramin submitted an EPBC Referral for the ‘Angas Zinc Project’ (2006/3087) on 5 October 2006, which was subsequently deemed to be not a controlled action (date of notice, 1 November 2006).

Section 2 - Matters of National Environmental Significance

Describe the affected area and the likely impacts of the proposal, emphasising the relevant matters protected by the EPBC Act. Refer to relevant maps as appropriate. The interactive map tool can help determine whether matters of national environmental significance or other matters protected by the EPBC Act are likely to occur in your area of interest. Consideration of likely impacts should include both direct and indirect impacts.

Your assessment of likely impacts should consider whether a bioregional plan is relevant to your proposal. The following resources can assist you in your assessment of likely impacts:

• Profiles of relevant species/communities (where available), that will assist in the identification of whether there is likely to be a significant impact on them if the proposal proceeds;

• Significant Impact Guidelines 1.1 – Matters of National Environmental Significance;

• Significant Impact Guideline 1.2 – Actions on, or impacting upon, Commonwealth land and Actions by Commonwealth Agencies.

2.1 Is the proposed action likely to have ANY direct or indirect impact on the values of any World Heritage properties?

No

2.2 Is the proposed action likely to have ANY direct or indirect impact on the values of any National Heritage places?

No

2.3 Is the proposed action likely to have ANY direct or indirect impact on the ecological character of a Ramsar wetland?

No

2.4 Is the proposed action likely to have ANY direct or indirect impact on the members of any listed species or any threatened ecological community, or their habitat?

Yes

2.4.1 Impact table

Species	Impact
Caladenia agrocalla - White-beauty Spider-	The Flora and Fauna assessment (COOE

Species	Impact
orchid (Endangered) Glycine latrobeana - Clover Glycine (Vulnerable) Prasophyllum pallidum - Pale Leek-orchid (Vulnerable)	2016) identified the species as potentially occurring within the Project site. Potential threats include the introduction of weeds and dust deposition, which will be managed under BIH's Biodiversity Management Plan and Dust Management and Monitoring Plan. Another potential threat is hydrology (water level) changes adversely affecting bushland habitat condition, this risk will be mitigated and managed by using a calibrated groundwater model, active monitoring and application of managed aquifer recharge if required. These aspects will be included in a groundwater management plan, as part of the ML's PEPR, the regulatory framework. The site plan and mining operations have been designed around minimising disturbance to the local community and environmentally sensitive receptors. Mitigation measures include installation of 30 metre wide vegetation buffer zones and connecting vegetation corridors, minimising dust generation, trapping dust onsite and managing noise and vibration impacts (associated Noise and Blast Management Plans to be implemented through the PEPR stage).
Caladenia rigida - Stiff White Spider-orchid (Endangered)	Recorded within the Project site, 600 east of the of the development footprint. Potential threats include the introduction of weeds and dust deposition, which will be managed under BIH's Biodiversity Management Plan and Dust Management and Monitoring Plan. Another potential threat is hydrology (water level) changes adversely affecting bushland habitat condition, this risk will be mitigated and managed by using a calibrated groundwater model, active ground water level monitoring and application of localised managed aquifer recharge if required. These aspects will be included in a groundwater management plan,as part of the ML's PEPR, the regulatory framework. The site plan and mining operations have been designed around minimising disturbance to the local community and environmentally sensitive receptors. Mitigation measures include installation of vegetation

Species	Impact
	buffer zones and connecting vegetation corridors, minimising dust generation, trapping dust onsite and managing noise and vibration impacts (associated Noise and Blast Management Plans to be implemented through the ML's PEPR stage). A regional orchid recovery plan (Quarmby, 2010) is in place and to meet one of the objectives of increasing sub-population numbers, a breeding program partnership will be initiated with the landholder and relevant NRM experts if NRM experts deem this approach beneficial.
Pteropus poliocephalus - Grey-headed Flying-fox (Vulnerable)	The Flora and Fauna assessment (COOE 2016) identified the species as potentially occurring within the Project site. The species has complex migration traits in response to ephemeral and patchy food resources. Potential threats include noise, vibration and light disturbance, and reduction in foraging resources, namely Eucalyptus blossom. Agroforestry fenceline plantings of E.maculata and E.leucoxylon are present within the 'Goldwyn' site, including the operating area and could provide a blossom resource, however, these plantings are 25 years old and the trees are in poor condition experiencing a high blow over rate and mortality and hence have a low foraging resource value. The Biodiversity Management Plan has revegetation as a mitigation strategy for visual amenity and strengthening biodiversity values, revegetation works will occur within the agroforestry's senescence areas as well as on all landscape bunding, boundary vegetation buffer zones and corridors, and in strategic sightlines. The site plan and mining operations have been designed around minimising disturbance to the local community, including minimising noise, visual and vibration disturbance. Potential impacts will be managed under BIH's Biodiversity Management Plan, Strategic Visual Assessment Plan, Noise Management and Monitoring Plan and Dust Management and Monitoring Plan.
Isoodon obesulus obesulus - Southern Brown Bandicoot (eastern) (Endangered)	The Flora and Fauna assessment (COOE 2016) identified suitable habitat for the species

Species	Impact
	within the Project site, outside of the development footprint. Potential threats include noise and vibration disturbance, and increased predation. The site plan and mining operations have been designed around minimising disturbance to the local community, including minimising noise and vibration disturbance. Potential pest impacts will be managed under BIH's Biodiversity Management Plan.
Calidris ferruginea - Curlew Sandpiper (Critically Endangered)	Preferred habitat is not present on the mining lease, hence the species is unlikely to occur within or near the lease. The species is uncommonly recorded inland around dams, waterholes and bore drains. Likelihood of occurrence is very low. Potential threats include alteration of the existing water sources. Management of stormwater onsite will involve a combination of swales, treatment devices (gross pollutant traps and oil and sediment separators), retention basins and ephemeral wetlands. The final, post mining design will provide an increase in surface water habitat.
Zoothera lunata halmaturina - Bassian Thrush (South Australian) (Vulnerable)	Preferred habitat is not present on-site. Likelihood of occurrence is low. Potential threats include weed invasion and increased predation. Potential impacts will be managed under BIH's Biodiversity Management Plan.
Notechis scutatus - Eastern Tiger Snake (Vulnerable) - included for completeness	Preferred habitat, riparian areas, is limited on site. There is one ephemeral creekline that is undergoing understory and mid story revegetation, the overstory is intact. Apart from a creek crossing no development will be undertaken in the riparian zone. Likelihood of occurrence is low as habitat has been overgrazed for a long period of time and is degraded. Potential threats are habitat loss or degradation, feral predation and low frog population numbers. Potential impacts will be managed under BIH's Biodiversity Management Plan.
Numenius madagascariensis — Eastern Curlew, Far Eastern Curlew (Critically Endangered) Listed marine Listed migratory - CAMBA, JAMBA, ROKAMBA	The eastern curlew takes an annual migratory flight to Russia and north-eastern China to breed, arriving back home to Australia in August to feed on crabs and molluscs in intertidal mudflats. In South Australia, the species is scarce between the Victorian border

Species	Impact
	and Cape Jaffa and patchily distributed from the Coorong north-west to the Streaky Bay area, and has previously been recorded in Lake Alexandrina and Lake Albert, South Australia. Therefore, the species is very unlikely to be found, if so a vagrant only, within or near the proposed mining lease as the habitat is not suitable.
Grantiella picta — Painted Honeyeater (vulnerable)	Species not recorded within the proposed mining lease. Preferred habitat is woodland, no clearance of native vegetation will occur on the mining lease and Terramin is planning to revegetate 10.5 hectares of the 36 hectare 'Goldwyn' farming property the project is based on, within the proposed mining lease area. The mining lease poses no credible impact to the species.
Pedionomus torquatus — Plains-wanderer (Critically Endangered)	The plains wanderer is a highly unique, ground-dwelling bird that lives in the grasslands of Queensland, New South Wales, Victoria and South Australia. Preferred habitat is not present within the proposed mining lease, the existing land form is predominately cleared woodland with introduced cattle pastures. The mining lease poses no credible impact to this species.
Merops ornatus - Rainbow Bee-eater IUCN: Listed as Least Concern (Global Status: IUCN Red List of Threatened Species: 2017.1 list) NGO: Listed as Least Concern (The Action Plan for Australian Birds 2010 - non-threatened)	The Rainbow Bee-eater occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation (Higgins 1999). The breeding season extends from August to January (Boland 2004a; Higgins 1999). The nest is located in an enlarged chamber at the end of long burrow or tunnel that is excavated, by both sexes, in flat or sloping ground, in the banks of rivers, creeks or dams, in roadside cuttings, in the walls of gravel pits or quarries, in mounds of gravel, or in cliff-faces.. Nests of the Rainbow Bee-eater are presumably susceptible to predation, flooding and trampling because they are located on the ground and in banks, for example, of rivers and creeks. Potential impacts will be managed under BIH's Biodiversity Management Plan, buffer zones have been put in place around riparian and existing remnant vegetation hence trampling will be avoided.

2.4.2 Do you consider this impact to be significant?

No

2.5 Is the proposed action likely to have ANY direct or indirect impact on the members of any listed migratory species, or their habitat?

Yes

2.5.1 Impact table

Species	Impact
Motacilla cinerea — Grey Wagtail Motacilla flava — Yellow Wagtail Listed migratory - CAMBA, JAMBA, ROKAMBA	The mining lease poses no credible impact to these species due to habitat not being suitable. Reference - Draft referral guideline for 14 birds listed as migratory species under the EPBC Act.
Actitis hypoleucos — Common Sandpiper Calidris acuminata — Sharp-tailed Sandpiper Calidris melanotos — Pectoral Sandpiper Tringa nebularia - Common Greenshank Listed migratory - Bonn, CAMBA, JAMBA, ROKAMBA	Common Sandpiper - This species is a migratory shorebird, the mining lease due to its inland location poses no credible impact to these species. Sharp-Tailed Sandpiper & Pectoral Sandpiper - preferred wetland habitat not present on or near the proposed mining lease area Common Greenshank - preferred habitat may be present near proposed mining lease boundary but riparian condition rated as 'poor' by the EPA, species not likely to be present but riparian habitat is being managed for biodiversity values so no impact by the mining operation is anticipated (Hansen, 2016).
Actitis hypoleucos - Common Sandpiper, Calidris acuminata - Sharp-tailed Sandpiper, Calidris ferruginea - Curlew Sandpiper (Critically Endangered), Tringa nebularia - Common Greenshank	No migratory species were recorded during the Flora and Fauna Survey (COOE, 2016). Potential impacts include negative alteration of the existing water sources but this is not plausible given the existing riparian condition and Terramin's planned biodiversity management works. Management of stormwater onsite will involve a combination of swales, treatment devices (gross pollutant traps and oil and sediment separators), retention basins and ephemeral wetlands. Potential constructions will be short-term and the final design will provide an increase in surface water habitats.
Apus pacificus - Fork-tailed swift Hirundapus	The Fork-tailed Swift is almost exclusively

Species	Impact
caudacutus - White-throated Needletail Listed Marine Listed migratory - CAMBA, JAMBA, ROKAMBA	aerial, flying from less than 1 m to at least 300 m above ground and probably much higher. The Fork-tailed Swift and the White-throated Needletail are non-breeding visitors to Australia (Higgins 1999). The mining lease poses no credible impact to the species as no large trees that may be potential roasting will be cleared.

2.5.2 Do you consider this impact to be significant?

No

2.6 Is the proposed action to be undertaken in a marine environment (outside Commonwealth marine areas)?

No

2.7 Is the proposed action to be taken on or near Commonwealth land?

No

2.8 Is the proposed action taking place in the Great Barrier Reef Marine Park?

No

2.9 Is the proposed action likely to have ANY direct or indirect impact on a water resource related to coal/gas/mining?

No

2.10 Is the proposed action a nuclear action?

No

2.11 Is the proposed action to be taken by the Commonwealth agency?

No

2.12 Is the proposed action to be undertaken in a Commonwealth Heritage Place Overseas?

No

2.13 Is the proposed action likely to have ANY direct or indirect impact on a water resource related to coal/gas/mining?

No

Section 3 - Description of the project area

Provide a description of the project area and the affected area, including information about the following features (where relevant to the project area and/or affected area, and to the extent not otherwise addressed in Section 2).

3.1 Describe the flora and fauna relevant to the project area.

Flora Species

Flora located within Goldwyn consists of cleared agricultural grazing land with paddock Red Gum or Blue Gums (*Eucalyptus leucoxylon ssp. leucoxylon* and *E. camaldulensis ssp*.). All species were recorded within the remnant vegetation parcel located within the central parcel of the proposed ML. No remnant vegetation will be cleared as part of this project.

A total of nine broad vegetation associations were identified within the proposed mining lease boundary, predominantly comprising minor variations in *Eucalyptus leucoxylon ssp. leucoxylon* and *E. camaldulensis ssp.* Woodland. The ML is considered to contain areas of high conservation value, with suitable habitat for listed flora and fauna species. In particular, listed flora and fauna species were recorded throughout the central parcel of native vegetation within the ML (the Native Vegetation Heritage Agreement Area comprising five vegetation associations), while SA-listed bird species were recorded within the creekline of Goldwyn (Association 9). A total of 166 flora species have been recorded within the ML, including 38 introduced species, five of which are declared under the NRM Act. An additional 10 native flora species (all from the Orchidaceae family) recorded outside of the survey have been identified as known to occur within the Project site.

One Environment Protection and Biodiversity Conservation Act 1999 (EPBC)-listed flora species was identified after the survey, namely the:

- Endangered Stiff White Spider Orchid, *Caladenia rigida*

Four SA-listed flora species were recorded:

- Behr's Cowslip Orchid (*Diuris behrii)* - Vulnerable- Pale Wood-rush (*Luzula flaccida*) - Vulnerable- Blue Star Sun-orchid (*Thelymitra latifolia*) – Vulnerable- Pink Gum (*Eucalyptus fasciculosa*) - Rare.

An additional nine regionally-listed (AMLR) flora species were recorded: nine listed as rare, one listed as Vulnerable (recorded post-survey) and one listed as Endangered.

The Flora and Fauna survey (COOE 2016) and the Bushland Condition Monitoring report has been attached to Section 2. The Native Vegetation Heritage Report has been attached to Section 2.

Fauna Species

The Project site was surveyed for mammals, reptiles, frogs and birds using a range of methodologies for four consecutive nights. A total of 1308 observations from 85 species within 46 families were recorded during the fauna survey. Five bat species from two families were also identified from 2033 echolocation call sequences. A total of 62 bird, 17 mammal, seven reptile and four amphibian species were recorded. Eight of the 17 mammal species comprised bats and of the nine ground-dwelling mammals, four were introduced species. There were two introduced bird species observed from the 62 records.

No EPBC-listed fauna species were observed.

Four SA-listed fauna species were recorded:

- Yellow-tailed Black Cockatoo (*Calyptorhynchus funereus*), Vulnerable

- White-winged Chough (*Corcorax melanorhamphos*), – Rare

- Crested Shriketit (*Falcunculus frontatus*), – Rare

- Common Brushtail Possum (*Trichosurus vulpecula*), - Rare.

Nine regionally-listed (AMLR) species were recorded, comprising the Rare Brown Tree Frog (*Litoria ewingii*), Common Ringtail Possum (*Pseudocheirus peregrinus*) and seven bird species listed as Rare and higher.

The Flora and Fauna survey (COOE 2016) and the Bushland Condition Monitoring report has been attached to Section 2. The Native Vegetation Heritage Report has been attached to Section 2.

3.2 Describe the hydrology relevant to the project area (including water flows).

BIH lies within the Western Mount Lofty Ranges Prescribed Water Resources Area (PWRA), managed by the associated Water Allocation Plan (WAP). The three types of water resources in the PWRA managed by the WAP are underground water, surface water and watercourse water. BIH is situated within the Onkaparinga River Catchment and the Inverbrackie Creek sub-catchment. Onkaparinga River is the third largest watercourse in South Australia. Its headwaters are near Charleston and it flows southwest past Oakbank and Mylor down to Clarendon Weir and Onkaparinga Gorge, before entering the Gulf St Vincent at Port Noarlunga South. No part of the catchment drains to a RAMSAR listed wetland or riparian area (see attached map).

The Inverbrackie Creek sub-catchment covers an area of 2674 ha, with ground surface elevation ranging between 350 m and 500 m Australian Height Datum (AHD). The area is characterised by lower and flatter topography around the Woodside (350 to 380 m AHD) to higher undulating and moderately steep terrain in the vicinity of BIH (400 to 480 m AHD). The average annual rainfall for the Inverbrackie Creek sub-catchment is 721 mm/yr. Rainfall is winter dominant, falling mainly between April and October.

Surface water

The sub-catchment is drained by Inverbrackie Creek and its non-perennial tributaries that generally flow from the upper section of the sub-catchment in the east towards the confluence with the Onkaparinga River southeast of Woodside. Inverbrackie Creek is located about 535 m from the proposed mine workings. BIH contains two drainage lines, one of which is located within the proposed development footprint. This creek is bounded by established vegetation,

with only two discrete cleared areas where crossings have been formed. At the upstream end, beyond the eastern property boundary of the site, the watercourse is interrupted by an existing on-line water storage (farm dam) located on the Petaluma property. The watercourse continues to another on-line storage (farm dam) on the Bird-in-Hand property and then under Pfeiffer Road and ultimately discharges into Inverbrackie Creek, located west of the subject site.

River levels of Inverbrackie Creek are monitored at Craigbank (Station A5030508), approximately 2 km northeast of the BIH Project site. The creek has an appreciable flow only during winter months or after a significant rainfall event. The water level at Craigbank fluctuates seasonally and the magnitude of these fluctuations is less than 0.9 m. The flows can reach up to 350 ML/d. However, the average rate during the periods of flow is 4.8 ML/d.

The EPA has a monitoring site located 1.7 kilometres downstream of BIH, off the Woodside-Nairne Road. Water assessments have been undertaken in 2008, 2011, 2013 and 2016 in line with the AUSRIVAS protocol (available at: http://www.epa.sa.gov.au/reports_water/c0032-ecosystem-2016). The most recent EPA SA report (2016) shows a slight improvement from 2008, with the creek rating increased to “poor” from “very poor”. Key points obtained from the 2016 EPA report state that the Inverbrackie Creek has:

- Permanent to near permanently flowing stream in autumn and spring 2016

- Moderately diverse macroinvertebrate community dominated by organic feeders but lacking any Rare or sensitive species

- Moderately fresh Water, slightly coloured and enriched with nutrients

- Riparian vegetation consisting of weedy shrubs over introduced grasses and weeds

In summary, the creek was given a poor rating because the site sampled showed evidence of major changes in ecosystem structure and moderate changes to the way the ecosystem functions. There was clear evidence of human disturbance at the site due to nutrient enrichment, the mobilisation of fine sediment and the extent of weeds in the riparian zone.

Terramin provide an analysis of surface water data and macroinvertebrate samples taken between May 2014 and August 2016 in a Macroinvertebrate and Water Quality Investigation (Terramin 2017). The investigation found Inverbrackie Creek is a “highly disturbed waterway”

that is characterised by “poor water quality” and “[N]utrients appear to have a negative impact by increasing algal growth, biological oxygen demand and decreasing habitat heterogeneity and are of concern. Metals appear to be unlikely to cause the decrease in the health of the stream. Flow within the creek also drives the health of the system and the future timing of sampling must be incorporated into a standard monitoring design".

Hydrology Reports included

- Surface water report part 1

- Surface water report part 2

- Surface water report part 3

Catchments and RAMSAR wetlands (20170515_-_locality_plan_ramsar_cthland_cats.pdf)

Groundwater

The prime aquifer system within the sub-catchment area is a Fractured Rock Aquifer (FRA), which is capable of supplying groundwater at rates of 1 - 40 L/s, with a salinity of less than 1,500 mg/L. The regional groundwater flow direction follows the general form of the topography, flowing to the south-west. Fracturing in the region is considered to be ubiquitous and there is the potential for groundwater to flow across different hydrogeological units.

Summary of Groundwater Assessment

Please see attachment "Groundwater Existing Environment + Summary of Impacts" for an outline of the groundwater existing environment, methodology and testwork undertaken (including 3 year groundwater census), and the summary of potential impacts and ranges of water management and mitigation strategies. For a more detailed groundwater report, please see attachments "Final Groundwater Assessments 1 and 2", appendices A - G, and the associated groundwater model peer review.

Terramin expects to be over 90% effective with the water management strategy of avoidance, grouting and managed aquifer recharge, however, have based our water management systems

on worst case of 70% effective, in order to build capacity into our systems. This allows for adequate infrastructure to be in place if higher inflows are encountered while ensuring the protection of the supply and quality of groundwater for all sensitive receptors (existing users and water dependent ecosystems) from the operation. These assumptions have been made after studying similar operations and receiving advice from grout experts and specialists specifically on the Project's requirements and the Bird-in-Hand geological context.

Summary of Groundwater and Native Vegetation Heritage Agreement area

The following is taken from the report "Groundwater Assessment for the NVHA" completed by Golder Associates (attached).

A key element of this assessment was to establish whether the NAtive Vegetation Heritage Agreement (NVHA) area represents a groundwater dependent ecosystem and whether the structure and function this ecosystem could change if groundwater levels were lowered as a result of groundwater inflows to the proposed underground mine. To mitigate against the groundwater related impacts, the Project includes a mine design that avoids the major identified fracture zone. Where groundwater is identified, the grouting of fractures ahead of mine development will be used to limit groundwater inflows. Any water that is intersected by the mining process will be treated back to the quality of the aquifer and reinjected back into the aquifer via a Managed Aquifer Recharge (MAR) system. The combination of grouting of fractures and the reinjection of groundwater back into fractures away from the mine will maintain groundwater levels around the proposed mining area to ensure a 'no net groundwater extraction' approach. A groundwater investigation including drilling, baseline groundwater monitoring and numerical groundwater modelling of groundwater response to mining was undertaken by Australian Groundwater Technologies (AGT) (AGT, 2017 – is attached to this referral). An independent review of the model was undertaken by Innovative Groundwater Solutions, who reviewed the model against the Australian groundwater modelling guidelines (NWC, 2012) (review attached to this referral).

Based on the depth to groundwater (15 to 60 m below ground level (bgl)) and the ongoing survival of the existing vegetation through the period of mining and township water supply, it is unlikely vegetation within in the study area accesses or relys on the deeper groundwater supplies. Most of the area containing remnant vegetation is above a clay aquitard that sits between the fractured rock aquifer and the near-surface seasonally perched water table. It is possible some of the trees on site may have deep root systems or taproots where they are located in areas of outcropping rock, e.g. some areas to the east of Reefton Road within the NVHA where Tarcowrie Siltstone or the Cox Sandstone reaches surface. The reliance of these trees on the deeper groundwater is unlikely when considering typical tree root development (Australian Standard 4970-2009). A limiting factor for the growth of roots is gas exchange with most plants being shallow rooted with the majority of roots occurring within the top 600 mm of

the soil profile.

Tree root systems are classed into three different parts: structural woody roots, second order roots and nonwoody roots. Studies show that Blue Gums, the dominate Eucalypt species of NVHA (HA1555) are unlikely to access groundwater, particularly if clay layers are present (CSIRO, 2005). It is the non-woody roots that absorb water from the environment for plant function, and it is implausible these roots will occur at the depths required to access groundwater at the site. The depth to groundwater is greater than 15 m and generally beneath a clay 'cap' acting as an aquitard. Therefore any change in groundwater levels is unlikely to have a significant impact on the condition of vegetation and associated biodiversity values such as listed flora, specifically orchids and avifauna in the project area.

This is supported by the continued survival of the suite of sensitive flora and fauna despite the timber harvesting, grazing, development of a small, now abandoned settlement (Reefton Heights), quarrying, mining and groundwater abstraction practices that have taken place over the preceding 137 years. Groundwater abstraction from a bore installed within the old mine workings provided 1,780ML in 12 months in 1934-35. Then from 1935 and 1967 150ML per annum was abstracted for the nearby Australian Army's Woodside Barracks at Inverbrackie. During this time the water level was recorded as going from 112 ft to 212 ft (34m to 65m) below ground level (bgl) (1935 Dept of Mines Report). Additionally, the current irrigation use results in annual dynamic changes in groundwater levels within the catchment. Given these potential impacts its worth noting the biodiversity values remain high.

Groundwater on site is shallowest within the ephemeral riparian gully, occurring 15 m bgl. If vegetation were able to access the groundwater, it is more likely to be in these areas. Red Gum (*E.camaldulensis*) vegetation communities are commonly associated with watercourses, drainage lines and gullies across southern Australia, so is likely to be the main vegetation association in the lower lying parts of the gully on site, surveying confirms this (NVC, 2012). Red Gum (*E.camaldulensis*) communities are adapted for riparian environments, known for having a varying water supply and are tolerant to changes in water accessibility.

Important conclusions of this assessment include:

A regional fractured rock aquifer system underlies the NVHA area and surrounding catchment. The groundwater elevation beneath the NVHA area is at least 15 m bgl, with 90% of the NVHA area reporting groundwater levels of between 20 m and 60 m bgl.

Based on the known root depth of identified species within the NVHA area (*Eucalyptus leucoxylon* and *Eucalyptus camaldulensis*) and the modelled geology demonstrating a clay aquitard zone between the FRA and the near-surface tree root zone, the probability of vegetation within the NVHA area accessing groundwater from the Fractured Rock Aquifer (FRA) system is extremely low. There is an area east of Reefton Road that has no known clay zone and rocks outcrop to surface.

Groundwater is shallowest within a gully, occurring 15 m below the natural ground level. This accounts for 10% of the total NVHA area. This area is most likely to be associated with Red Gum vegetation communities are commonly associated with watercourses, drainage lines or gullies across southern Australia. Red Gum communities are adapted to riparian environments, known for having a varying water supply and are hence tolerant to changes in water availability. Therefore, in the unlikely occurrence groundwater of the FRA was accessed, any change in groundwater levels is unlikely to have a significant impact on the condition of the Red Gum (*Eucalyptus camaldulensis*) community and have no impact on the Blue Gum communities (*Eucalyptus leucoxylon*). The majority of the listed flora species appear to be found within the Blue Gum communities (COOE, 2016). Given this, no impact to ecosystem health and habitat condition for the listed flora and fauna can be expected.

Notwithstanding the above, current groundwater levels beneath the gully area are expected to be maintained during the mining operation as part of the mine water management system and objective of returning all groundwater back into the ground. Utilising MAR and the presence of a clay aquitard which behaves as a hydraulic barrier (limiting the cone of drawdown emanating from the proposed mine) the risk of the NVHA area being impacted by the Project is further reduced.

The lowering of groundwater levels outside of the gully area is unlikely to pose an adverse risk to the vegetation within the NHVA area as current groundwater levels (20 to 60 m bgl) are several meters (tens of metres) beyond the reach of the root system.

Hydrogeology reports included

- Groundwater Assessment for the NVHA

- Final Groundwater Assessment Part 1

- Final Groundwater Assessment Part 2

Appendix A1

Appendix A2 part 2

Appendix C1 C2 C3

Appendix D1 D2

Appendix E

Appendix F

Appendix G

IGS Independent Review of Groundwater Model

3.3 Describe the soil and vegetation characteristics relevant to the project area.

Soil

BIH geomorphology comprises soils formed on basement rock and soils formed on outwash sediments derived from basement rock highs. The associated broad soil groups comprise:

- Low hills and rises with mainly acid to neutral, loam to clay loam texture contrast soil

- Low hills and rises with mainly acid to neutral, sandy to sandy loam texture contrast soil

- Non-arable hills and rises with shallow stony soil and variable rock outcrop

- Plains and gentle slopes with mainly deep neutral to acid soil.

Vegetation Characteristics

Of the proposed 195.9 ha identified for the ML, approximately 29.87 (15.25%) comprises native vegetation cover. The native vegetation is broadly characterised by eucalypt dominant vegetation groups, with structural formations of mid woodland and low open forest. Vegetation

and associated environmental descriptions for the patches identified on the ML site are provided in the flora and fauna assessment. The Flora and Fauna survey (COOE 2016) and the Bushland Condition Monitoring report has been attached to Section 2. The Native Vegetation Heritage Report has also been attached to Section 2.

3.4 Describe any outstanding natural features and/or any other important or unique values relevant to the project area.

No outstanding natural features in the form of geological monuments, caves or cliffs have been identified on or in proximity to the BIH site.

3.5 Describe the status of native vegetation relevant to the project area.

Within the AMLR, vegetation clearance has been extensive since European settlement and only 14% of the original native vegetation of the region remains. Approximately 90% of vegetation remnants are less than 31 ha in size and half of those (45%) are less than six hectares. The largest native vegetation remnants in the AMLR include Deep Creek Conservation Park (CP) and the Scott Creek CP/Mount Bold Reservoir complex. The remnant vegetation reflects the selective and disproportionate clearance patterns – areas of productive soils that were most suitable for agricultural production were preferentially cleared.

Prior to European settlement, the BIH Project site likely comprised eucalypt open forest and woodlands. Currently, the development footprint (within the property named 'Goldwyn') has been historically cleared and the development footprint of BIH is located within these existing cleared areas.

The flora and fauna assessment describes a total of nine broad vegetation associations that were identified across the proposed ML, predominantly comprising minor variations in *Eucalyptus leucoxylon* ssp. *leucoxylon* and *E. camaldulensis* ssp. Woodland. The proposed ML is considered to contain areas of high conservation value, with suitable habitat for listed flora and fauna species. In particular, listed flora and fauna species were recorded throughout the central parcel of native vegetation within the proposed ML (comprising five vegetation associations), while SA-listed bird species were recorded within the creek line of Goldwyn property (Association 9).

The Native Vegetation Council undertook a survey of the above mentioned central parcel of native vegetation in 2011, describing the condition and location of the proposed vegetation heritage agreement area and some identified conservation values, including listed species and previous sources of biodiversity information. This area was accepted as a Native Vegetation

Heritage Agreement area HA 1555 under Section 23 of the *Native Vegetation Act* with the landowner for 13.8 hectares of native vegetation in 2016. The assessment is attached to section 2.

In September 2015 a Bushland Condition Monitoring Assessment Site Report was undertaken of an area within the vegetation heritage agreement area by the Nature Conservation Society of South Australia which results in rankings for 14 different habitat condition indicator values.

These include;

Species diversity - excellent,

Weed Abundance and threat - poor,

Structural Diversity - ground cover - good,

Structural diversity B - plant life forms - excellent,

Regeneration - trees and woody shrubs - good,

Tree Hollows - very poor,

Fallen logs and trees - moderate,

Tree health - dieback - poor,

Tree health - lerp infestation - excellent,

Tree health - mistletoe - excellent,

Feral Animal Abundance - excellent,

Total grazing pressure – poor,

Tree Habitat score - poor.

The Bushland condition monitoring report was undertaken for the NVHA area in 2015, and is attached to section 2 of this Referral.

3.6 Describe the gradient (or depth range if action is to be taken in a marine area)

relevant to the project area.

The town of Woodside is characterised by low to flat topography with ground surface elevation of 350 m to 380 m AHD, to higher undulating and moderately steep terrain in the vicinity of BIH (400 to 480 m AHD).

The proposed development footprint (Goldwyn) has a natural fall across the site from the south-east to the northwest with an average gradient of approximately 8%. A ridgeline passes through the property on the northern side of the creek. The southern side of the ridge grades towards the creek at close to 10% grade, while the northern side grades to Pfeiffer Road, also at close to 10% average grade.

3.7 Describe the current condition of the environment relevant to the project area.

The proposed BIH ML area ranges from highly modified pastures and irrigated sown grasses, to high conservation value remnant vegetation patches.

The development footprint has been designed around locations of highly modified land (cleared agricultural land) that avoids clearance of native vegetation. All significant trees and remnant vegetation's locations have been surveyed and then the mine site then planned around them.

Soil erosion attributes have been assessed for the Project site, with potential for water erosion ranging from moderate (engineered works needed e.g. contour banks) to moderately high (semi arable). Just north of the mine site, the potential for water erosion is low (no special management needed). There is low potential for wind erosion across the whole BIH Project site.

Thirty-eight introduced flora species and six introduced fauna species were recorded during the 2014 flora and fauna survey, attached to Section 2 of this Referral.

A Bushland condition monitoring report was undertaken for the NVHA area in 2015, attached to section 2 of this Referral.

3.8 Describe any Commonwealth Heritage Places or other places recognised as having heritage values relevant to the project area.

Located on Goldwyn there is a South Australian registered heritage site of State significance on Pfeiffer Road comprising a chimney and flue, within the former Lone Hand Gold Mine (State heritage ID:12853).

Although the Bird-in-Hand Gold Project site is bounded by Pfeiffer Road to the north-west, the registered place is not expected to be impacted. A buffer zone of 25 metres prohibiting any activity has been implemented within the site design.

3.9 Describe any Indigenous heritage values relevant to the project area.

The current project area was once the home of the Peramangk people. The model of Aboriginal land use indicates that the region would have been used seasonally, with camping places at major waterholes along the Onkaparinga River (Hahndorf).

Terramin has been advised by DPC that the central archive, which includes the Register of Aboriginal Sites and Objects (the Register), administered by the DPC's – Aboriginal Affairs and Reconciliation Division (AARD), has no entries for Aboriginal sites in the BIH Project site.

Based on a review of the available information, EBS Heritage (EBS, 2016) assessed that there is a very low risk for the project to encounter any cultural heritage items, objects or remains in the proposed development, given the history of intense mining activities and town construction (Reefton Heights) that took place here in the early 19th century.

Both Indigenous and Cultural Heritage reports have been attached to this submission – "Heritage Assessment for a Mining Lease" and "Cultural Heritage Assessment".

3.10 Describe the tenure of the action area (e.g. freehold, leasehold) relevant to the project area.

The development footprint is located entirely within CT/6055/379, Goldwyn (192 Pfeiffer Road, Woodside, SA, 5244) which is a 36 Ha freehold property owned by Terramin.

3.11 Describe any existing or any proposed uses relevant to the project area.

- Grazing modified pastures

- Remnant native cover (Native Vegetation Heritage Agreement area)

- Irrigated perennial vine fruits

- Roads

- Water storage – intensive use/farm dams

- Rural residential

- Wine production (bottling)

    - Inc. retail (cellar door sales)

- Agroforestry

Section 4 - Measures to avoid or reduce impacts

Provide a description of measures that will be implemented to avoid, reduce, manage or offset any relevant impacts of the action. Include, if appropriate, any relevant reports or technical advice relating to the feasibility and effectiveness of the proposed measures.

Examples of relevant measures to avoid or reduce impacts may include the timing of works, avoidance of important habitat, specific design measures, or adoption of specific work practices.

4.1 Describe the measures you will undertake to avoid or reduce impact from your proposed action.

Terramin Planning Approach

With recent amendments to the South Australian Mining Act, DPC has adopted a performance-based or outcome-based source-pathway-receptor approach to regulation, rather than prescriptive regulation and conditioning.

The BIH site layout and mining operations have been planned following the impact control and management hierarchy of:

1. Elimination (prevention) - redesign to eliminate the impact

2. Control through design/engineering - physical control

3. Control through management system - manage the risk through procedures and the way the activity is conducted.

When developing the ML application, Terramin must identify potential impacts that may occur as a result of activities and assess the likelihood and consequences of the impacts to determine the risk. This includes an assessment of the likelihood and consequence of credible worst-case impacts as well as expected impacts. Control and management strategies are developed that can be used to reduce the risk of the potential impacts. A set of outcomes must be developed for each of the identified environmental impacts. Clear and measurable criteria should also be set to demonstrate the achievement of outcomes. These criteria will be used by DPC as the key indicators of compliance.

The outcomes and measurement criteria are based on the residual risk when the control and management strategies have been implemented. Terramin has developed preliminary management measures to reduce impacts on particular environmental factors relevant to this EPBC Referral. These factors have been identified as relevant through a preliminary environmental assessment of BIH. As illustrated above, these management systems will be incorporated and provided in more detail in the ML and PEPR and will be assessed to ensure best practice, technical and economic achievability and progressive rehabilitation, where possible.

BIH management plans will include:

- Biodiversity Management Plan (Erosion, weeds and pests, fire, biodiversity, etc.)

- Blast Management Plan- Heavy Vehicle pre-check plans (inc. requirement for disease prevention, including phytophthora and phylloxera)

- Dust Management and Monitoring Plan

- Erosion Management and Monitoring Plan

- Groundwater Monitoring and Management Plan (including use of 50+ monitoring bores, a calibrated groundwater model, geological model and Managed Aquifer Recharge system)

- Noise Management and Monitoring Plan

- Phytophthora and phylloxera Management Plan (in accordance with VineHealth Australia regarding transport of machinery and heavy vehicles)

- Surface Water Monitoring and Management Plan

- Strategic Visual Assessment Plan

- Waste Management Plan

Vegetation buffer zones of 30 metres wide have been designed along all boundaries, near the operational area. To further mitigate noise, dust and light spill impacts to biodiversity five-metre high landscape amenity bunding has also been designed around the majority of the operational area.

All bunds and vegetation buffer zones will be revegetated with endemic native plants. Species selection has been entirely chosen based on local endemic species to maximise vegetation success on local soil and climatic conditions. Seeds have been collected where possible from local sources.

Trigger, Action, Response Plans (TARP) for all impact aspects including dust, noise, groundwater (attached in draft form). A typical TARP document sets out a set of conditions (or “triggers”) and a set of actions which mine managers and supervisors must follow when those trigger events occur. TARPs also typically include a number of different trigger levels, each with a set of responsibilities assigned to mine personnel to action as necessary.

The idea behind having a TARP in place is that it greatly reduces the need for mine management to waste valuable time thinking about what must be done in response to emergency-type situations, when there’s often little or no time to formulate a plan. With a TARP in place, all the manager needs to do is take the prescribed actions to respond to the particular trigger level, as specified in the TARP.

Draft TARPs for groundwater, noise and dust have been attached.

Groundwater has been included in "3.2 Describe the hydrology relevant to the project area (including water flows)".

Air Quality Impact Assessment

The air quality objectives and guidelines listed below (Table 1) were adopted as the air quality objectives for the Project. Only the pollutants of interest to the Project, as discussed in Section 1.4 of the Air Quality Impact Assessment (attached), have been included. Air Quality project’s objectives have been derived from applicable Australian legislation and guidelines.

Table 1.

Indicator	Project Objective	Averaging Period
Environmental Value		
TSP	90 µg/m³	24-hour

Amenity*		
PM10 Toxicity	50 µg/m³	24-hour
PM2.5 Toxicity	25 µg/m³	24-hour
Toxicity	8 µg/m³	Annual
Dust deposition Nuisance/ Ecological	4 g/m²/month (max. total deposited dust level)	Annual*
Nuisance/ Ecological	2 g/m2/month (max. increase in deposited dust level)	

µg/m³ micrograms per cubic metre

* Not legislative; recommended Project goal to reduce likelihood of complaints

Outcomes

The following is a summary of key findings of the predicted air quality with proposed mitigation strategies employed:

(Note: all modelling completed with all activities running simultaneously. In reality, this is very unlikely to occur).

- No exceedances of the Project Objectives were predicted at any offsite sensitive receptors for any of the pollutants of interest

- All predicted 24-hour average and annual average PM2.5 (atmospheric particulate matter less than 2.5 microns) concentrations were well below the Project Objective for both construction and operation.

- Total dust deposition rates were predicted to remain below the Project Objective (4 g/m2/month) in the adjacent vineyards during both construction and operation;

- Total dust deposition rates in a small area of the remnant vegetation to the east of site were predicted to be above the Project Objective (4 g/m2/month) during both construction and operation.

- No exceedances of the dust deposition Project Objectives were predicted at any sensitive receptor.

- Mitigation strategies were identified to be included in an air quality management plan. The mitigation strategies combined with a dust monitoring program is anticipated to allow compliance with the Project Objectives throughout the life of the Project.

- A particulate and dust monitoring program was recommended to allow Terramin to reactively manage project air emissions during construction and operation. Potential monitoring methods that could be considered as part of the monitoring program were suggested:-Boundary monitoring for particulates using non-Australian Standard methods would provide an indication of the efficacy of site air quality management practices.

Australian Standard monitoring at nearby receptors would allow demonstration of compliance with air quality objectives.

Dust deposition monitoring along the western, eastern, and southern boundaries would provide an indication of whether dust deposition impacts are likely in adjacent vineyards and area of remnant vegetation.

Noise Impact Assessment

The proposed ML and the nearest noise-sensitive receivers are all located within the Watershed (Primary Production) Zone with Onkaparinga Valley Policy Area as defined under the Adelaide Hills Council Development Plan.

Under the Development Act, there are no limits associated with construction noise, however, Terramin has elected to apply the Watershed (Primary Production) limits to their construction activities, as a better acoustic amenity outcome for the surrounding environment. Construction will not occur overnight.

Under the Noise Environment Protection Policy (Noise EPP), the applicable noise criteria for industrial activities are presented in the table 2 below.

Table 2 - Noise EPP Noise Criteria

Receiver zone		Noise level at noise-sensitive receivers
Watershed (Primary Production)	Day(1)	LAeq 57 dB(A)
	Night(1)	LAeq 50 dB(A)

Note: The Noise EPP defines daytime as between 7.00 am and 10.00 pm on the same day and night time as between 10.00 pm on one day and 7.00 am on the following day.

Under Part 5, Section 20 of the Noise EPP, where a development application is being sought under the *Development Act 1993* the predicted source noise level for the development should not exceed the relative indicative noise level from Section 5, less 5 dB(A). This Section does not apply, as the Project falls under the *Mining Act 1971*; however, Terramin is electing to adopt this for the ore production phase of the project in order to provide a better acoustic amenity outcome for the surrounding environment and community.

The acoustic assessment for the Project has been broken down into three scenarios, which have been listed with their associated noise criteria in table 3 below.

Table 3 - List of modelled scenarios and the associated noise criteria

Scenario Description (Time Period - LAeq, 15min)	Project Noise Criteria
Surface construction (Year 0-1)	
Day time only	57 dB(A)
Underground development (Year 1-2)	

Day time	57 dB(A)
Night time	50 dB(A)
Ore production (Year 2-7)	
Day time	52 dB(A)
Night time	45 dB(A)

(note: all modelling has been completed with all activities running simultaneously. In reality, this is very unlikely to occur).

Noise criteria are set in accordance with the Noise EPP and are derived based on the land uses principally promoted by the relevant development plan. The equivalent continuous noise level criteria are 57 dB(A) during the day time period and 50 dB(A) during the night time period; however, although not required, Terramin will adopt a project noise limit 5 dB(A) lower than this in accordance with Part 5, Section 20 of the Noise EPP for the ore production phase of the project in order to provide a better acoustic amenity outcome for the surrounding community.

Surface construction activities will capture the initial works on site including site clearing, road grading, earthworks and construction of surface infrastructure. These works will only be undertaken during the day and the applicable noise criterion is 57 dB(A), unlike any other rural development.

Noise modelling has demonstrated, that with the appropriate design and management strategies in place, noise impacts can be mitigated to a point where operations at the mine site are predicted to meet the requirements of the relevant legislation, as well as proposed noise criteria for ore production which is lower than the legislative limits and proposed outcome and measurable criteria for construction, underground development, and ore production. Mine closure earthworks will be less invasive than construction and are predicted to comply with the Noise EPP, as closure works are far less intensive than the construction works (non-mining infrastructure to remain onsite, and minimal earthworks required).

Despite the predicted mine noise levels meeting the proposed noise criteria and being assessed as low impact, it is acknowledged that the mine noise will be audible and initially intrusive for

some sensitive receivers used to a relatively quiet rural environment. Outcomes proposed ensure that Terramin will manage the impacts and risks associated with noise to a level which is within the proposed limits and is as low as reasonably practicable.

Surface Water Impact Assessment

This section identifies and assesses the impact and risk associated with the existing surface water values (receptors) as a result of construction, operation, and closure of the proposed mine.

Through the adoption of design modification or specific mitigation measures, all identified impacts and risks were categorised as low (or negligible) and considered ALARP. The key environmental risks will be monitored through the environmental management framework required by the mining approval.

Overall, the objective of the surface water management design is to prevent contamination from known sources and minimise sedimentation from within Goldwyn.

Water erosion provides the highest risk rating of potential impacts to surface water quality, specifically through construction. Design measures to slow and control velocity have been integrated into the design preventing water erosion and sedimentation of surface waters.

Primary design methods incorporated into the landscape design include utilising erosion modelling during the design process of the landscape amenity bunds to determine slope characteristics, as well as cover management strategies.

Chemicals and hydrocarbons will be kept within designated storage areas, bunded to prevent the accidental mobilisation of contaminants affecting soil and surface water quality. Final design of the bunding of hazardous materials storage area(s) will be designed to retain surface water flows during a 1 in 100 year flood event.

A flood event exceeding the capacity of the storage area is considered unlikely (i.e. during the 8 year project lifespan) during construction and operation of the Project. Water from the storage area reports to contained water storage dams or the treatment plant located onsite. Stormwater from any flood event can be contained and treated prior to leaving site. There is little risk of

contamination of surface water from stored chemicals or hydrocarbons.

The site is divided up into specific catchments, which have run off directed into existing drainage or where collecting water from the mining area, into the water treatment plant. A network of drains, sumps and pumps are used to manage water flows. Areas which report to the water treatment plant include runoff from the IML, mining roads, laydown areas and the workshop. This negates the risk of runoff from identified potentially acid forming (PAF) mullock and/or hydrocarbons from the workshop entering into the natural surface water drainage.

The Goldwyn property will have contoured drainage lines traversing the operational area to aid the reduction of sedimentation from overland runoff. Swales utilising water sensitive urban design principles will be installed with endemic vegetation along drainage lines. This includes the edge management via the drainage line along the eastern boundary of Goldwyn and the drainage line located along the south-western boundary of Goldwyn.

Collection sumps have been integrated into the stormwater management site design to reduce the risk of hydrocarbons and sedimentation exiting site. The construction of a surface water retention dam (detention basin) is designed to allow sediments to drop out naturally before entering the surface drainage system reporting to the Inverbrackie Creek. Hydrocarbon traps are incorporated in the sump designs.

All disturbed areas which are not sealed and maintained as part of the operating area will be sprayed as soon as is practical with hydro-mulching to reduce potential for wind and water erosion until soil is stabilised through germinated vegetation. Native grass varieties will be used in the hydro-mulching as they carry a lower risk of bushfire, however, a sterile annual grass will be used in the first year to increase soil stability in the short term.

The landscape amenity bunds will then be planted with tubestock which is endemic to the region.

Between the spraying of native grasses and tubestock planting, Terramin expect a self-sustaining system to establish which stabilises the soil and prevents surface water sedimentation from occurring from the landscape amenity bunds.

Hydro-mulching

Hydro-mulching is a one-step process that uses water as a carrier to spray seed, fertiliser, tracking dye onto the seedbed, but has the benefits of Australian-tested cellulosic Growth Medium mulches and a binder added to the slurry. Hydro-mulching provides a temporary layer of erosion control from wind and water until vegetation germinates and is perfect for batter stabilisation. It is important to note that hydro-mulching is not hydro-seeding; hydro-seeding is simply a method of applying seed and does not provide extra protection against erosion.

Slopes of the landscape amenity bunds located on the inside of the operational area are designed to be of a harsher gradient, to allow maximum use of the available area and reduce the overall footprint of the site. As a result, they carry a higher likelihood of water erosion. Where required a synthetic erosion control blanket that has a flexible membrane that works to protect the soil surface from erosion will be used. This can be altered to support the growth of vegetation or prevent it through the use of a hydrophobic polymer.

All chemical and hydrocarbon storage will be in accordance with:

- AS 1940-2004: The storage and handling of flammable and combustible liquids

- AS 1692-2006: Steel tanks for flammable and combustible liquids

- Relevant South Australian legislation

- Best practice guidelines

The wheelwash and washdown area will bunded, with wash-water recycled through a sump and hydrocarbon separator within the washdown area.

Parts of Goldwyn not utilised for operations will maintain existing drainage and allow rainfall to flow to the natural low points where it will be allowed to evaporate/infiltrate as it has historically.

Post closure, hardstand areas will be deep ripped and returned to cropping or native vegetation where practical/appropriate (as agreed with the stakeholders).

Erosion control measures typically consist of providing a surface treatment to resist scouring velocities and structures within the channel to reduce flow velocities. Surface drainage (overland flow paths and swales) will be protected by erosion control measures, where required as determined by assessing expected flow velocities.

Given the relatively high rainfall in the area, site vegetation cover within the drainage channels will establish naturally. In order to increase the establishment, the drains will be planted with sedges. Other treatment measures will be required to minimise channel flow velocities, where high gradients exist. In these areas, rock riprap utilising local materials won from the site during the construction phase will be installed at critical locations within the channels.

Rock rip rap will be placed:

- at pipe outlet points,

- at the culvert road crossing of the existing creek,

- at the upstream end of the surface water retention dam (detention basin), and

- within swales where flow velocities are estimated to be greater than 2 m/s.

Mobilisation of contaminants

The site has been designed with specific catchment areas with integrated contaminant traps (gross pollutant traps (GPT)) for solids, oil and sediment separation. The primary treated water then reports to either the surface water retention dam (detention basin) or the water treatment plant. Any contaminated surface water is managed within the boundary of the mine site to ensure suitable quality before release. A comprehensive monitoring plan including water quality testing prior to surface water leaving site is incorporated in the site design to further reduce likelihood of contaminates leaving site. Contaminant catchment areas are listed below in the table.

Table | Contaminant Catchment Areas

Catchment name	Area (ha)	Impervious area (%)
Integrated Mullock Landform (IML)	1.4	70
Mine Operations	3.6	25

Office and access roads	1.3
60	

The 100-yr Average Recurrence Interval flood extents for the main creek that passes through the site have been determined through the creation of a Hydrologic Engineering Centre – River Analysis System (HEC-RAS) model. The flood extents are contained within the well-defined creek valley that passes through the property. The width of the floodplain typically ranges between 10 and 15m wide. All development, other than the access road which crosses the creek, has been kept at least 40m away from the flood extents.

Acid and metalliferous drainage

Acid and metalliferous drainage (AMD) and neutral and metalliferous drainage (NMD) potential from mullock has been assessed (Tonkin, 2016-attached). During geological logging AMD aspects were recorded and tested. The Project has very little AMD potential and generated rock is typically acid consuming. Terramin generated a 3D block model incorporating the spatial distribution and quantities of PAF, Non-acid Forming (NAF), NAF-Acid Consuming Material (ACM) or Uncertain (UC) material. This model was utilised during mine design to avoid any areas which would increase the likelihood of AMD generation. AMD material typically occurs in the oxide and transition zone associated with the supergene sulfide zone. The underground mine plan and decline has been moved to avoid this area which reduces the potential volume of PAF material. Using the AMD block model it is calculated that approximately 2% of waste rock brought to the surface will likely classify as PAF, 98% of the waste rock brought to the surface for storage in the IML will be from fresh material which is NAF (ACM).

Further refinements of the mine design will be undertaken to avoid PAF material and operating procedure will involve geological inspection of development faces to ensure PAF is correctly managed and stored to ensure that run-off is contained. The Stormwater Management Plan considers the location and potential contaminants from operations and incorporates run-off into treatment design. Any potential AMD/NMD material will be placed on a purpose-built pad and drainage directed to a sump and then pumped to water treatment plant.

A site contamination audit during the closure phase will be undertaken to reduce any chance of impacts to surface water post-closure. The closure plan is designed to eliminate, as far as is possible, the risk of post-closure impacts to both surface water and soil by ensuring no AMD/NMD material is left on the surface at the close of operations.

4.2 For matters protected by the EPBC Act that may be affected by the proposed action, describe the proposed environmental outcomes to be achieved.

Proposed environmental outcomes (that will become legally enforceable with the approval of the Mining Lease) include:

- No loss of abundance or diversity of native vegetation (as defined by Native Vegetation Act 1991, SA) caused by mining activities on or off the lease during construction, operation and post mine completion through; clearance, dust/contaminant deposition, noise, fire, reduction in water supply, or other damage as defined by Nature Conservation Society of South Australia (NCSSA) under their Bushland Condition Monitoring Program., unless prior approval under the relevant legislation is obtained

- No unplanned fires

- No adverse impact to supply or quality of water by mining operations to existing users and water dependent ecosystems

- No nuisance noise (as defined by Environment Protection Act 1994 (SA) and Noise Impact Assessment 2017)

- Includes construction noise limits unlike any other industrial development in South Australia

- No nuisance dust (as defined by Dust Impact Assessment 2017)

- Designed rehabilitation sites are established self-sustaining systems (as monitored by Landscape Function Analysis)

- No adverse impacts on soil quality within the ML that could compromise the post mining land use

- No native fauna injuries or deaths that could reasonably have been prevented.

- No introduction of new species of weeds or pests (including feral animals), or sustained increase in abundance of existing weed or pest species on the ML.

Section 5 – Conclusion on the likelihood of significant impacts

A checkbox tick identifies each of the matters of National Environmental Significance you identified in section 2 of this application as likely to be a significant impact.

Review the matters you have identified below. If a matter ticked below has been incorrectly identified you will need to return to Section 2 to edit.

5.1.1 World Heritage Properties

No

5.1.2 National Heritage Places

No

5.1.3 Wetlands of International Importance (declared Ramsar Wetlands)

No

5.1.4 Listed threatened species or any threatened ecological community

No

5.1.5 Listed migratory species

No

5.1.6 Commonwealth marine environment

No

5.1.7 Protection of the environment from actions involving Commonwealth land

No

5.1.8 Great Barrier Reef Marine Park

No

5.1.9 A water resource, in relation to coal/gas/mining

No

5.1.10 Protection of the environment from nuclear actions

No

5.1.11 Protection of the environment from Commonwealth actions

No

5.1.12 Commonwealth Heritage places overseas

No

5.2 If no significant matters are identified, provide the key reasons why you think the proposed action is not likely to have a significant impact on a matter protected under the EPBC Act and therefore not a controlled action.

The Protected Matters Report identified threatened species and migratory species that have the potential to interact with the BIH Project site.

Survey work, site investigations and desktop research have indicated that the proposed action is not likely to have a significant impact on a matter protected under the EPBC Act because:

- No clearance of remnant or endemic native vegetation will occur- BIH is located within an area that is highly sensitive for the local community. The proposed Project has been carefully designed around avoiding or minimising impacts that could potentially affect environmental values or concern members of the community. Design aspects include management around; groundwater drawdown, groundwater contamination, noise, air quality, dust generation, underground blasting, increased traffic and visual amenity. In addressing potential community impacts/concerns and avoiding vegetation clearance, Terramin has also reduced likely potential impacts on Matters of National Environment Significance (MNES).- The Project's area of operation is on cleared agricultural land, containing introduced cattle pastures, where the likelihood of threatened and migratory species occurring is very low.

-The biodiversity management plan addresses general land management practices which reduce or avoid impacts to biodiversity values, for example, these include issues such as weeds, grazing by hard hooved animals, fire, disease, surface water quality and feral animals.

- The proposed Project area has a 30 metre vegetation buffer zone with additional 5 metre high vegetated earth bunds to mitigate any potential edge effects on remnant vegetation, particularly within the native vegetation heritage agreement area HA 1555 located on neighbouring property to the east of the development area. *Caladenia rigida* listed as

Endangered under the EPBC Act and *Diuris behrii, Luzula flaccida* and *Thelymita latifolia* listed as vulnerable under the SA National Parks and Wildlife Act 1972 and *Eucalyptus fasciculosa* listed as Rare under the SA NPW Act occur within the vegetation heritage agreement area. The closest known *C.rigida* locations are approximately 450 metres from the operational area of Goldwyn and populations of the *D.behrii* are 100 metres from the Goldwyn boundary. Given these distances, no direct impact, physical disturbance, dust, or other impacts are anticipated. See attached reports; Air quality impact report, Noise impact report, Blasting impact report, Stormwater management report, Groundwater impact assessment.- No clearance of significant trees located in on Goldwyn, additionally significant trees have an earthworks exclusion buffer zones of 5 metres outside each individual tree. In order to provide improved habitat for the significant trees, companion planting has been undertaken on Goldwyn.Areas where threatened and migratory species have been noted to occur are outside the area of potential direct impact of BIH. Any potential indirect impacts identified do not meet the significant impact criteria specified in the relevant significant impact guidelines.

-The Project is required to proceed through a rigorous licensing process, which requires the assessment of environmental risk and the development of management options to minimise the risk of environmental impact.

The geology beneath the western portion of HA 1555 consists of clay of variable depth, of up to 80 metres reducing the likelyhood of rock fractures bearing water being present. Within the western portion, the groundwater level is modelled to be naturally occurring below a depth of where vegetation roots acquire water for the majority of the vegetation heritage area, apart from the riparian zone which is interpreted to be a perched aquifer of a depth of 15 metres. Given the clay presence, which acts as an aquitard, the depth to water, and the fact that *Eucalyptus leucoxylon* roots are unlikely to be greater than 10 metres deep (ref- AS4970-2009) the probability of an impact to vegetation health is very low. This is supported by work into groundwater uptake by Eucalyptus leucoxylon which found little or no groundwater uptake in areas containing high clay content soils (CSIRO, report 05/06, 2005).

The neighbouring property containing the historic BIH mine workings, the historic Reefton Heights settlement and the native vegetation heritage agreement (NVHA) area HA 1555 contains intact endemic Blue Gum or Red Gum woodland. An assessment of any groundwater impacts of the proposed mining operation on the hydrological processes of the unsaturated zone and /or the perched aquifer accessed by this vegetation has been undertaken (Golders 2017, report 1659870). The area has been cleared and re-established over a number of periods of mining since the 1880’s. Dewatering of the area through mining occurred between 1881 and 1897. The BIH Gold Mine workings were again dewatered in 1934-35, removing a total of 380 million Gallons (1727.5 Ml) in 12 months (Dept of Mines 385/45, RB2100063, 1945).

Additionally, water was abstracted from the mine voids between 1935 and 1967 to supply the

Australian Army's Woodside Barracks at Inverbrackie at the rate of 150 megalitres a year. The biodiversity values appeared to have not been impacted over the long term by this past practice. The existence of a zone of clay between the surface soils and the deeper fractured rock aquifers appears to act as an aquitard. A review of geological records and the groundwater

modelling undertaken support this interpretation. Currently, in situ monitoring bores are being monitored and this will continue during operations.

Terramin proposes a no net groundwater abstraction concept by returning all groundwater encountered around the mine workings back into the aquifer using MAR. Hydrological modelling of the MAR shows that the water table will not be significantly lowered beneath the vegetation heritage agreement area. Mine water will be further managed through avoidance of FRA and the application of grouting to seal mine openings to further reduce groundwater inflows into the mine.

To provide further confidence in the maintenance of existing 'perched' groundwater levels, a MAR system has been modelled, designed, approved by regulators (DPC, DEWNR and following approval from the Environment Minister) and will be installed for use if monitoring indicates a variation to groundwater levels. The MAR provides the ability to ensure water levels remain at, or above, pre-mining levels within the native vegetation heritage area (See Groundwater Assessment for NVHA, attavched to section 3.2)

-The Cox Sandstone and Tarcowie Siltstone geological units are modelled to emerge at surface with no clay aquitard and limited soil cover in the far eastern portion of the NVHA, the groundwater levels are modelled to be 45 to 60 metres deep in this area (Golder, 2017 report1659870). There is a very low probability, given these depths, that *Eucalyptus leucoxylon* source water from the groundwater via roots accessing via rock fractures, however, to mitigate this improbable impact a bore monitoring system will be commissioned along with a MAR system to ensure groundwater levels do not decrease due to mining operations.

- The MAR system will not be installed in the NVHA area itself, due to the risk of damaging listed species, but be placed nearby, as demonstrated in the Groundwater Assessment for the NVHA.

The agroforestry fenceline plantings on the Goldwyn property have the potential to provide a food source to Grey-headed Flying Fox *(Pteropus poliocephalus*), however, these trees are senescing, falling over etc, and require harvesting and hence would not provide an ongoing sustainable food source. There is no planned systematic clearance of agroforestry trees for wood harvesting purposes , (apart from removal from fences when they blow over). A small

portion of these trees will be removed to allow an access road to be constructed, this will be approximately 0.24 hectares out of 5.43 hectares.

- Approximately 6.5 hectares of endemic native vegetation has been planted (2015-2017) within the Project area and within gaps between the existing agroforestry fenceline plantings. As part of Terramin's biodiversity management plan (attached to section 4) these will provide a future food and shelter source. An additional 4 Ha of revegetation will occur once construction is complete (on landscape amenity bunding, and gap filling), totalling 10.5 Ha of revegetation of endemic native vegetation.

- The total remnant native vegetation, includes the NVHA, covers approximately 22 hectares n (the NVHA contained within this area is 13.8 hectares). The flora and fauna surveying found 60 species of native birds, of which 20 are listed as Rare, vulnerable or near threatened in the AMLR bioregion, additionally there are 4 species which are found to be in long- term decline (Szabo et al). Many of these 24 species are carrying what is termed an extinction debt in the AMLR as a result of regional land clearance, habitat fragmentation and land management practices since European colonisation. Many species or populations are modelled to become extinct due to demographic stochasticity and environmental variation (Possingham and Field, 2001). The 24 species are identified from Szarbo, et al and NRM board factsheets (http://www.naturalresources.sa.gov.au/adelaidemtloftyranges/home). A key recommendation (Szabo, et al) is to increase the habitat available and to improve land management practices of existing habitat. The proposed Project will increase the available habitat by 10.5 hectares, this revegetation connects to the NVHA and represents an effective 30% increase in habitat patch size, increasing the biodiversity corridor. In time as the vegetation matures, the population size of some of the declining avifauna species found in the NVHA is expected to increase.

- 50 nestboxes for native fauna have been installed on the Goldwyn property, as low numbers of naturally occurring hollows have been noted as part of the Bushland Condition Monitoring within the NVHA area.

- A partnership will be sought with the landowner of the NVHA area, appropriate NRM bodies and experts to determine if a breeding program for *Caladenia rigida* is a useful option to be considered to increase the subpopulation found in this area.

- It is noted that some native orchid species, in particular, the Nodding Greenhood, *Pterostylis nutans* are growing profusely on historic BIH overburden and tailings piles, these are located within neighbouring native vegetation. This area is outside the proposed Project development

and will not be disturbed.

- The Project must comply with a range of South Australian and Federal legislation, regulations and associated policies and guidelines, which ensure that impacts to the environment are minimised.

- Terramin have compiled a table of species identified in the PMR and notes associated with each species as to why any impact is unlikely.

Caladenia agrocalla - White-beauty Spider- orchid (Endangered)

Glycine - Clover Glycine (Vulnerable)*latrobeana*

Prasophyllum pallidum - Pale Leek-orchid (Vulnerable)

The Flora and Fauna assessment (COOE 2016) identified the species as potentially occurring within the Project site. Potential threats include the introduction of weeds and dust deposition, which will be managed under BIH's Biodiversity Management Plan and Dust Management and Monitoring Plan. Another potential threat is hydrology (water level) changes adversely affecting bushland habitat condition, this risk will be managed by using a calibrated groundwater model, active monitoring and application of managed aquifer recharge if required. These aspects will be included in a groundwater management plan, as part of the ML's PEPR, the regulatory framework. The site plan and mining operations have been designed around minimising disturbance to the local community and environmentally sensitive receptors. Mitigation measures include installation of 30 metre wide vegetation buffer zones and connecting vegetation corridors, minimising dust generation, trapping dust onsite and managing noise and vibration impacts (associated Noise and Blast Management Plans to be implemented through the PEPR stage).

Caladenia rigida - Stiff White Spider-orchid (Endangered)

Recorded within the Project site, 600 east of the of the development footprint. Potential threats include the introduction of weeds and dust deposition, which will be managed under BIH's Biodiversity Management Plan and Dust Management and Monitoring Plan. Another potential threat is hydrology (water level) changes adversely affecting bushland habitat condition, this risk will be managed by using a calibrated groundwater model, active ground water level monitoring and application of localised managed aquifer recharge if required. These aspects will be included in a groundwater management plan,as part of the ML's PEPR, the regulatory framework. The site plan and mining operations have been designed around minimising

disturbance to the local community and environmentally sensitive receptors. Mitigation measures include installation of vegetation buffer zones and connecting vegetation corridors, minimising dust generation, trapping dust onsite and managing noise and vibration impacts (associated Noise and Blast Management Plans to be implemented through the ML's PEPR stage). A regional orchid recovery plan (Quarmby, 2010) is in place and to meet one of the objectives of increasing sub-population numbers, a breeding program partnership will be initiated with the landholder and relevant NRM experts if NRM experts deem this approach beneficial.

Pteropus poliocephalus - Grey-headed Flying-fox (Vulnerable)

The Flora and Fauna assessment (COOE 2016) identified the species as potentially occurring within the Project site. The species has complex migration traits in response to ephemeral and patchy food resources. Potential threats include noise, vibration and light disturbance, and reduction in foraging resources, namely Eucalyptus blossom. Agroforestry fenceline plantings of *E.maculata* and *E.leucoxylon* are present within the 'Goldwyn' site, including the operating area and could provide a blossom resource, however, these plantings are 25 years old and the trees are in poor condition experiencing a high blow over rate and mortality and hence have a low foraging resource value. The Biodiversity Management Plan has revegetation as a mitigation strategy for visual amenity and strengthening biodiversity values, revegetation works will occur within the agroforestry's senescence areas as well as on all landscape bunding, boundary vegetation buffer zones and corridors, and in strategic sightlines.

The site plan and mining operations have been

designed around minimising disturbance to the local community, including minimising noise, visual and vibration disturbance. Potential impacts will be managed under BIH's Biodiversity Management Plan, Strategic Visual Assessment Plan, Noise Management and Monitoring Plan and Dust Management and Monitoring Plan.

Isoodon obesulus obesulus - Southern Brown Bandicoot (eastern) (Endangered)

The Flora and Fauna assessment (COOE 2016) identified suitable habitat for the species within the Project site, outside of the development footprint. Potential threats include noise and vibration disturbance, and increased predation. The site plan and mining operations have been designed around minimising disturbance to the local community, including minimising noise and vibration disturbance. Potential pest impacts will be managed under BIH's Biodiversity Management Plan.

Calidris ferruginea - Curlew Sandpiper (Critically Endangered)

Preferred habitat is not present on the mining lease, hence the species is unlikely to occur within or near the lease. The species is uncommonly recorded inland around dams, waterholes and bore drains. Likelihood of occurrence is very low. Potential threats include alteration of the existing water sources. Management of stormwater onsite will involve a combination of swales, treatment devices (gross pollutant traps and oil and sediment separators), retention basins and ephemeral wetlands. The final, post mining design will provide an increase in surface water habitat.

Zoothera lunata halmaturina - Bassian Thrush (South Australian) (Vulnerable)

Preferred habitat is not present on-site. Likelihood of occurrence is low. Potential threats include weed invasion and increased predation. Potential impacts will be managed under BIH's Biodiversity Management Plan

Notechis scutatus - Eastern Tiger Snake (Vulnerable) - included for completeness

Preferred habitat, riparian areas, is limited on site. There is one ephemeral creekline that is undergoing understory and mid story revegetation, the overstory is intact. Apart from a creek crossing no development will be undertaken in the riparian zone. Likelihood of occurrence is low as habitat has been overgrazed for a long period of time and is degraded. Potential threats are habitat loss or degradation, feral predation and low frog population numbers. Potential impacts will be managed under BIH's Biodiversity Management Plan

Numenius madagascariensis — Eastern Curlew, Far Eastern Curlew (Critically Endangered)

Listed marine

Listed migratory - CAMBA, JAMBA, ROKAMBA

The eastern curlew takes an annual migratory flight to Russia and north-eastern China to breed, arriving back home to Australia in August to feed on crabs and molluscs in intertidal mudflats. In

South Australia, the species is scarce between the Victorian border and Cape Jaffa and patchily distributed from the Coorong north-west to the Streaky Bay area, and has previously been recorded in Lake Alexandrina and Lake Albert, South Australia. Therefore, the species is very unlikely to be found, if so a vagrant only, within or near the proposed mining lease as the habitat is not suitable.

Grantiella picta — Painted Honeyeater (vulnerable)

Species not recorded within the proposed mining lease. Preferred habitat is woodland, no clearance of native vegetation will occur on the mining lease and Terramin is planning to revegetate 10.5 hectares of the 36 hectare 'Goldwyn' farming property the project is based on, within the proposed mining lease area. The mining lease poses no credible impact to the species.

Apus pacificus - Fork-tailed swift

Hirundapus caudacutus - White-throated Needletail

Listed Marine

Listed migratory - CAMBA, JAMBA, ROKAMBA

The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher. The Fork-tailed Swift and the White-throated Needletail are non-breeding visitors to Australia (Higgins 1999). The mining lease poses no credible impact to the species as no large trees that may be potential roasting will be cleared.

Motacilla cinerea — Grey Wagtail

Motacilla flava — Yellow Wagtail

Listed migratory - CAMBA, JAMBA, ROKAMBA

The mining lease poses no credible impact to these species due to habitat not being suitable. Reference - Draft referral guideline for 14 birds listed as migratory species under the EPBC Act

Actitis hypoleucos — Common Sandpiper

Calidris acuminata — Sharp-tailed Sandpiper

Calidris melanotos — Pectoral Sandpiper

Tringa nebularia - Common Greenshank

Listed migratory - Bonn, CAMBA, JAMBA, ROKAMBA

Common Sandpiper - This species is a migratory shorebird, the mining lease due to its inland location poses no credible impact to these species.

Sharp-Tailed Sandpiper & Pectoral Sandpiper - preferred wetland habitat not present on or near the proposed mining lease area

Common Greenshank - preferred habitat may be present near proposed mining lease boundary but riparian condition rated as 'poor' by the EPA, species not likely to be present but riparian habitat is being managed for biodiversity values so no impact by

the mining operation is anticipated (Hansen, 2016).

Pedionomus torquatus — Plains-wanderer (Critically Endangered)

The plains wanderer is a highly unique, ground-dwelling bird that lives in the grasslands of Queensland, New South Wales, Victoria and South Australia. Preferred habitat is not present within the proposed mining lease, the existing land form is predominately cleared woodland with introduced cattle pastures. The mining lease poses no credible impact to this species.

Merops ornatus - Rainbow Bee-eater

IUCN: Listed as Least Concern (Global Status: IUCN Red List of Threatened Species: 2017.1

list)

NGO: Listed as Least Concern (The Action Plan for Australian Birds 2010 - non-threatened)

The Rainbow Bee-eater occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation (Higgins 1999). The breeding season extends from August to January (Boland 2004a; Higgins 1999). The nest is located in an enlarged chamber at the end of long burrow or tunnel that is excavated, by both sexes, in flat or sloping ground, in the banks of rivers, creeks or dams, in roadside cuttings, in the walls of gravel pits or quarries, in mounds of gravel, or in cliff-faces.. Nests of the Rainbow Bee-eater are presumably susceptible to predation, flooding and trampling because they are located on the ground and in banks, for example, of rivers and creeks. Potential impacts will be managed under BIH's Biodiversity Management Plan, buffer zones have been put in place around riparian and existing remnant vegetation hence trampling will be avoided.

Listed migratory

No migratory species were recorded during the Flora and Fauna Survey (COOE, 2016). Potential impacts include negative alteration of the existing water sources but this is not plausible given the existing riparian condition and Terramin's planned biodiversity management works. Management of stormwater onsite will involve a combination of swales, treatment devices (gross pollutant traps and oil and sediment separators), retention basins and ephemeral wetlands. Potential constructions will be short-term and the final design will provide an increase in surface water habitats.

Section 6 – Environmental record of the person proposing to take the action

Provide details of any proceedings under Commonwealth, State or Territory law against the person proposing to take the action that pertain to the protection of the environment or the conservation and sustainable use of natural resources.

6.1 Does the person taking the action have a satisfactory record of responsible environmental management? Please explain in further detail.

Terramin's ability to operate safely and in an environmentally responsible manner is at the forefront of Terramin’s business activities. Terramin has been subject to significant environmental regulation in relation to its exploration, development, and mining activities at AZM. Exploration licences and mining leases are issued subject to various obligations to environmental monitoring and rehabilitation, and ongoing compliance with all relevant legislative obligations. Terramin Australia Ltd’s directors, employees, and consultants are committed to achieving a high standard of environmental performance and, in this regard, the Board has an established and active Risk & Compliance Committee.

Terramin reports quarterly on its projects and compliance to the environmental conditions listed in the ML6229 (AZM) conditions.

In late 2011, an Environmental Direction was issued to Terramin by the South Australian the then Department for Manufacturing, Innovation, Trade, Resources and Energy (DMITRE), relating to compliance of the Angas Zinc Mine tailings storage facility (TSF) water reduction plans and associated actions. Management of water in the TSF was a matter of intense focus during 2012 and improvements in evaporation techniques, mine water disposal and the construction and use of a pipeline providing clean water to local primary producers resulted in a significant drop in the water level. At the end of 2012, the TSF water level was deemed by DMITRE to be compliant with the terms of the Environmental Direction. Water management will continue to be an ongoing focus for the management team to ensure that the TSF of AZM remains within agreed parameters, as defined in the PEPR. At no time was there any impact or harm to the environment and no water from the TSF entered the surrounding environment.

Terramin has managed their projects such that there have been no other material breaches, other instances of non-compliance, or any recorded known areas of outstanding non-compliance, with any applicable environmental legislation or other regulations.

In August 2017 the first ever completed closure plan in South Australia under the new 2011 South Australian mining regulations was approved for Terramin's Angas Zinc Mine. The approved plan represents the most comprehensive body of work into mine closure plan in South Australia to date. The closure plan provides for the rehabilitation of AZM to a safe and stable landform in perpetuity.

6.2 Provide details of any past or present proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against either (a) the person proposing to take the action or, (b) if a permit has been applied for in relation to the action – the person making the application.

Not applicable

6.3 If it is a corporation undertaking the action will the action be taken in accordance with the corporation's environmental policy and framework?

Yes

6.3.1 If the person taking the action is a corporation, please provide details of the corporation's environmental policy and planning framework.

Terramins risk based planning framework approach is described in section 4.1

6.4 Has the person taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?

Yes

6.4.1 EPBC Act No and/or Name of Proposal.

Angas Zinc Mine, EPBC reference number 2006/3087

Section 7 – Information sources

You are required to provide the references used in preparing the referral including the reliability of the source.

7.1 List references used in preparing the referral (please provide the reference source reliability and any uncertainties of source).

Reference Source	Reliability	Uncertainties
COOE 2016. Bird-in-Hand Gold Project Flora and Fauna Survey 2014. Report prepared for Terramin Australia Ltd.	Reliable	None
Tonkin Consulting 2016. Bird-in-Hand Gold Mine Stormwater Management Plan - Draft. Report prepared for Terramin Australia Ltd.	Reliable	None
EBS Heritage 2016. Pfeiffer Road Woodside Cultural Heritage Assessment. Report prepared for Terramin Australia Ltd.	Reliable	None
AGT 2017. Bird-in-Hand Gold Project Groundwater Assessment - 19 June 2017. Report prepared for Terramin Australia Ltd.	Reliable	None
Terramin 2017. Bird In Hand Inverbrackie Creek Macroinvertebrate and Water Quality Investigation - 4 May 2017.	Reliable	None
Heritage Assessment for a Mining Lease, 26 May 2016 - Phillip Clarke	Reliable	None
Social Impact Assessment / Community Engagement Assessment – (Design for Growth) pending, however, not applicable for assessing this submission.	?	?
Willson and Bignall 2009. Regional Recovery Plan for	Reliable	None

Reference Source	Reliability	Uncertainties
Threatened Species and Ecological Communities of Adelaide and the Mount Lofty Ranges, South Australia. Department for Environment and Heritage, SA.		
Zulfic, D., Barnett, S.R., and van den Akker, J., 2002. Mount Lofty Ranges Groundwater Assessment, Upper Onkaparinga Catchment. South Australia. Department of Water, Land and Biodiversity Conservation. Report, DWLBC 2002/29.	Reliable	None
Teoh, K.S., 2002. Estimating the Impact of Current Farm Dams Development on the Surface Water Resources of the Onkaparinga River Catchment. South Australia. Department of Water, Land and Biodiversity Conservation. Report, DWR 2002/22.	Reliable	None
Aquaterra 2008. unpublished report Hydrogeological Scoping Study, Bird-in-Hand Gold Project, Woodside South Australia. Report prepared for Terramin.	Reliable	None
Inverbrackie creek, near Woodside, 2008-2016 Aquatic ecosystem condition report. Available at: http://www.epa.sa.gov.au/reports_water/c0032-ecosystem-2016	Reliable	None
RB2100063 - Report on the proposed water supply from the Bird-in-Hand Gold Mine, 1945.	Reliable	None
Salt Accumulation and groundwater Uptake by Pine and Bluegum Forests in Bakers Range. Leaney, F.W., Mustafa, S. and Lawson, J. CSIRO Land and Water Science Report 05/06, 2005	Reliable	None

Reference Source	Reliability	Uncertainties
Native vegetation council. Assessment of proposed heritage agreement area, application 2011_1019_473.	Reliable	None
Nature conservation Society of SA, Bushland Condition Monitoring Assessment site report, site WOO-HIST-A-1.	Reliable	none
Dust Impact Report	Reliable	None
Noise Impact Report	Reliable	None
RB2860045 - Report on Woodside, Bird-in-Hand mine water supply, proposed increase in rate of pumping	Reliable	None
Golder Associates Technical Memorandum, project 1659870, Groundwater Assessment for the Native Vegetation Heritage Agreement Area	Reliable	None
Draft referral guideline for 14 birds listed as migratory species under the EPBC Act. http://www.environment.gov.au/biodiversity/threatened/publications/epbc-act-referral-guidelines-migratory-birds	Reliable	Reliable
Hansen, B.D., Fuller, R.A., Watkins, D., Rogers, D.I., Clemens, R.S., Newman, M., Woehler, E.J. and Weller, D.R. (2016) Revision of the East Asian-Australasian Flyway Population Estimates for 37 listed Migratory Shorebird Species. Unpublished report for the Department of the Environment. BirdLife Australia, Melbourne.	Reliable	Reliable

Section 8 – Proposed alternatives

You are required to complete this section if you have any feasible alternatives to taking the proposed action (including not taking the action) that were considered but not proposed.

8.0 Provide a description of the feasible alternative?

Not Applicable

8.1 Select the relevant alternatives related to your proposed action.

8.27 Do you have another alternative?

No

Australian Government
Department of the Environment and Energy

Section 9 – Contacts, signatures and declarations

Where applicable, you must provide the contact details of each of the following entities: Person Proposing the Action; Proposed Designated Proponent and; Person Preparing the Referral. You will also be required to provide signed declarations from each of the identified entities.

9.0 Is the person proposing to take the action an Organisation or an Individual?

Organisation

9.2 Organisation

9.2.1 Job Title

Environment Superintendent

9.2.2 First Name

Matt

9.2.3 Last Name

Daniel

9.2.4 E-mail

mdaniel@terramin.com.au

9.2.5 Postal Address

unit 7, 202-208

Glen Osmond Road
Fullarton, SA SA 5063
Australia

9.2.6 ABN/ACN

ABN

66122765708 - TERRAMIN EXPLORATION PTY LTD

9.2.7 Organisation Telephone

Australian Government
Department of the Environment and Energy

08 82131415

9.2.8 Organisation E-mail

info@terramin.com.au

9.2.9 I qualify for exemption from fees under section 520(4C)(e)(v) of the EPBC Act because I am:

Not applicable

Small Business Declaration

I have read the Department of the Environment and Energy's guidance in the online form concerning the definition of a small a business entity and confirm that I qualify for a small business exemption.

Signature:..... Date: .....

9.2.9.2 I would like to apply for a waiver of full or partial fees under Schedule 1, 5.21A of the EPBC Regulations

No

9.2.9.3 Under sub regulation 5.21A(5), you must include information about the applicant (if not you) the grounds on which the waiver is sought and the reasons why it should be made

Person proposing the action - Declaration

I, Matt Daniel, declare that to the best of my knowledge the information I have given on, or attached to the EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence. I declare that I am not taking the action on behalf of or for the benefit of any other person or entity.

Signature: MDaniel Date: 16/10/2017

I, Matt Daniel, the person proposing the action, consent to the designation of Terramin Exploration Pty Ltd as the proponent of the purposes of the action describe in this EPBC Act Referral.

Signature: MDaniel Date: 16/10/2017

Australian Government
Department of the Environment and Energy

9.3 Is the Proposed Designated Proponent an Organisation or Individual?

Organisation

9.5 Organisation

9.5.1 Job Title

Environment Superintendent

9.5.2 First Name

Matt

9.5.3 Last Name

Daniel

9.5.4 E-mail

mdaniel@terramin.com.au

9.5.5 Postal Address

Unit 7, 202-208

Glen Osmond Road
Fullarton SA SA 5063
Australia

9.5.6 ABN/ACN

ABN

66122765708 - TERRAMIN EXPLORATION PTY LTD

9.5.7 Organisation Telephone

08 82131415

9.5.8 Organisation E-mail

info@terramin.com.au

Proposed designated proponent - Declaration

Australian Government
Department of the Environment and Energy

I, Matt Daniel, the proposed designated proponent, consent to the designation of myself as the proponent for the purposes of the action described in this EPBC Act Referral.

Signature: ..... Date: 16/10/2017

9.6 Is the Referring Party an Organisation or Individual?

Organisation

9.8 Organisation

9.8.1 Job Title

Environmental Superintendent

9.8.2 First Name

Matt

9.8.3 Last Name

Daniel

9.8.4 E-mail

mdaniel@terramin.com.au

9.8.5 Postal Address

Unit 7, 202-208

Glen Osmond Road
Fullarton, SA SA 5063
Australia

9.8.6 ABN/ACN

ABN

66122765708 - TERRAMIN EXPLORATION PTY LTD

9.8.7 Organisation Telephone

08 82131415

Australian Government
Department of the Environment and Energy

9.8.8 Organisation E-mail

info@terramin.com.au

Referring Party - Declaration

I, Matt Daniel, I declare that to the best of my knowledge the information I have given on, or attached to this EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence.

Signature: ..... Date: 16/10/2017

Appendix A - Attachments

The following attachments have been supplied with this EPBC Act Referral:

1. 15.019_170517_site_plan.jpg
2. 500m_buffer_caladenia_rigida.pdf
3. 20170515_-_locality_plan_ramsar_cthland_cats.pdf
4. air_quality_tarp_draft.pdf
5. amd_report_-_final.pdf
6. appendix_a1.pdf
7. appendix_a2_part2.pdf
8. appendix_b.pdf
9. appendix_c1_c2_c3.pdf
10. appendix_d1_d2.pdf
11. appendix_e.pdf
12. appendix_f.pdf
13. appendix_g.pdf
14. biodiversity_management_plan.pdf
15. bushland_condition_monitoring_2015-hist-a-1_site_report.pdf
16. chapter_5_-_methodology_-_final_draft.pdf
17. community_engagement_plan_draft.pdf
18. community_engagment_summary_30august2017.pdf
19. cooe_2016_-_florafauna_report.pdf
20. cultural_heritage_assessment.pdf
21. dust_impact_report.pdf
22. environment-policy-final.pdf
23. epbc_revegetation_disturbance_and_avoidance.pdf
24. final_groundwater_assessment_part1.pdf
25. final_groundwater_assessment_part_2.pdf
26. goldwyn_boundary.zip
27. groundwater_assessment_for_nvha.pdf
28. heritage_agreement_vegetation_associations_area.pdf
29. heritage_assessment_for_a_mining_lease.pdf
30. igs_independent_review_of_gw_model.pdf
31. mc4421.zip
32. md005_-_pepr_determination.pdf
33. ministerial_determination_-_bih_gold_project.pdf
34. native_vegetation_heritage_agreement.pdf
35. noise_impact_report_rs.pdf
36. noise_tarp_draft.pdf
37. stormwater_management_plan.pdf
38. surface_water_report_part_1.pdf
39. surface_water_report_part_2.pdf
40. surface_water_report_part_3.pdf
41. tarp_for_groundwater_draft.pdf