Initial Advice Statement

Kidston Pumped Storage Hydro Project

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Client: Genex Power Limited

ABN: 18 152 098 854

Prepared by

AECOM Australia Pty Ltd
Lev el 5, 7 Tomlins Street, South Townsville Qld 4810, PO Box 5423, Townsville QLD 4810, Australia
T +61 7 4729 5500 F www.aecom.com
ABN 20 093 846 92520 093 846 92520 093 846 925

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1.0 Introduction

Genex Power Limited (Genex) proposes to develop the Kidston Pumped Storage Hydro Project (the Project) on the decommissioned Kidston mine site (the Project site). The Project site is located near the township of Kidston, in Etheridge Shire Council Local Government Area, in northwest Queensland.

Genex are seeking to have the Project declared a 'Coordinated Project' under the Queensland *State Development and Public Works Organisation Act 1971* (SDPWO Act).

1.1 Purpose and Scope of the IAS

The purpose of this IAS is to provide the following.

- Project information regarding the potential environmental, social and economic impacts, to support a 'coordinated project' declaration under SDPWO Act.
- Supporting information to determine which type of coordinated project should be declared being either a project that requires an Environmental Impact Statement (EIS) or Impact Assessment Report (IAR).
- Provides information to interested and affected stakeholders and the general public.

It is proposed that the Project be assessed by the OCG under the IAR process under the SDPWO Act.

1.2 Background

Under Section 27(2) of the SDPWO Act, the Coordinator-General can declare a project a 'coordinated project' on the following grounds.

> *…(b) the project has at least 1 of the following—*
>
> *(i) complex approval requirements imposed by a local government, the State or the Commonwealth;*
>
> *(ii) strategic significance to a locality, region or the State, including for the infrastructure, economic and social benefits, capital investment or employment opportunities it may provide;*
>
> *(iii) significant environmental effects;*
>
> *(iv) significant infrastructure requirements…*

It is proposed that the Project is eligible to apply for a 'coordinated project' declaration under the SDPWO Act on the basis of achieving items (i) and (ii) above. These elements are detailed further in the following sections.

1.2.1 Approval Complexity

The Project presents a unique situation, in which a new non-resource project is proposed over existing resource tenure. The Queensland legislative framework currently does not make provision for the land use transition of decommissioned mine sites to renewable energy projects, and as such no existing legislative mechanism allows for the approval and regulation of certain aspects of the Project.

The key complexity in regulating the Project surrounds the water discharge requirements of the Project. As the Project is a non-resource activity, being constructed and operated on a resource tenure, the water discharge cannot be authorised under the existing Environmental Authority for an existing, or new mining activity. Therefore, a non-resource approval mechanism would typically be required. There is currently no mechanism for approval in the *Environmental Protection Act 1994* for a pumped storage hydro activity, and the required discharge of water from a decommissioned mine site.

Whilst it is understood that legislative amendments to cater to such projects are proposed to occur in future, the timeframes for these changes are uncertain, and will fall outside of the Project development timeframes. It is proposed to use the Coordinated Project process as an alternative approval pathway for what would typically be approved as an environmentally relevant activity under the *Environmental Protection Act 1994*.

1.2.2 Strategic Significance

The Project offers a large-scale, low-cost and flexible solution to Queensland's growing peaking power requirements. The Project is well positioned to take advantage of the combined effects of an oversupply of baseload generation capacity and escalating peak power prices being driven by increasing gas turbine fuel costs. As renewable energy generation gains momentum in Queensland, especially the prevalence of large-scale solar projects, the need for energy storage and energy management will play an increasingly important role in the State's electricity network.

The Project effectively acts as large-scale battery storage, allowing solar energy to be stored and harnessed as baseload power during peak demand periods. This innovative beneficial reuse of the old Kidston mine infrastructure for the purpose of developing a regional renewable energy industry, with significant construction and operational employment opportunities, makes the Project unique and strategically important to the local, regional and state economy.

The significance of the Project has been recognised by the State of Queensland by being declared as both a Prescribed Project and a project of Critical Infrastructure under the *State Development and Public Works Organisation Act 1971* (SDPWO Act) on 27 June 2017. Under section 76(E) of the SDPWO Act the Minister may declare a project to be Critical Infrastructure at the same time as declaring it a Prescribed Project if the Minister considers the project is critical or essential to the State for economic, environmental or social reasons. The Project is also supported by the Australian Renewable Energy Agency through a funding agreement.

1.2.3 Impact Assessment Report

Section 26 of the SDPWO Act states that the Coordinator-General may require an Impact Assessment Report (IAR) when satisfied the environmental effects of the Project do not, having regard to their scale and extent, require assessment through the Environmental Impact Statement (EIS) process.

An EIS is typically required when the development will have 'significant environmental effects'. Under the Act, 'environment' includes:

> *(a) ecosystems and their constituent parts, including people and communities; and*
>
> *(b) all natural and physical resources; and*
>
> *(c) the qualities and characteristics of locations, places and areas, however large or small, that contribute to their biological diversity and integrity, intrinsic or attributed scientific value or interest, amenity, harmony and sense of community; and*
>
> *(d) the social, economic, aesthetic and cultural conditions that affect, or are affected by, things mentioned in paragraphs (a) to (c).*

The primary activity for which an approval is being sought under the coordinated project process is for the water discharges as a result of excess water following significant rainfall events. Release of mine-affected water is a common practice across Queensland for a range of activities. This activity is typically managed through a range of management and monitoring requirements in line with industry standards prescribed under the *Environmental Protection Act 1994* and regulated by the Department of Environment and Science. Industry standards include model mining conditions (ESR/2016/1936) and technical guideline for water release to Queensland waters (ESR/2015/1654).

Coupled with the reasons driving the need for a coordinated project declaration and the relevant existing practices and industry standards, 'fit for purpose' Impact Assessment Report (IAR) process is considered to be the most appropriate for the Project. The potential impacts are concentrated on the water discharge, which are considered further in Section 10.2 of this IAS.

Approvals under other Queensland legislation are being sought concurrently for a number of elements of the Project, including the change in the use of the land and regulation of the proposed Wises Dam structure. These approvals are discussed further in Section 12.0 of the IAS.

2.0 The Proponent

Genex Power Limited (Genex) is an Australian public company listed on the Australian Securities Exchange. Genex is focused on generation and storage of renewable energy. Genex is the sole proponent of the Kidston Renewable Energy Hub in northwest Queensland, which comprises the Kidston Stage 1 solar farm (KS1) (50MW); Kidston Stage 2 solar farm (K2S) (270MW), and the Pumped Storage Hydro (K2H) (the Project).

Genex is committed to high standards of corporate governance. The Genex Board is responsible for corporate governance and compliance. The Board's guiding principle in meeting this responsibility is to act honestly, conscientiously and fairly, in accordance with the law, in the interests of shareholders, employees and other stakeholders.

In June 2014 Genex acquired 100% of Kidston Gold Mines Limited (KGML) from Barrick Gold Corporation. KGML has a full interest in the Kidston Gold Mine, comprising the Mining Lease (ML3347) and the freehold land on which it is located, and other supporting rights and licences. Genex assumed operational control of the Kidston mine site on 1 January 2015 (following a transition arrangement with the vendor).

Since 2015 the environmental management of the Kidston Site has been maintained under a strict protocol according to the Environmental Authority (EA) over the existing mining lease. A permanent site manager is located at Kidston, reporting directly to the Chief Operating Officer. The Department of Environment and Science (DES) undertakes an annual review of the site to ensure the site is maintained as per the EA.

3.0 Nature of the Proposal

3.1 Scope of the Project

The Project is proposed as a beneficial reuse of the closed Kidston Gold Mine in Kidston, Queensland. The Project has a planned capacity of 250 megawatts (MW), and is proposed to be supported by an associated solar farm, and through a direct connection into the National Electricity Market (NEM).

The Project effectively acts as natural battery storage, allowing solar energy to be stored and harnessed as baseload power on demand. This innovative use of the old Kidston mine infrastructure for the purpose of developing a regional renewable energy industry makes the Project unique.

The significance of the Project has been recognised by the State of Queensland by being declared as both a Prescribed Project and a project of Critical Infrastructure under the *State Development and Public Works Organisation Act 1971* (SDPWO Act) on 3 March 2016 and 27 June 2017 respectively. Under section 76(E) of the SDPWO Act the Minister may declare a project to be Critical Infrastructure if the Minister considers the project is critical or essential to the State for economic, environmental or social reasons. The Project is also supported by the Australian Renewable Energy Agency through a funding agreement.

4.0 Location of Key Project Elements

4.1 Location

The Project is proposed over the decommissioned Kidston mine site, on lot 1 SP289310. The Project is located directly west of the township of Kidston within Etheridge Shire Council area, and is situated 280km north west of Townsville and 275km south west of Cairns. The Project area is bound by the township of Kidston and the Copperfield River to the east, part of the decommissioned Kidston Mine site to the south (which contains KS1), agricultural grazing land to the west and a Nature Refuge (Newcastle Range – the Oaks Nature Refuge) to the north.

The site can be accessed by road from both Townsville and Cairns with the final 80km of road consisting of well-maintained gravel road. As Kidston Mine was Australia's first fly-in, fly-out mine the site can be accessed by air from both Townsville and Cairns with a flying time of approximately 75 minutes.

The water release infrastructure for the Project is proposed to be located from the existing pits to convey water to the Copperfield River as shown in Figure 1.

4.2 Tenure

The Project site is largely located on Freehold Land (Lot 1 SP289310), with a portion associated with the Water Release Project entering into leasehold land (Lot 66 SP287774) and unallocated State Land (Copperfield River). The tenure of the lots will not change as a result of the development.

Lot 1 SP289310 is currently subject to mining lease ML3347, containing all remaining mining infrastructure and landforms residual of the Kidston gold mine. The mining lease will not be relinquished within the foreseeable future.

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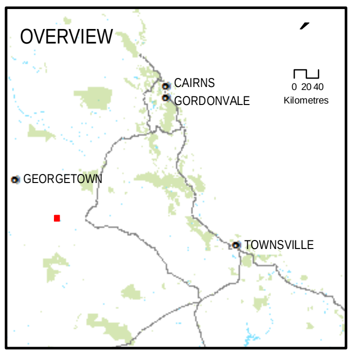
Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 100 200 300 400
Meters
1:17,000 (when printed at A3)

Legend
- Boundary Points
- Watercourses
- Major Roads
- Minor Roads
- Water Intake Pipeline
- Key Project Infrastructure Footprint
- Spillway Options Corridor
- Mining Lease Boundary
- Cadastral Parcel



Data sources:
Roads and Tracks, Cadastre, Watercourses - DNRM 2017
Electrical Network - Ergon Energy 2017
SISP Imagery 2017

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Kidston Solar Farm
Genex Power Limited

Indicative Project Area

PROJECT ID	60544566
CREATED BY	JR
LAST MODIFIED	LB - 13/06/2018
VERSION:	1

Figure
1

A3 size

File Folder: Z:\605X\60544566\4. Tech Work Area\4.99 GIS\02_MXDs\Hydro\H60544566_002_Indicative_Project_Area_20180510_A3L_v2.mxd

5.0 Overview of the Project

The following section provides an overview of the Project, detailing design, construction, operational and decommissioning aspects. The Project is proposed as a beneficial reuse of the closed Kidston Gold Mine, Queensland, for a pumped storage hydro facility. A description of pumped storage hydro technology is provided in Section 5.1.

The Project has a planned capacity of 250MW, and is proposed to be supported by the associated solar farm (K2S), and through a direct connection into the National Electricity Market (NEM). The Project effectively acts as natural battery storage, allowing solar energy to be stored and harnessed as baseload power on demand. This innovative use of the old Kidston mine infrastructure, for the purpose of developing a regional renewable energy and storage industry, makes the Project unique.

5.1 Pumped Storage Hydro

Pumped storage hydro is a form of hydroelectric energy storage (Figure 2). The method stores energy in the form of the gravitational potential energy of water, which is gained when the water is pumped from a lower elevation reservoir to a higher elevation reservoir. During periods of high energy demand, this stored potential energy is converted to kinetic energy by releasing the stored water from the upper reservoir, through electricity-generating turbines into a lower reservoir. In periods of low energy demand, the water is pumped from the lower reservoir back into the upper reservoir to begin the electricity generation cycle again. Low-cost surplus off-peak power is typically used to run the pumps. Pumped storage allows energy from intermittent renewable energy sources to be saved for periods of higher demand. Pumped storage hydro is recognised as the largest-capacity form of grid energy storage available in the current market. The technique is currently the most cost effective means of storing large amounts of energy. Capital costs and the presence of appropriate landforms and geography are critical decision factors in site selection of such projects.

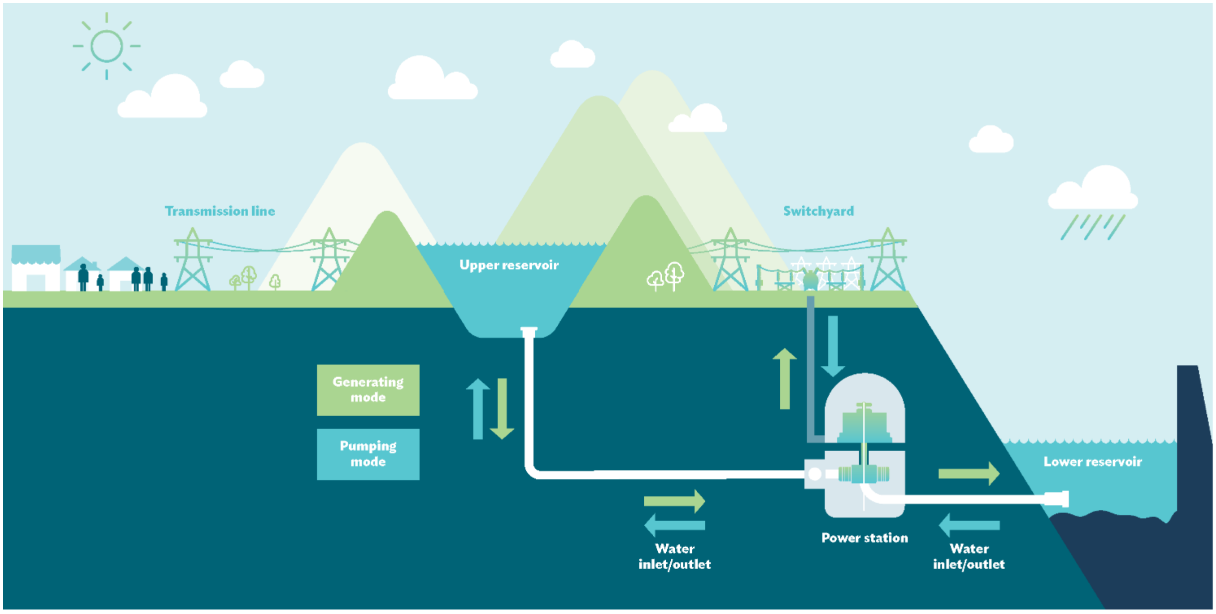

Figure 2 How pumped hydro energy storage works (Hydro-Electric Corporation, 2018)

5.2 Project Description

The Project utilises two pit voids from the decommissioned Kidston Gold Mine; Wises and Eldridge as the upper and lower reservoirs respectively. A concrete lined pressure tunnel and powerhouse will connect the upper and lower reservoir allowing water to be conveyed between the two pits, in pumping or generation mode.

During daytime/off peak periods, water will be pumped from the lower Eldridge Pit to the upper Wises Pit reservoir. During peak power demand periods, the stored water will release from the upper reservoir to generate electricity. Figure 3 illustrates the general Project arrangement showing the final Wises Pit Dam at full water capacity and the Eldridge Pit at a reduced water level.

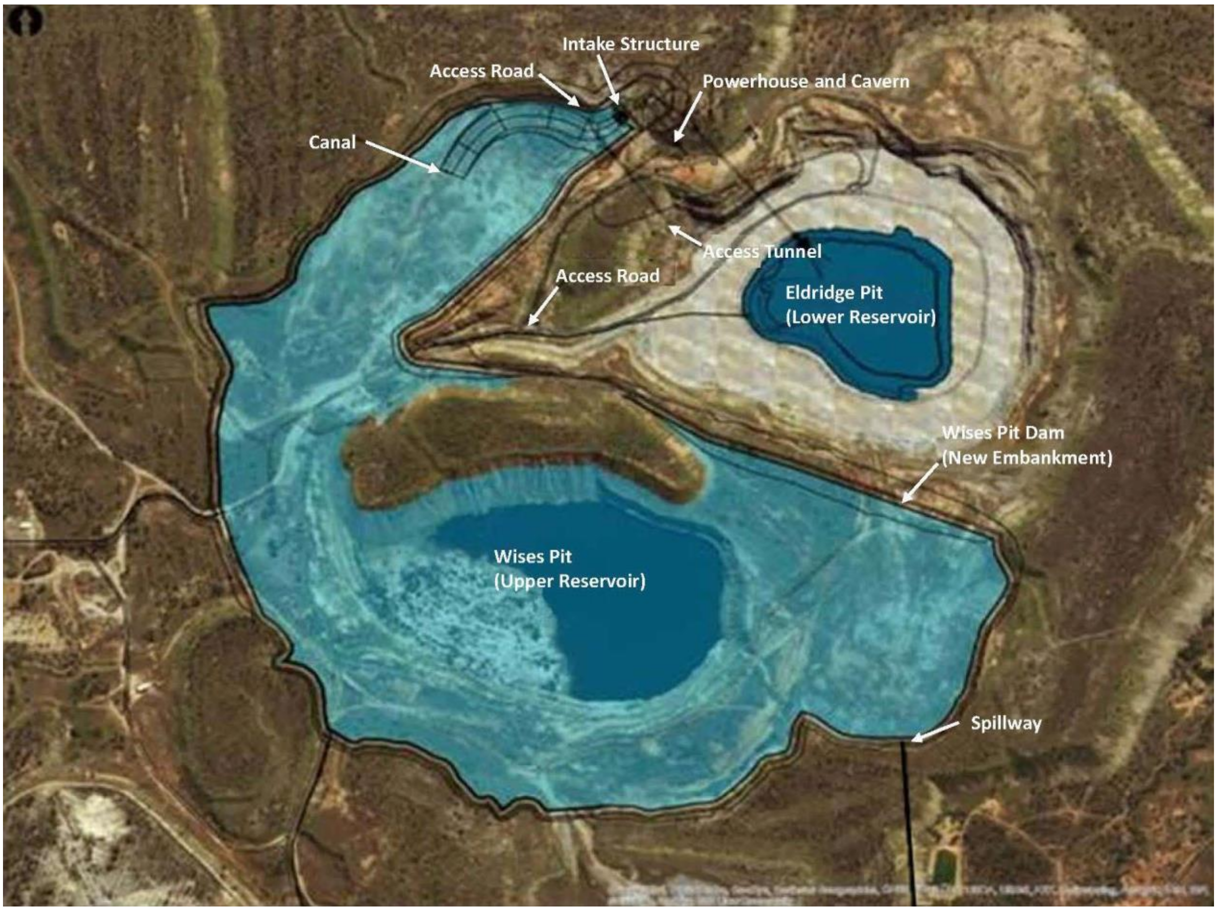

Figure 3 Kidston Project General Overview

Since 2015, the Project has undergone a technical feasibility study and a number of design optimisations resulting in the two-pit solution, utilising the existing mining voids. The Project has been sized to 250MW (approximately 1,870 megawatt hours (MWh)).

Release of water from the pits will be required during both construction and operation to facilitate the Project. Water release requirements are discussed in detail in Section 6.0 of the IAS.

The Project consists of the following arrangement and civil components:

- Upper reservoir formed by building a dam of up to 20m high around the existing Wises Pit.
- Lower reservoir utilising the existing Eldridge Pit.
- Upper gated intake to control the release of water.
- Lower reservoir intake/outlet with stoplog gates to cut off or stop the flow of water.
- Water conveyance shafts, short power tunnels and tailrace tunnel. Once passed through the power station, the tailrace tunnel is where the water passes through to the reservoir.
- Powerhouse cavern to accommodate two fixed speed reversible Francis pump-turbines, main transformers and auxiliaries; and Main Inlet Valve (MIV), which is the valve between the headrace water conveyance shaft and the pump-generator turbines.
- Transformer access tunnel parallel to the powerhouse cavern.
- Single construction and access tunnel from the Eldridge Pit to the powerhouse.

- Cable, vent and emergency access shaft(s).
- Switchyard and control building including offices, store rooms and workshop.
- Pipework and spillway from Wises Pit Dam to Copperfield River for flood management and water balancing.
- Onsite access roads.

Figure 4 shows the below ground hydropower infrastructure proposed between the Wises and Eldridge Reservoirs.

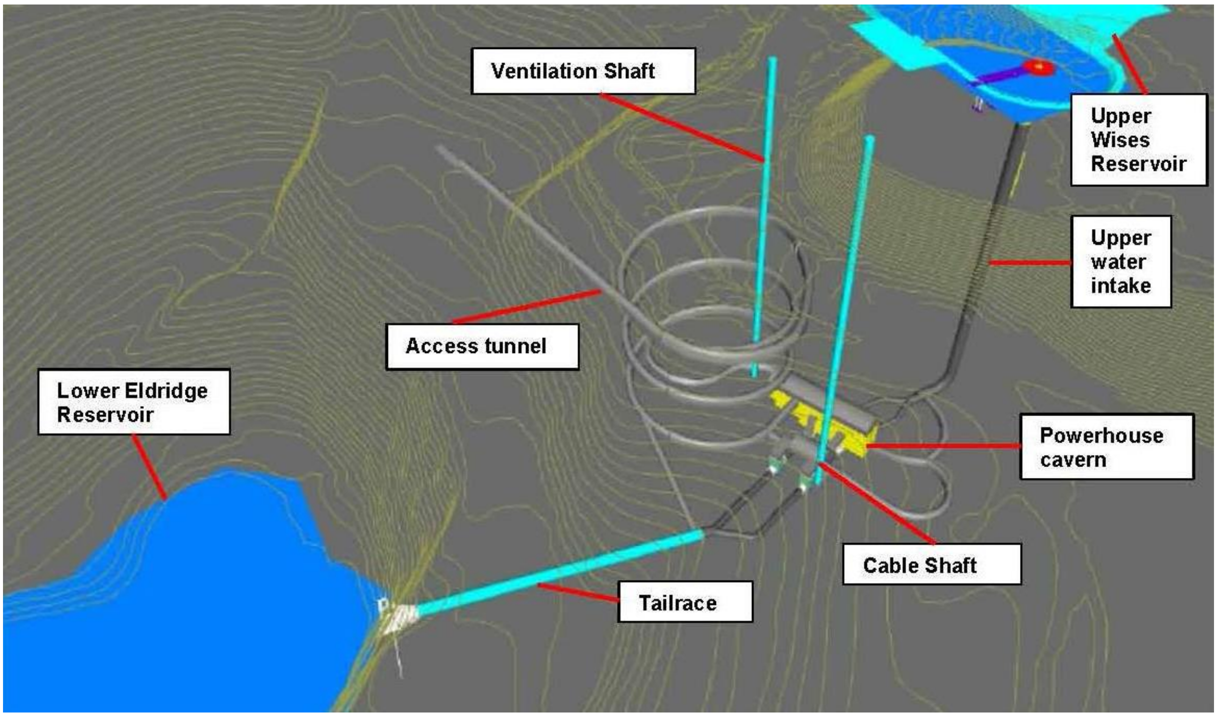

Figure 4 **Kidston Project below ground hydropower infrastructure**

5.3 Construction Phase

The existing pits are to be upgraded to make them suitable for operational and water discharge requirements. This will include increasing the storage volume of the Wises Pit by building a dam, construction of tunnel infrastructure and dewatering the Eldridge Pit to gain access to allow completion of tailrace outlet construction. The conceptual design and construction methodology will continue to be revised as the Project detailed design progresses and as additional information becomes available (e.g., revising slope stability). Further details of the construction elements of both the Wises and Eldridge Pits are described below:

5.3.1 Wises Pit (Upper Reservoir)

- The dam will be constructed using compacted layered waste rock material excavated from around the Wises Pit.
- The perimeter of the dam wall will be approximately 6km, utilising the available waste rock material on site.
- A high-density polyethylene (HDPE) liner will be installed on the water side of the dam to reduce seepage loss to the Eldridge Pit.
- The water side of the rockfill dam will be overlain by both a transition layer and a fine material layer; the HDPE liner will be installed on these.
- The HDPE liner will be connected to the rock foundation through a reinforced concrete plinth anchored to the rock and from which consolidation grouting can be executed.

Eldridge Pit (Lower Reservoir)

- The lower reservoir will make use of the existing Eldridge Pit. As part of the original pit construction, cable bolting was undertaken to maintain the stability of the excavated slopes. To limit the need for slope stabilisation around the pit, the permanent access tunnel has been elevated with a portal at an elevation in the pit which will minimise the requirement to dewater before tunnelling can start.
- Underground excavation between the Wises Pit and the Eldridge Pit will commence to construct access tunnels, the powerhouse cavern as well as shafts using a variety of construction methods such as drill and blast, rock bolting and shotcreting.
- Construction work will include the installation of temporary services such as ventilation, power, water supply, and installation of gantry cranes.
- Dewatering will be staged to suit the construction program of the Wises Pit Dam (which will need to store this water). The outfall portal entry has been designed to remove the requirement for full Eldridge Pit dewatering before the tunnelling can start.
- Construction will commence of key infrastructure such as the powerhouse cavern, the tailrace (channel that carries water away from the dam) and pressure piping.
- Once the tunnelling has been competed, installation of the turbines can then proceed, including supply and installation of electrical, transformer, instrumentation and controls.

5.4 Operational Phase

The Project will seek to sell electricity during peak demand periods when prices are high (typically in the morning and evening). This will be achieved by releasing water from the upper reservoir, through a reversible turbine-generator system, into the lower reservoir (known as a generation cycle).

Once the generation cycle is completed, the reversible turbine-generator system will pump the water back into the upper reservoir when prices are lowest, typically overnight by using grid power (known as a pumping cycle) or during the day by utilising the electricity produced from Genex's proposed co-located solar project (K2S).

5.5 Rehabilitation

The Project is located predominantly on a freehold site which was a former open cut gold mine. During the final stages of the mining operation and following the closure in 2001, a number of key rehabilitation works occurred. The major rehabilitation works included:

- grading and revegetation of the tailings facility and waste rock dumps
- implementing a water management plan for surface and groundwater flows within the existing site, including flooding of the pits
- removing all mining related buildings and revegetation of associated footprints during these activities.

An Environmental Authority (EA) was granted over the site in October 2013 to govern the management of the site following closure and rehabilitation of the mine. This was inherited by Genex following its acquisition of the site in 2015 and included providing an environmental bond to the Queensland State Government of $3.8 million.

While managing the site under the terms of the EA, Genex is seeking to beneficially reuse the site through a new productive industrial use, being a renewable energy generation and storage facility. Genex completed the development of its 50MW Kidston – Stage 1 Solar Farm (KS1) on the old tailings site, which was energised in December 2017. Stage 2 of the development involves further reuse of the site through repurposing the existing mine pits into a new pumped storage hydro facility (the Project) and developing the associated K2S solar farm.

Based on current design specifications, the Project will have a minimum lifespan of 50 years, with various components having a lifespan extending beyond this. With operation anticipated to commence in 2021, the Project lifespan would run until 2071 at a minimum.

On this basis, Genex considers that it would be extremely difficult to foresee the available rehabilitation methods at this future date, given it is highly likely that there will be significant advances and modifications to rehabilitation methods, available technologies to assist with rehabilitation, and changes to government policies on adequate rehabilitation procedures.

Notwithstanding this, Genex considers that it or the asset owner would have several available options once the Project nears the end of its design life, which would include:

- spending capital to upgrade the facility to extend the economic life of the Project
- repurposing the facility for an alternative solution (e.g. tourism)
- closing the facility and proceeding with rehabilitation works.

Genex considers that the most likely option would be to upgrade the facility to extend the economic life of the Project. If Genex or the asset owner took the decision to repurpose or close the facility at the end of its design life, Genex considers that to achieve a successful rehabilitation program, Genex or the asset owner at the time would need to take into account current rehabilitation methods (including technology advances), current Government policies on rehabilitation and best-industry practices for safety and environmental protection.

6.0 Project water releases

As noted in section 1.2.1, a key complexity for the Project is the need to discharge water, although there is no regulatory framework other than an imposed condition under the SDPWO Act. Project water releases include the following key components:

- **Construction phase water releases -** to facilitate the construction of the tailrace outlet works, which require dewatering of the Eldridge Pit.
- **Operational phase water releases -** to maintain an appropriate volume of water in the combined system at levels feasible for power generation.

The following section provides a description of these key components of the required water releases for the Project.

Further details about construction and operation, including technical studies to support the refinement of the discharge strategy, will be provided in the proposed IAR.

6.1 Construction Phase Water Releases

Construction phase water releases may be required in order to:

- Facilitate the construction of the access and tailrace tunnel works in Eldridge Pit which require the dewatering of Eldridge Pit.
- Maintain the ongoing safety and integrity of key construction activities such as the construction of the tailrace tunnel works by ensuring that water levels in both the Wises upper reservoir and the Eldridge Pit are kept at optimum levels.

6.2 Operational Phase Water Releases

Operational phase water releases may be required in order to:

- Ensure the safe operation of the Wises upper reservoir by, as far as practical, minimising the prolonged storage of water above the full supply level.
- Maintaining sufficient water storage capacity to temporally contain, without uncontrolled release, inflows from significant wet season inflows.
- Ensuring Project power generation potential is not adversely impacted by the excessive aggregation of excess water within the system.

Depending on the nature of the rainfall event, additional water accumulated in the system will be released as either a Type 1 or Type 2 release as described in Section 6.2.1 below.

6.2.1 Proposed Water Release Strategy

In order to facilitate the release of water from the Project in accordance with the required need to release outlined above, a number of different approaches to water releases are proposed. Each approach is differentiated by the need to respond to different causal events and results in two distinct approaches to the release of water from the Project.

6.2.1.1 Release Event Type 1 - Controlled Discharges to Maintain Water Levels

Operational Phase

The Project has been designed with additional contingency water storage that affords the Project the ability to temporally store up to 500ML of additional water without exceeding the full supply level (FSL). This buffer compartment therefore gives the Project ability to temporally buffer the rate of water inflow against the opportunity to release excess water (e.g. when the Project is subject to a significantly localised rainfall event that does not generate a requisite opportunity to release).

It is noted that effective use of the buffer compartment will necessitate the use of seasonal operating rules. While these are subject to ongoing definition as the Project design progresses it is noted that:

- During the wet season the effectiveness of the buffer allowance to provide contingency storage and reduce the likelihood of an uncontrolled discharge will be progressively limited as water accumulates in the reservoirs.
- Maintenance of additional water in the buffer allowance in the lead up to, and during the dry season (when the likelihood of significant inflow events is low) provides an opportunity for reduced reliance on an external water source (Copperfield Dam).

Therefore water management objectives for the buffer allowance are likely to be subject to seasonally varying operating rules.

Release of excess water is primarily planned to consist of the controlled release of water during naturally-occurring streamflow events in the Copperfield River. This type of release (Type 1 - Controlled Discharges) will be made to ensure that Project water equilibrium is maintained.

Construction Phase

Potential release during the construction phase would also utilise a Type 1 controlled release, however the proposed conditions under which they would occur allow for a higher rate of release due to the additional sensitivity of the Project to further inflows during this critical period

6.2.1.2 Release Event Type 2 – Pass-Through Discharge

In the event of a significant rainfall event being forecast (e.g. cyclonic or regional monsoonal trough, during the operational phase of the Project), a pass-through discharge (Type 2 release event of rainfall may be required.

This would be achieved by maintaining the upper reservoir at spillway level so that any additional rainwater entering the Wises Dam would pass-through the reservoir and discharge via the spillway. Depending on the duration and timing of the event, the power generation cycle would likely be required to stop. It is also likely that some additional maintenance water releases would need to be made following the rainfall event to remove any surplus water collected in the lower reservoir.

Use of Type 2 pass-through discharges may also occur during the construction phase when water is stored at elevated levels in the constructed Wises upper reservoir, prior to the pump-turbines having been installed.

6.2.2 Unexpected Water Quality Changes

As a contingency management strategy, and in the unlikely event that water quality in the pits should begin to change beyond an acceptable limit for infrastructure (eg. chloride ≤ 100 mg/L), it may be necessary to release additional water from the Project over and above that gained through inflow of rainfall. It is envisaged that this would be managed through the use of a Type 1 release as described above.

6.2.3 Replenishment of Freshwater

The Project has an annual water allocation of 4,650 ML per annum from the Copperfield Dam under an existing water services agreement. Genex plans to use the water allocation during the construction and operation phases to mitigate the risk of water deficiency caused by extended drought or unforeseen weather events, and to avoid having to supplement water from other sources such as the Copperfield River.

7.0 Project Need, Justification and Alternatives Considered

7.1 Project Objectives

The Project, along with the proposed co-development of K2S, has several objectives which benefit Genex, the State of Queensland and the National Electricity Market (NEM). These can be summarised as follows.

- To underpin a new Renewable Energy Zone (REZ) in Far North Queensland, where an abundance of wind and solar resources exist, through the provision of energy storage and ancillary services to support further renewable generation projects, including localised load, inertia, voltage control and other ancillary services.
- To facilitate the development of new transmission infrastructure as a cornerstone of the new REZ, which will be required to support further renewable generation projects.
- Improving the reliability of the Queensland transmission network through the addition of new dispatchable, synchronous generation.
- Helping to maintain the affordability of electricity for consumers in Queensland, through supporting development of additional low cost renewable generation.
- To contribute to the overall lowering of carbon emissions, through supporting the development of renewable projects, including Genex's co-located solar projects.
- To re-purpose an abandoned mine site into a new industrial use for the next 50+ years.
- To benefit the local and regional community through providing local employment opportunities for up to 500 people, future growth of tourism and support of the local indigenous community through sponsorship of tourism projects.
- To deliver commercial returns to Genex's shareholders.

7.1.1 Project Need, Justification and Strategic Benefits

The Project offers a large-scale, low-cost and flexible solution to Queensland's growing peaking power requirements. The Project is well positioned to take advantage of the combined effects of an oversupply of baseload generation capacity and escalating peak power prices being driven by increasing gas turbine fuel costs. As renewable power gains momentum in Queensland, especially the prevalence of rooftop solar but increasingly supplemented by the deployment of large-scale solar projects, the need for energy storage and energy management will play a far more important role in the electricity network.

Large-scale storage projects such as the Project will provide stability in supply to the grid which will become even more important because of intermittent generation issues associated with renewable energy. The Project will significantly contribute towards alleviating the growing pressure on peaking power demand and peak power prices in Northern Queensland and in Queensland more generally.

Besides delivering rapid response, flexible and renewable peaking power into the network in Northern Queensland, the Project also is expected to create more than 370 jobs in the construction phase as well as numerous indirect jobs and demand generally for services in the greater Etheridge Shire. The Project is also expected to create approximately 9 jobs during the operation phase.

7.1.1.1 Queensland Peaking Power Deficit and Rising Prices

The Northern Queensland region is currently a net importer of electricity from the Central Queensland region, with a forecast growing peaking power deficit. Once operational, the Project will significantly alleviate this emerging issue.

The Queensland electricity market is currently experiencing high peak prices during hot summer days and cold winter days, and frequent power price spikes compared with other Australian States. Furthermore, the Mount Stuart Power Station (a peaking power generation station) is scheduled for decommissioning in 2023. This issue is further compounded by the increase of liquefied natural gas

(LNG) export which is making existing gas generators (for peaking and shoulder generation) costly to run.

At 250MW, the Project will add significantly to the State's peaking and shoulder power generation capacity. Aside from the capacity issues, the Project will also mitigate price increases forecast as a direct consequence of open cycle gas turbine peaking generators operating in an environment of escalating gas prices.

7.1.1.2 Blackstart Capability and Ancillary Services

Approximately 90% of Queensland's power needs are met through the operation of coal fired power stations (59%) and gas turbines (31%). These generators have a restricted ability to self-start in the event of a power grid failure. Hydroelectric power plants are renowned for their ability to offer rapid response grid "blackstart" capabilities, that is, the ability to restart other generators and the electricity grid within seconds in the event of network shutdown. With potential cyclone events and bushfire threats, the Project will provide Queensland with a more reliable solution during these events.

The Project will also provide a full range of ancillary services to the grid, including frequency and voltage control, load levelling, synchronous generation capacity and capacity deferral. In addition, it has the potential to support grid stability through inertial spinning reserve and fast ramp rates, which is particularly important in the context of growing deployment on the network of intermittent renewable energy.

7.1.1.3 Economic Stimulus and Employment – Etheridge Shire

The Project will significantly contribute to the economic wellbeing of the Etheridge Shire. It will require extensive use of local building materials, construction services and human resources during construction and operation, in a region that could considerably benefit from economic and social uplift.

KS1 is already providing economic activity and employment opportunities to Kidston and the Etheridge Shire, and more than 160 jobs were created during the construction period.

As noted in Section 7.1.1, it is anticipated that the Project and K2S will generate a total of more than 500 jobs during construction, which Genex anticipates will be filled primarily by personnel from within the immediate Local Government Area (Etheridge Shire) and other nearby locations (Townsville, Cairns etc.). The Project alone will generate approximately 370 of those jobs.

In addition to these economic benefits, Genex currently supplies water on a voluntary basis, at no cost, to the local township of Kidston and to surrounding cattle stations.

The Copperfield Dam which is the source of the water for Kidston also plays an important role in regulating the river flow down to Einasleigh. The dam is currently maintained by the State with Kidston Gold Mines Limited (KGML, 100% owned by Genex) providing 100% of private sector funding via its water services agreement with the State. The success of the Project will ensure the continuation of the various social benefits to residents in and around the Kidston area as a result of being able to use the Copperfield Dam.

7.1.1.4 A Global First for Queensland in Innovation and Clean Energy Leadership

Once completed, the Project will be the first in the world to utilise two disused mine pits for hydroelectric power generation, and the first hybrid large-scale solar photovoltaic and pumped hydro storage plant. The Project has already found interest internationally, and Queensland, as the host State, will receive recognition as an enabling partner in this innovative and ground-breaking use of a redundant mining asset for a clean energy power solution.

Queensland currently has over 11,000 abandoned/closed mines of various scales, most of which are in locations with excellent solar resources. The maintenance of abandoned mines and their environmental footprint currently poses a significant financial drain on the State. If the Project is successful, it is possible for the scheme to be duplicated across a number of sites within Queensland. This would not only substantially alleviate environmental costs and liability to the State, but also demonstrate an innovative approach for repurposing mining projects for new industrial uses beyond the end of mine life.

7.2 Design Refinement and Assessment of Alternatives

The Project design has progressed through a number of design iterations that have considered key selection criteria including environmental impact, constructability, operations and maintenance, and relative costs (capital and operational). A summary of the development of the proposed design is outlined below.

As previously highlighted, 27.5 GL of water are required to be removed from Eldridge Pit to gain access for construction of the tailrace outlet works. In the following discussion, 'excess construction water' refers to the residual volume of water from the Eldridge Pit not able to be accommodated in onsite storage for each design option.

7.2.1 Design Option 1 – Original Design (Prefeasibility)

The initial prefeasibility design called for a 330MW installed capacity based on a market study of the optimum installed capacity.

Limited availability of survey information (due to the pits being full of water) resulted in uncertainty regarding the available driving head (i.e. the difference in water level between the upper and lower reservoir - a key driver of generating capacity) and the storage volumes of these reservoirs.

Whilst a higher capacity was considered preferable, the prefeasibility study concluded that current pit capacity without modification would only allow for 220MW installed capacity by using the pits in their current configuration.

Key concerns arising from prefeasibility design included:

- Significantly large volume of excess construction water (approximately 27.5 GL) that would need to be removed from the Eldridge Pit ahead of construction to allow installation of the tailrace. As the existing Wises Pit can only hold approximately 10 GL, and the balance of 17.5 GL would need to be released.
- Potential stability issues associated with construction of key infrastructure such as the access road into Eldridge Pit
- The high dollar per MW cost resulting from a smaller installed capacity; especially in light of the high cost of required enabling infrastructure such as the transmission line.

7.2.2 Design Option 2 – Turkeys Nest Design (Feasibility)

The feasibility-level Design Option 2 sought to overcome the geometric deficiencies (head difference and volume able to be transferred between pits) in the original design. Genex initially advised that an installed capacity of 330MW was not optimised and that alternatives should be considered. An alternative design was proposed to Genex which involved the construction of a turkey's nest reservoir (a ring dam with no external catchment) on top of the northern waste rock dump area in order to overcome the deficiencies inherent in the original design.

This option presented additional benefits including having Wises Pit as a balancing reservoir instead of as the upper reservoir, increased head and therefore potential for higher installed capacities, and a potential reduction in the volume of water required to be released from Eldridge Pit if the turkeys nest dam was used to hold water removed from Eldridge Pit. However, the turkey's nest only provided for an additional 4.4 GL of storage; meaning that, in combination with the additional 10 GL provided by Wises Pit in its current configuration, this still left a water surplus of approximately 13 GL - which would need to be removed during construction.

Genex engaged a number of specialist sub-consultants such as Water Treatment Services (for in pit treatment) and AGE (for groundwater modelling) as well as consulting several suppliers to assess a range of potential options to address the surplus water volume to avoid the need for discharging the water to the Copperfield River. Several options were compared for the management of surplus water as follows, and summarised in Table 1.

- It was found that Options A, B and C provided optimum solutions for the storage of a portion of the water from the Eldridge Pit and it was recommended that these options were carried forward along with Option D (raising of Wises Pit full supply level (FSL) to 543 m AHD).

- Options E (in pit treatment) and F (reverse osmosis) were able to provide technically viable solutions but at considerable additional cost, complexity, generation of additional waste streams and energy consumption, and significant risk to the construction schedule due to the need to treat additional interim inflows from weather events during construction. For these reasons these options were not considered to be feasible.
- Option G (evaporative blowers) and H (dilution using water from the Copperfield Dam) were only able to provide potential additional contingency measures for the removal of up to 2 GL each and were not considered viable alternatives for treatment of the large volume of excess construction water.

Table 1 Summary of Options from the 2016 Workshop

Options		Volume addressed (GL)	Treatment cost ($M)	Pumping cost ($M)	Option ranking	Notes
Probable options						
A	Store in Wises Pit, current capacity up to 530m AHD	10	N/A	5.6	1	No constraints except ensuring adequate freeboard maintained in case of heavy rain during construction.
B	Store in Turkey's Nest (up to 581.5m AHD)	Up to 4.1GL	N/A	N/A	1	Not available until 1.5 years after the commencement of construction
C	Water use during construction	~0.3	N/A	0.1	1	Could be used for the construction of turkey's nest, Wises Dam, etc.
	Subtotal	14.4	N/A	5.7	N/A	Currently 10GL storage available straight away but the rest only during construction
Potential options						
D	Storage in Wises Pit between 530m and raising to FSL of 543m AHD	11	2.7	2.4	2	Potential risk of impact to groundwater. This risk was assessed and considered to be low based modelling work undertaken by AGE.
E	In pit treatment and release	17.5	>9.5		4	Costs of in pit treatment higher than anticipated and not viable.
F	Reverse osmosis and release	12	14.5	3.4	3	Approximately 400 days required to treat 14 GL of water. This treated water would still need to be released to the Copperfield River. Significant volumes of brine concentrate would need to be stored.
G	Evaporative blowers	2	6.5	N/A	N/A	2 GL over 2 year construction window assuming normal years (not heavy rain)

Options		Volume addressed (GL)	Treatment cost ($M)	Pumping cost ($M)	Option ranking	Notes
Probable options						
H	Dilution	2	1.2	0.8	N/A	Requires regulatory approval for release.

Key factors which made this design unfeasible included:

- Large scale earthworks associated with construction of the turkey's nest dam
- Unacceptable geotechnical risks associated with construction of the turkey's nest dam on modified ground conditions
- The construction of the turkey's nest was necessary for dewatering of Eldridge Pit and therefore added significant time to the construction program
- None of the options assessed were able to completely address the construction water surplus
- The high cost per MW due to the cost of the proposed turkeys nest dam was only considered viable for a 450MW project, but not for a 250MW project.

The following option was therefore recommended to be taken forward:

- Upgrading the Wises Pit by creating a dam to an FSL of 551m AHD (crest of 552.7m AHD) and excavating its northern dump area down to 546.90m AHD
- Raising the entrance of the access tunnel to disconnect the underground works from the Eldridge Pit dewatering and pumping of 11 GL from Eldridge Pit to the Wises Pit
- Once the dam has been built and infrastructure to transfer water between the pits was constructed, to pump the remaining 16.5 GL of water from the Eldridge Pit to the upgraded Wises Dam thereby allowing for storage of this water without discharge.

7.2.3 Design Option 3 – Optimised Reference Design

At the feasibility level it was concluded that the concept of utilising the two existing mine pits as the upper and lower reservoirs was optimum for a 250MW installed capacity. While the turkey's nest concept was well accepted, it was only deemed necessary for higher installed capacities. In addition, a number of geotechnical and operational risks were identified with its proposed location on the northern waste rock dump.

Groundwater modelling undertaken for the feasibility stage was updated to include this 250MW concept and concluded that the Eldridge Pit would continue to act as a sink and intercept potential groundwater seepage from the Wises Pit for this revised design option.

Dewatering of the Eldridge Pit to enable the construction of the underground infrastructure was considered further. Of the approximately 27.5 GL of water required to be removed from the Eldridge Pit to enable access to the tailrace outlet, the majority (95%, 26 GL) could be temporarily stored in the upgraded Wises Pit reservoir up to the FSL of 551m AHD.

Water sampling and chemical analysis from the Eldridge Pit showed that any water released (including potential additional inflows from rainfall) would require significant time-consuming and expensive treatment to enable the water to be released from site (e.g. to the Copperfield River).

The design team concluded that the most effective solution to this dewatering issue would be an engineering solution involving the modification of the Wises Pit to store the excess water if possible.

This design phase also established that treatment of surplus water from significant rainfall inflows during the operational phase of the Project would be impractical to treat given that the volumes of water requiring treatment are highly variable. The operational water balance model showed that no releases will be required for around a third of all years, but when required due to heavy rainfall, could exceed 1GL. A number of key aspects of this design required further consideration including:

- Management of excess water during the dewatering of Eldridge Pit along with any additional rainfall inflows during the construction period
- Minimising discharge of surplus water during the significant rainfall events during the operational phase of the Project.

7.2.4 Design Option 4 – Proposed Design

This design phase confirmed that the Optimised Reference Design (Design Option 3) concept of utilising the two existing mine pits as the upper and lower reservoirs was optimum for a 250 MW installed capacity. A number of engineered solutions were explored in order to enlarge the constructed Wises Pit upper reservoir to provide sufficient capacity to contain the entirety of the water required to be dewatered from Eldridge Pit during construction of the tailrace outlet. These included removal of the backfilled waste rock material in Wises Pit and an additional raising of the proposed Wises Pit embankment.

Similar to the costs associated with treatment options explored during the Optimised Reference Design, the costs of including additional capacity to Wises Pit were found to be unacceptably high. In addition, the provision of a fixed capacity solution (in terms of either storage or treatment capacity) could still present a risk to the Project construction resulting from additional ingress of water during storm events occurring during the dewatering of Eldridge Pit and the subsequent tailrace construction period.

The Proposed Design has also included an engineered mitigation for the management of excess water during operations. The design proposed for the Wises Pit upper reservoir incorporates an additional 0.5 GL buffer volume between 550.56 m AHD and 551 m AHD. The purpose of the buffer is to limit the likelihood of uncontrolled discharge by:

- Allowing the Project to store some additional water without unacceptable impacts to power generation and general operations
- Allowing for the temporary storage of water until an opportunity to release is presented by naturally occurring stream flow in the Copperfield River
- Act as a balancing storage during storm events when the rate of inflow is higher than the rate of water able to be released.

Key advantages of the Proposed Design include:

- Minimal volume of excess water during construction (reduced from 17.5 GL)
- Significant operational flexibility provided by the buffer storage volume to absorb stormwater inflow or control the timing of potential releases
- No generation of additional waste streams or handing of large quantities of chemicals resulting from water treatment processes
- Low technology risk solution.

An additional option to temporarily increase the FSL of the Wises Pit reservoir is currently being explored and if deemed acceptable by the Department of Natural Resources, Mines and Energy (DNRME) would provide an additional 0.5 GL of storage.

7.3 Design consistency with Management Hierarchy for Surface or Groundwater (EPP Water)

The Proposed Design has been reviewed against the management hierarchy for surface and ground water outlined in the EPP (Water). Table 2 provides a summary of the review of Proposed Design against each step of the management hierarchy.

Table 2 Review of the Proposed Design against Management Hierarchy for Surface or Groundwater (EPP (Water), Part 5, Sec, 13)

Step 1 – Water Conservation	Step 2 – Waste Prevention	Step 3 – Treatment or Recycling	Step 4 – Release Options
Development of the Proposed Design has progressively reduced the excess construction water volume from approximately 17.5 GL to an estimated 1 GL. During operations, water conservation measures are not applicable as the generation of pumped storage hydro power does not consume water as a process input. The existing body of water contained in the pit is effectively continually recycled around a semi-closed loop consisting of power generation and pump back. In the absence of evaporative losses and wet season inflows, the volume would remain constant. Water is still required to replace evaporative losses as evaporation typically exceeds rainfall during an annual cycle. While this may be considered a process water input there is little operational flexibility to minimise this demand as the successful operation of the Project requires that the total volume of water in both pits is maintained at an optimum level.	Further measures to reduce the potential volume of surplus construction water are being explored and consist of a temporary raising of Wises Pit to increase its storage capacity. During operations, the generation of additional volumes of potentially contaminated water has been minimised to the greatest extent possible through the passive diversion of stormwater runoff around the Eldridge Pit (Wises Pit has only a very small external catchment). Rainwater falling directly on each dam's water surface will however continue to contribute additional inflows. The lining of the embankment of Wises Pit has been designed to mitigate any potential for ongoing deterioration in water quality through mobilisation of potential sources of contamination originating from waste rock dump material	Onsite reuse of water for bulk earthworks including construction of the Wises Pit dam is estimated to use approximately 0.3 GL of water from the pits. Due to the quality of the water within the pits, no practical offsite reuse of the excess water is possible. Water stored in the pits does not currently meet water quality objectives (WQOs) for stock watering or irrigation without extensive treatment. There are no identified industrial demands for the untreated water within a reasonable distance. The presence of the Copperfield Dam also provides a significant alternative source of uncontaminated water that does not require treatment. A number of treatment options have been explored, most extensively as part of Design Option 2. Options investigated considered reverse osmosis, forced evaporation (mechanical blowers) and in-pit treatment. A key reason for why treatment options were found to be unviable for the Project was that the volumes of water requiring treatment are highly variable. The operational water balance model shows that no releases will be required for around a third of all years but when required due to heavy rainfall, could exceed 1GL. The periodic nature of the generation of excess water volumes and the requirement for intermittent operation is not suited to membrane	There are no practical options for disposal of excess water at a waste treatment facility due to the remote nature of the Project location. The ability of irrigation to land to remove surplus water during the wet season is very limited as soils are typically at or near saturation point an unable to absorb irrigation water. Whilst irrigation to land was considered during the development of the Proposed Design, especially during construction, it was considered unsuitable given the volumes able to be removed and given the land area available. A controlled, event-based release of water from the Project under conditions that will not cause unacceptable environmental harm to downstream EVs is deemed to present the best option for the periodic release of excess water from the Project.

Step 1 – Water Conservation	Step 2 – Waste Prevention	Step 3 – Treatment or Recycling	Step 4 – Release Options
	used in the embankment construction.	filtration water treatment which must remain continuously operational for optimum use. The use of enhanced evaporation does not provide a suitable disposal solution as treatment rates are slow, largely unavailable during wet weather (low evaporative potential) and are subject to high running costs and low reliability.	

8.0 Timeframe for the Project

For the purpose of the IAS, the following timeframes in Table 3 are anticipated. Further specific information relating to potential timeframes for the Water Release Project may be provided in the proposed IAR.

Table 3 Project Development Timeframes

Milestone	Timeframe
Feasibility Study	Completed November 2016
Optimisation Study	Completed October 2017
Selection of preferred EPC Contractors	Completed October 2017
Selection/procurement of hydroelectric turbine equipment package	Completed April 2018
Procurement of additional supplies	H2 2018
Financial Close	H2 2018
Construction	2019 - 2021
Commissioning & operation	2021 - 2022

9.0 Economic Indicators

Genex is currently working with its EPC contractors to finalise capital cost estimates for the Project, which will be provided in the full IAR. It is anticipated that the total capital cost for the Project will be in excess of A$330 million. Indirect employment opportunities, benefits to other businesses, industries and communities have been discussed in Section 7.0.

10.0 Existing Environment and Potential Impacts

The following section provides an overview of the existing environmental, social, land use and infrastructure within and surrounding the Project area.

The information provided is based on desktop information and previous assessments undertaken on the Project area. The key potential impacts (where applicable) have been identified for construction, operation and decommissioning.

10.1 Land

10.1.1 Land Use

The Project site is largely surrounded by Pastoral Leases. Oaks Rush Station borders the mine site to the North, West and South and the Kimberly Station borders the township to the east. The township area of Kidston is between the border of the Mining Lease and the Copperfield River. There are six freehold land parcels and the remaining are land leases, State land and some Council owned reserves (i.e. Kidston Airport and Airstrip). The existing surrounding land uses include agricultural grazing land and renewable energy facilities. The lot adjoining the site to the south (Lot 2 SP289310) contains a solar farm (KS1).

The township area was created for the purpose of servicing the mine. Since the closure of the mine the residential population of the town has significantly decreased leaving a small permanent population in the township. The permanent residential population is estimated at 10 residents in total. The residents are either employed by:

- local council
- Oaks Rush accommodation facility
- Genex for maintenance or monitoring of the Kidston mine site
- maintenance of the KS1 solar farm
- grazing business in the area.

The majority of the buildings and houses in the old township have been destroyed and depleted due to either natural disasters (i.e. cyclonic weather) or failure in the foundations of the buildings likely due to the age of the building.

The Project area and surrounding land is zoned as rural under the Etheridge Shire Planning Scheme 2005. The planning scheme identified the Project area as containing good quality agricultural land and low and medium bushfire hazard (Etheridge Shire Council, 2005). The Queensland Land Use Mapping Program (QLUMP) identified the following land uses within the Project area and surrounding area as grazing native vegetation; residential and farm infrastructure; services; transport and communication; reservoir/dam, river, marsh/wetland (Queensland Government, 2018).

The surrounding pastoral leases have previously co-existed with the former Kidston Gold Mine site during its long-term operation. Similarly, the Kidston Township has historically co-existed with the mine site directly adjacent, however given the mine has been closed for a number of years, residents present may not be accustomed to potential amenity impacts associated with the construction and operation of the Project.

The wider Project has largely been contained within the Mining Lease, with the exception of the specific infrastructure associated with the required water discharges for the Project.

During construction there will be temporary impacts to surrounding land uses in relation to potential dust and noise and vibration emissions and increased traffic in the wider area. These impacts are temporary in nature, and can be managed through a range of mitigations in Construction Environmental Management Plans. These particular impacts are also detailed further in 10.3 of this IAS. Mitigation measures are discussed in Section 11.0.

During operation, the potential impacts on surrounding land users may include noise and vibration from the operating equipment albeit this is expected to be minimal. There has been no detailed technical assessment undertaken in relation to these operational matters; however, it is anticipated it would be to a significantly lesser extent than the previous mining operation. This matter is detailed further in Section 10.3 of the IAS.

Water Releases Required for the Project

The project proposes to release water via a spillway. The spillway extends from the Wises Pit to the Copperfield River via the existing Mining Lease and traverses leasehold land to the south east. The alignment chosen for the spillway has avoided sensitive surrounding land uses, such as residential lots and heritage areas. The alignment is also not considered a priority area of the wider grazing use of the remaining leasehold lot.

The Project will release water into the Copperfield River. The Copperfield River has a number of adjoining land uses within the vicinity of the Project. Assessment of impacts associated with the receiving environment, included land uses as they relate to the water in the Copperfield River, will be detailed further in the IAR.

10.1.2 Topography and Geology

The Project site is generally elevated with the highest points being 570m AHD on the north western and south eastern sections of the site. The land encompassing the pits is generally at an elevation between 550m to 530m AHD.

A desktop review of soils, based on the Queensland DME 1:100,000 series map identified the Project as containing gently undulating to undulating lands with long gentle slopes and rounded ridge crests with hard pedal yellow duplex soils (Australian Soil Resource Information System (ASRIS), 2013).

The Plan of Operations for the Kidston Gold Mine by Barrick Gold Corporation provided the following description of the geology of the site and surrounding area:

> "The structural geology of the Kidston area is dominated by a corridor of north east tending faults relating to the Gilbert Fault and north westerly trending structures parallel to Paddy's Knob dyke swarm and regional foliation. Parallel faults east of Kidston form the boundaries to the Palaeozoic Greenvale and Broken River tectonic provinces. These fault systems are crustal scale with multiple phases of movement. The south east and north west margins of the Kidston breccia pipe are parallel to the dominant fault orientation that is the Gilberton Fault. They are sharp, linear, and defined by parallel shears, some of which are occupied by mineralised sheet veins" (Barrick Australia, 2015).

The proposed spillway starts at an elevation of 520m AHD on Lot 1 SP289310, crosses through lot 66 SP287774 and ends in the Copperfield River at an elevation of 510m AHD. The Copperfield River and associated tributaries near the site drain Paleoproterozoic metamorphosed sedimentary rocks.

Topography and geology will be addressed in detail through referable dams approval process under the *Planning Act 2016*.

10.1.3 Contaminated Land

The Project site is included on the Environmental Management Register (EMR) due to historical mining activities on the site. A search of the EMR was undertaken in October 2017. The search identified that the site has been included on the EMR due to the following notifiable activities or hazardous contaminates:

- abrasive blasting
- chemical manufacturing or formulation
- chemical storage
- engine reconditioning works
- explosive production or storage
- landfill
- metal treatment or coating
- mine wastes

- petroleum product or oil storage
- smelting or refining.

Waste rock from the former Kidston mine is stored within the north, east, south and south east waste rock dumps and tailings stored within the tailings dam storage facility. Containment of seepage from the waste rock dumps and Tailings Dam is provided in onsite seepage containment structures (i.e. North Dump Seepage Dam, East Dump Seepage Dam, South East Dump Seepage Dam, Reclaim Dam, Butchers Creek Dam and Managers Creek Dam (Barrick Australia, 2015).

The Kidston mine was rehabilitated following strategies detailed in the Plan of Operations (February 2005 to December 2006) and the Closure Plan (Kidston Gold Mines Limited, 2000). The Closure Plan was implemented following completion of the major rehabilitation works, including the tailings storage facility, waste rock dump capping and completion of a Contaminated Lands Assessment (Stage 2) and remedial actions. The Contaminated Lands Assessment identified the primary contaminants present at the site as arsenic, which occurs naturally at the site as arsenopyrite in the ore and waste rock; hydrocarbons from spillage of oil and diesel fuels; and cyanide which is present in the South Pond sediments.

Construction activities will consider the management of ground breaking activities through the Construction Environmental Management Plan, and, where required, address residual contamination issues. During operation, potential for impacts from contaminated land are considered to remain unchanged. The site will continue to be managed in accordance with the approved Plan of Operations and Environmental Authority.

The potential impacts from releasing water for the Project are discussed in Section 10.2 and will be the subject of the IAR.

10.1.4 Protected Areas

The Project area does not contain any declared conservation sites under State or Commonwealth legislation or policy. The wider area includes the following Commonwealth Protected Areas:

- Rungulla National Park (approximately 60km west)
- Canyon Resources Reserve (approximately 34km north west)
- Blackbraes National Park (approximately 60km south)
- Undara Volcanic National Park (approximately 58km north east).

The wider area includes the following State Protected Areas:

- Newcastle Range-The Oaks Nature Refuge (adjoining Lot 1 SP289310 to the north and approximately 18.5km north west)
- Eagle's View Nature Refuge (approximately 32.2km south)
- Granite Creek Nature Refuge (approximately 52.9km south west)
- Stuarts Spring Nature Refuge (approximately 52.9km south west)
- Gilberton Nature Refuge (approximately 59km south west)
- Goanna Spring Nature Refuge (approximately 59.4km north east)
- Werrington Nature Refuge (approximately 49.7km south).

The Etheridge Shire Planning Scheme 2005 does not identify any local protected areas.

No impacts are anticipated to protected areas identified above. The Project site is immediately adjacent to the heritage listed Kidston Township. Places of heritage significance are discussed further in Section 10.5 of the IAS.

10.1.5 Native Title

A search of the National Native Title Tribunal database on 8 May 2018 indicates that there are no current claims or determinations over the bulk of the Project area (lot 66 SP287774, lot 1 SP289310 and 2 SP289310).

The Ewamian People #2 and Ewamian People #3 have been determined as holding Native Title (QCD2013/006, QCD2013/007) over parcels of land that abut the southern extent of the proposed spillway (lot 66 SP287774). The area over which Native Title has been determined includes the Copperfield River and its northern banks. Depending on the extent of works intended for the end of the spillway, this area of Native Title may be impacted and will be managed at the time. A number of consultation activities have been undertaken with the indigenous party for the area, being the Ewamian People. A Cultural Heritage Management Agreement has been executed between Genex and the Ewamian People for the wider Project

10.2 Water

10.2.1 Climate

The Project area lies in the dry tropics. Based on the Köppen Classification system, the climate for the Project site is located within the grassland zone (hot, winter drought). There are no open Bureau of Meteorology (BoM) weather stations located within close proximity to the Project site, however data is available for the closed Kidston Gold Mine recording station (Station 30027, open from 1915 to 2002). Rainfall and river flow is seasonally distributed with a distinct wet season typically commencing in November and extending through to March. The winter dry season extends from April through to October.

Total annual rainfall is highly variable. Generally, around 80%-90% of the total annual rainfall (average 705 millimetres [mm] per annum) occurs during the wet season months of November to March. This is common in the dry tropics where the majority of rainfall can occur over a period of a few days in short, intense rainfall bursts. Rainfall is often associated with the remnants of tropical cyclones crossing the coast between Townsville and Cairns, or monsoonal systems that move in from the Gulf of Carpentaria.

10.2.2 Surface Water

The Project is located within the Copperfield River catchment, a tributary of the Einasleigh River (which is a major tributary of the Gilbert River). The Gilbert River Basin covers an area of approximately 46,500km^2 and drains into the Gulf of Carpentaria. The site lies adjacent to the Copperfield River which converges with the Einasleigh River approximately 40km downstream at the township of Einasleigh. Figure 5 provides a regional drainage overview.

The Copperfield River is a regulated system with flows controlled by the Copperfield Dam which is located on the Copperfield River at the Copperfield Gorge, approximately 18km upstream from the Project site. The dam, constructed in the 1980s to service the Kidston Gold Mine, continues to play a significant role in regulating river flow past the Project site. The dam will continue to be utilised to provide a water supply to the Project, both during construction and operation. The pipeline also services the Rycon Homestead, the Oaks Rush Resort and a number of stock watering points (DEWS, 2016). Controlled releases from the dam typically occur in August to augment low water levels in the Einasleigh Gorge. In addition, it is normal for the dam to overflow via the spillway during a normal wet season.

The Copperfield River, immediately below the dam to its junction with the Einasleigh River (including the reaches adjacent to the site), has multiple channels consisting of sandy beds with occasional exposure of rock bars. A number of smaller ephemeral streams converge with the Copperfield River in this reach. One of these streams is Charles Creek which collects runoff from the western sides of the historic Kidston mining infrastructure. Mining infrastructure within the Charles Creek catchment has be subject to rehabilitation and remediation works to minimise the volume of runoff from the former mine site to Charles Creek. No works during the Project construction and operation phases will impact features within the Charles Creek catchment.

A stream flow gauge is located upstream of the Project site on the Copperfield River at Spanner Waterhole (gauge ID 917115A) that has been operational since 1983. A preliminary review of the gauge data indicates that significant flows can occur within the Copperfield River adjacent to the Project site. Initial analysis indicates that streamflow may exceed 400ML per day, approximately four times during each wet season, with an average duration of 12 days per flow event.

Whilst there are currently no operational stream flow gauges between the Copperfield Dam and the Project, two gauges were operational on the Copperfield Dam between 1984 and 2015 and provide historic background information. Christmas Hill Creek is the only significant stream entering the Copperfield River between the Copperfield Dam and the Project site.

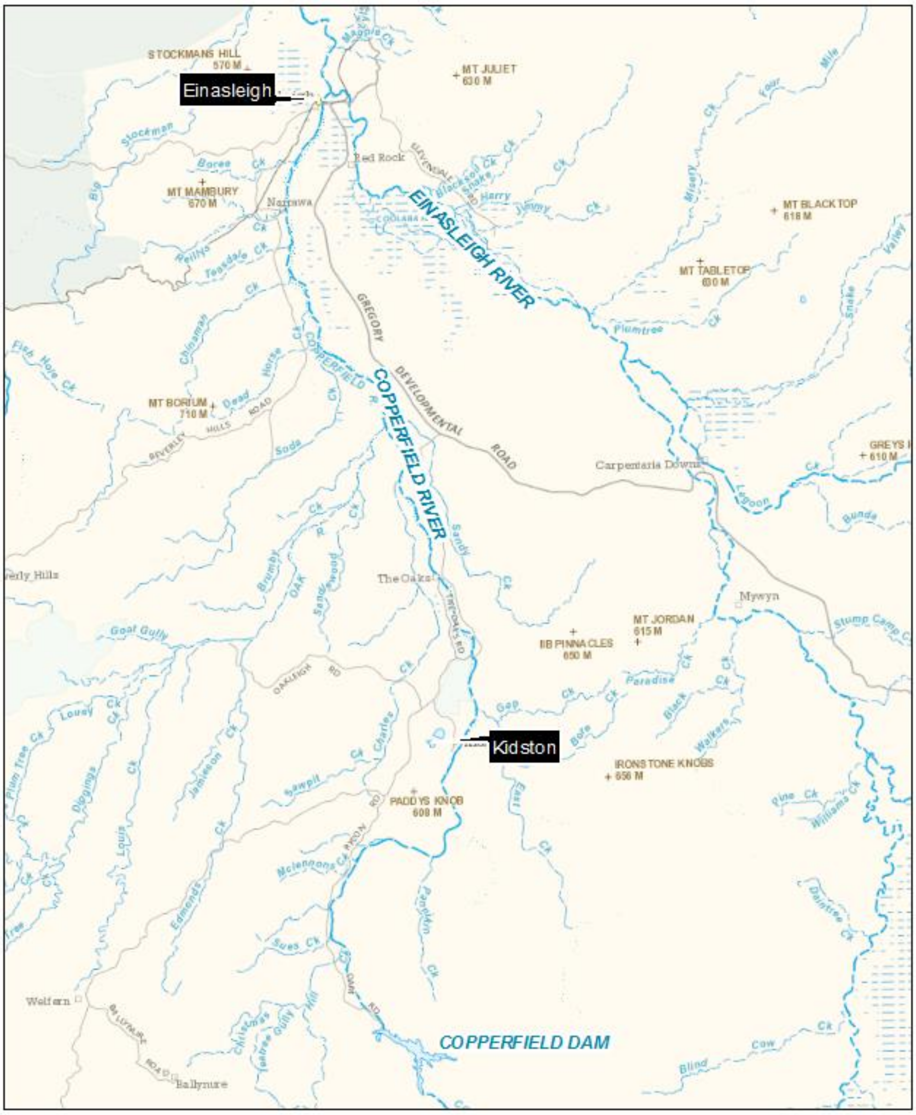

Figure 5 **Regional drainage overview**

EVs for the Gilbert Basin have not been prescribed in Schedule 1 of the *Environmental Protection (Water) Policy 2009*. A site-specific assessment of EVs relevant to the Project will be undertaken as part of the IAR process. The former mine has collected an extensive suite of samples for laboratory analysis from the Copperfield River. The data set contains approximately 180 samples (from 2004 to date) from an upstream monitoring site that is not impacted by mining activities. This dataset will be analysed to determine suitable WQOs for the Project.

Flooding of the site from the Copperfield River is not considered a risk. The Queensland Reconstruction Authority (QRA) Interim Floodplain Assessment Overlay identifies landforms that represent or indicate previous inundation. The overlay is used to indicate where further evaluation of flood impacts needs to occurs. The Project does not fall within the floodplain assessment overlay.

As described in Section 4.0 and illustrated in Figure 3, the Project utilises the Eldridge and Wises Pits to develop and operate the renewable energy pumped storage hydro scheme.

The Eldridge Pit is approximately 270m deep (water depth approximately 236m) and the Wises Pit is approximately 240m deep (water depth approximately 13m). The pits act as natural reservoirs containing 29.4 GL and 0.8 GL of water respectively.

Historical water quality samples have been taken of each pit on an almost yearly basis, each October since 2006. Water quality within the existing Wises and Eldridge Pits historically show elevated concentrations of several water quality parameters, however the concentrations present are not uncommon for metalliferous mines in North and Central Queensland. The water quality of the existing pits will be further explored in the IAR.

Environmental impacts of the Water Release Project relate to the potential discharges to the Copperfield River during wet weather events as outlined in Section 6.0. There will be minimal impact to surface water flow paths around the Project site as the Project utilises existing infrastructure. Further discussion on potential impacts is outlined below.

10.2.2.1 Release of Water to the Copperfield River

Water releases may be required from the existing pits during construction and operation as outlined in Section 6.0.

During construction, the water in the Eldridge Pit needs to be lowered to facilitate access to complete construction of the tailrace portal and to complete stabilisation works to Eldridge Pit walls adjacent the tailrace portal. In the absence of being able to release this water offsite, it is planned to dewater to the Wises Pit. However, there is currently insufficient capacity to hold the additional volume of water (approximately 27.5 GL) required to be removed.

During operation, there may be the requirement for opportunistic releases to remove excess water ingress from intense rainfall events during the wet season as outlined in Section 6.2.1. The length of time the Project can operate in power-generating mode (water is gravity-fed from the upper to lower reservoir) is dependent on the maintenance of an optimal operating water level range in the lower storage reservoir. Incremental reductions in the operating range caused by a rising tailwater level in the lower reservoir will therefore progressively shorten the length of time that water can be gravity-fed from the upper reservoir. This results in an increasingly shorter power generation cycle which could adversely impact the Project's viability if water levels in the lower reservoir remain high.

A water release regime in accordance with the *Technical Guideline for Wastewater Release to Queensland Waters* will be developed as part of the IAR process.

10.2.2.2 Import of Water from Copperfield Dam

Water will be required from the Copperfield Dam to support the Project. This water will be used to supplement existing site reserves (approximately 30 GL) within the Eldridge and Wises reservoirs. The volume of water required will vary depending on weather conditions.

The Project holds a current water allocation for taking water from the Copperfield Dam which is renewed annually. Importing water from the Copperfield Dam will likely lead to an improvement in the water quality within the reservoirs over the long term.

The potential impacts of import of Copperfield Dam water will be further assessed as part of the IAR process.

10.2.2.3 Potential Wises Dam Failure

As described in Section 5.0 and shown in Figure 1, the Project includes the construction of an up to 20m high dam at the Wises Pit.

A Failure Impact Assessment has been undertaken and submitted to the Department of Natural Resources, Mines and Energy for assessment under the *Water Supply (Safety and Reliability) Act 2008.* This process is occurring in parallel to the Coordinated Project process which will regulate water releases.

10.2.3 Groundwater

The Project site straddles the catchment divide of the Copperfield River to the east and Charles Creek to the west of the site. These two drainage features flow north and converge about 16km downstream from the mine site. Minor tributaries inclusive of Butchers Creek drain the former mine area and enter both drainage systems. The major drainage feature, the Copperfield River, is situated on a wide sandy floodplain comprising rock bars and outcrops, vegetated sand levee banks, and semi-permanent waterholes.

Groundwater investigations within the mine area have been undertaken historically as a condition of operational mining activities, including the existing impacts of the Eldridge and Wises pits on the local groundwater regime. Existing data identifies the former Kidston Mine being established in low permeability rocks with limited groundwater potential.

Hydrogeological studies previously undertaken have identified two aquifers at the site – a shallow weathered aquifer and a deeper fractured bedrock aquifer. The aquifers are generally not considered to be utilised by local landholders due to their low permeability and limited groundwater storage potential. The Copperfield Dam located approximately 17 km south of the site is the primary recognised water source for landholders in the area. Potential groundwater users within the groundwater catchment will be confirmed in the IAR.

Both the Eldridge and Wises pits currently contain water, with the Eldridge Pit containing the majority of available water. The Project will see most of this water being transferred to the Wises Pit during the construction phase and then between the two reservoirs as part of the operational phase. The proposed transfer of water between pits has the potential to impact on the groundwater regime due to the hydraulic head changes (water level) between the two pits, groundwater quality from alteration of pit water quality, and induced flow/hydraulic connectivity changes between the pits and surface water (Copperfield River). The potential impacts relating to the hydraulic head changes on groundwater have been assessed in a groundwater assessment by AGE during the engineering design. This assessment concluded that the Eldridge Pit would continue to act as a sink and intercept potential groundwater seepage from the Wises Pit.

Potential construction related impacts such as ground storage of chemicals will be managed through the construction management plan.

Potential induced flow/hydraulic connectivity changes between the pits and surface water (Copperfield River) will be further considered in the IAR.

10.3 Amenity

10.3.1 Air

The principal pollutant of concern for the Project in regard to potential impact on air quality is particulate matter from construction activities (dust). The Project's construction activities are likely to contribute to elevated levels of particulate include the following:

- Earthworks to raise the dam wall height
- Construction of concrete plinths to secure a high-density polyethylene liner
- Rock bolt stabilization works to batters
- Underground excavation works in hard rock to construct access tunnels
- Powerhouse cavern concrete and building works.

The following data examines the prevailing meteorology and examines the constraints and risks likely to be associated with the dam construction activities.

Regional meteorological data has been sourced from the Bureau of Meteorology (BOM) station located at Georgetown, approximately 100 kilometres north west of Kidston. Average annual wind conditions at 9am and 3pm were obtained from the BOM website (*http://www.bom.gov.au/climate/averages/tables/cw_030018.shtml;* accessed 4 May 2018). The Georgetown weather station provided up to 113 years of wind data between 1894 and 2007 with available data provided in Figure 6 below which shows that the principal wind direction is from the easterly quadrant.

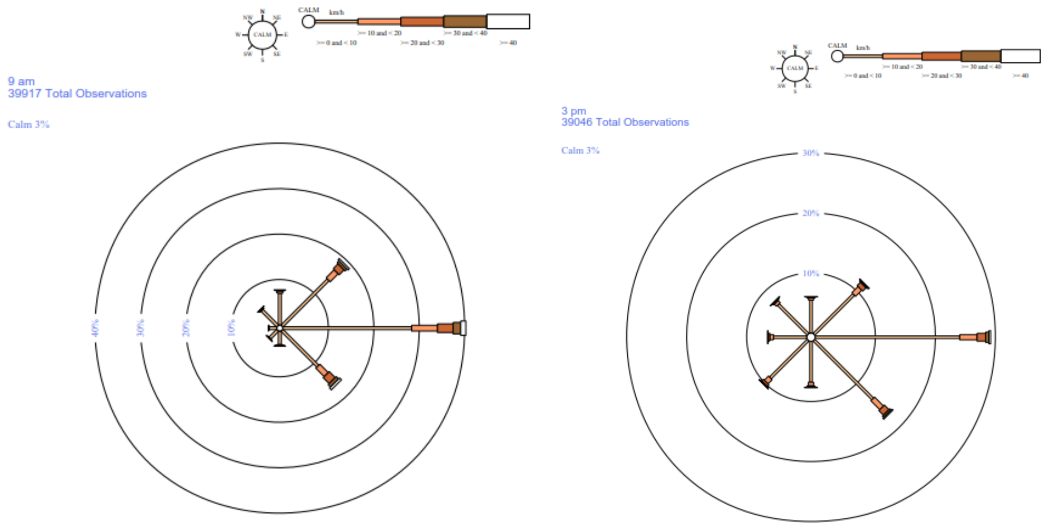

Figure 6 9 am and 3 pm Wind Roses at Georgetown (1894-2007)

The local area generally consists of slightly undulating terrain sloping to the north. The local relief of the surrounding area is minor and is not expected to influence air quality dispersion.

No major industrial pollution sources are located in the area with road and aviation traffic (Kidston airport is located approximately one kilometre east of the site) the only potential pollution sources (although limited usage).

As the site is a decommissioned mine, there exists the potential for elevated levels of hazardous contaminants within the site, resulting in the potential for those pollutants to be within airborne dust generated during construction activities.

The nearest sensitive receptors are located approximately 600m to the east of the site. It should be noted that the predominant wind patterns at the site are easterly suggesting that any pollution generated at the site would migrate to the west and are unlikely to affect the receptor locations.

Given the lack of any complex terrain, major sources of pollution and given that the nearest sensitive receptors are positioned upwind of the site, with the implementation of appropriate management and mitigation measures there are only minor air quality issues requiring consideration in regard to the proposed works. An analysis of the potential contamination in soil and its potential for migration from the site toward sensitive receptors should be considered as part of any further investigations at the site.

The water discharge will be via diffusers into the Copperfield River during high flow periods. No air drift is anticipated and the discharge site is more than 500m away from the closest residence, being the Kidston site manager's office. Air quality impacts are not proposed to be further considered in the IAR.

10.3.2 Noise and Vibration

Existing noise levels in the Project area are likely to be low, and dominated by typical rural activity, road usage and environmental contributors. The maintenance of the Kidston mine site may contribute a level of noise, however this is unlikely to be significant. The nearest sensitive receptor for noise is the Kidston Township, directly adjacent the site to the east.

The regional meteorological data is discussed in Section 10.3.1 above, and identifies the predominant wind patterns at the site are easterly.

The Project has the potential to impact on the immediate area, and surrounding area during both construction and operation. No detailed noise and vibration impact assessments have been undertaken during this assessment, however both construction and operational activities have been considered.

Construction activities that are likely to contribute to noise emissions include:

- Earthworks
- Blasting
- Drilling
- Rock stabilisation
- Concrete batching
- Underground excavation works
- Increased vehicular movements
- Other general construction activities.

During the operational stage, the noise and vibration impacts are likely to be less than those during construction. Operational equipment that may contribute to noise and vibration include:

- Operation of Pumps
- General operational activities
- Low level transport.

Noise impacts associated with the water release at the Copperfield River are expected to be minor. The discharges will be occurring whilst the Copperfield River is already flowing, and the discharge site is more than 500m away from the closest residence, being the Kidston site manager's office. Noise impacts are not proposed to be further considered in the IAR.

10.3.3 Visual Amenity

The landforms of the Project area represent those typical of an open cut mining operation. The Project site is characterised by open cut pits, mine walls, waste rock dumps and residual mine site infrastructure. Images of the existing Project area are provided in Figure 7 and Figure 8.

Figure 7 Looking northwest at Project Site

Figure 8 Looking southwest at Project Site (Pit 1 – Eldridge; Pit 2 - Wises; and KS1 in background)

The Kidston township is located east of the Project area. The township area was created for the purpose of servicing the mine. Since the closure of the mine the residential population of the town has significantly decreased. Beyond the immediate Project area, the landscape is characterised by medium density vegetation historically used for grazing.

Given the historical use of the Project area as an intensive mining activity, and the existence of the current landforms, it is not anticipated that the Project will impact the visual amenity of the surrounding area. No further impact assessment is proposed as a part of the IAR.

In addition to the above, water releases from the Project will alter the existing landscape of the Copperfield River in the immediate discharge location. The spillway will traverse from the Wises Pit to the banks of the Copperfield River, where dispersal infrastructure will be located.

Direct impacts on visual amenity from the water releases may include changes to the bed and bank appearance, removal of riparian vegetation, and intrusion of physical infrastructure such as the spillway and dispersal infrastructure.

10.4 Ecology

10.4.1 Terrestrial Ecology

The Project area has been heavily disturbed and modified over the life of the former Kidston mine operation. The Kidston mine has been progressively rehabilitated since 1997.

The site has historically been managed for weeds under the previous operations of the mine, and this was a key consideration in the rehabilitation objectives of the mine. Weed management has been an ongoing maintenance activity for the site, whilst in care and maintenance post mine life.

Potential impacts to terrestrial ecology values within the Project area include:

- Clearance of vegetation communities
- Loss of some fauna habitat
- Introduction or exacerbation of weed and pest species (construction and operational phases)
- Construction activity and noise (including dust).

The key disturbances from the immediate Project area will be to rehabilitated vegetation on and surrounding the waste rock dumps.

Potential impacts are largely contained to the construction stage of the Project. Loss of vegetation and habitat will occur during the construction of the spillway. Rehabilitated vegetation also may hold some habitat value, however given the level of historical disturbance to the site, the vegetation in those areas is lesser value than the fringing regional ecosystem.

The wider Project will be subject to approvals to clear native vegetation under the *Planning Act 2016* for mapped Category B, Least Concern vegetation.

The construction and operation of the Project will be subject to environmental management plans developed and implemented by a suitably qualified practitioner.

Direct impacts on terrestrial ecology outside of the highly modified site will be minimal, relating only to the water release infrastructure at the Copperfield River. Potential impacts associated with water quality changes in the Copperfield River will be addressed in the IAR, predominantly in relation to Aquatic Ecology as outlined in Section 10.4.2.

10.4.2 Aquatic Ecology

Existing environment and potential impacts in relation to aquatic ecology are relevant to the water releases required for the project is discussed below.

Macroinvertebrate are a useful indicator of stream health (this includes small aquatic insects or bugs). Macroinvertebrate surveys have been undertaken between 2009 and 2013 within the Copperfield River. Macroinvertebrate surveys were undertaken using standard 250 micrometre (µm) sweep netting at monitoring sites and the live picking method in accordance with AUSRIVAS and the Queensland Sampling Manual (2009).

Previous macroinvertebrate sampling indicates that there is little to no impact resulting from the Kidston mine. There is a larger difference in macroinvertebrate assemblages from year to year than when comparing between upstream, intermediate or downstream sites.

No higher-order aquatic ecology surveys have been undertaken at the site to date. An aquatic ecology survey will be undertaken as part of the IAR studies to identify any relevant species, update macroinvertebrate data for the site and consider potential impacts that may result from the water release project.

10.5 Cultural Heritage

10.5.1 Indigenous Cultural Heritage

A search of the Department of Aboriginal and Torres Strait Islander Partnerships (DATSIP) cultural heritage database on 8 May 2018 (ID#36268) indicates that there are no recorded Indigenous (Aboriginal) heritage places within 5km of the proposed works. Given the proximity to the Copperfield River, there is some potential for previously unrecorded cultural heritage sites in the area of works. However, this potential is reduced by historical land use in the area, which has caused significant levels of ground disturbance.

Based on available information, it is likely that the works would constitute a Category 4 activity under the Aboriginal Cultural Heritage Duty of Care Guidelines, gazetted under the *Aboriginal Cultural Heritage Act 2003*. Category 4 activities are those that occur in areas that have previously been subject to significant ground disturbance and which, as a result, are unlikely to harm Aboriginal cultural heritage (s5.4). However, there is recognition in the guidelines that residual Aboriginal cultural heritage values may remain in disturbed areas of high sensitivity landscapes, such as in proximity to major watercourses (s5.6, 6.0). These residual values may be tangible (such as artefacts or scarred trees), or intangible (such as story places or song lines).

An Aboriginal cultural heritage survey is being completed to identify any previously unrecorded tangible or intangible heritage values near the proposed spillway area. If cultural heritage values are identified, care will be taken to avoid Project impact. If impact cannot be avoided the Aboriginal Party, the Ewamian People #3, will be consulted regarding management measures.

It is noted that this eastern part of the Project (on lot 66 SP287774) is addressed in a Cultural Heritage Management Agreement (CHMA) with the Ewamian People #3 as a part of other works for K2S, which also includes the component of the spillway works located on lot 1 SP289310. Indigenous cultural heritage is not proposed to be assessed in the IAR.

10.5.2 Non-Indigenous Cultural Heritage

The proposed works are adjacent to the Queensland State Heritage Listed (SHR) Kidston State Battery and Township (SHR 600506). While there are no proposed works within the boundary of the heritage place, it is noted that the former township and isolated miners homestead leases extended past this boundary to the vicinity of Butchers Creek, and into the area of the proposed spillway. Consequently, the Project area has potential for historical archaeological and built remains that may be of State heritage significance.

An updated historical (non-Indigenous) heritage desktop assessment and survey of the Project is being completed and management measures will be developed as required. Such measures might include the monitoring of ground disturbing works, the avoidance of high value areas or, where this is not possible, the archaeological salvage of remains. Non-Indigenous cultural heritage is not proposed to be assessed in the IAR.

10.6 Traffic and Transport

The likely access for the Project will be via the main access point to the former Kidston mine site on Gilberton Road. The main traffic impact will be during the construction period of the Project. Based on traffic impact assessments for the KS1 and the K2S projects, it expected that there will be adequate “capacity” in the existing road network to cater for the additional trips generated by the Project. A Traffic Impact Assessment will be undertaken as part of a separate development application under the *Planning Act 2016*.

The spillway infrastructure will cut the extent of Old Kidston Road. Old Kidston Road branches from Gilberton Road in an easterly direction and travels through the Kidston Township to its formal extent at the spillway location. The road physically continues into the Mining Lease, where it becomes an access track for the mining lease operations.

The Project will cut the informal access to the mine site from the Kidston Township in this location by constructing the spillway. Alternative access to the Project will be assessed through a development application under the *Planning Act 2016*.

11.0 Environmental Management and Mitigation Measures

This section describes the key environmental management and mitigation measures related to the proposed water discharges required for the Project. The IAR will further consider the potential impacts and management related to water discharges, however Genex will also be obtaining other relevant approvals that will inform the environmental management of all relevant Project activities.

Genex is committed to ensuring that the Project is delivered in an environmentally responsible manner, and intends to put in place practical approvals, people/contractors, systems and processes to implement best practice environmental management.

The Project will require a comprehensive environmental monitoring program to measure and record project-specific environmental performance and compliance with conditions of approval. Regular audits of environmental and safety performance will be undertaken by Genex.

11.1 Management and Mitigation of Water Discharges

11.1.1 Surface Water

A controlled release strategy will be developed following the Queensland Department of Environment and Science Technical Guideline ESR/2015/1654 Version 2 – *Wastewater Release to Queensland Water.* The release strategy will be developed around consideration of the following key aspects:

- The water management hierarchy outlined in Environmental Protection (Water) Policy 2009
- Practical design and construction planning measures such as:
  - Minimising the need to release during construction through provision of temporary additional freeboard water storage to provide an additional buffer against stormwater inflows
  - Timing critical construction activities to avoid wet season rainfall
  - In the event that a discharge must be made, sourcing of released water from the highest quality source e.g. from the Eldridge Pit as opposed to Wises Pit.
- The operational release strategy will be developed to:
  - Be cognisant of streamflow and water quality in the receiving environment (i.e. the Copperfield River) as follows:
    - Potential releases would only be during naturally occurring stream flow events when flow is in excess of a pre-defined trigger and water quality is below the relevant WQOs nominated to support downstream EVs
    - Potential releases would cease once stream flow recesses below the nominated flow trigger such that the ongoing stream flow will negate the likelihood of stranding the released water in non-flowing waterholes and the released water will continue to pass out of the river system.
  - Be responsive to water quality in the former mine pits and only allow release of water at a rate that will ensure relevant WQOs considered to ensure downstream EVs are protected.
  - Minimise potential impacts to the existing streamflow regime and ensure that the frequency, duration and timing of existing streamflow events is maintained.

A Receiving Environment Monitoring Program (REMP) will also be included with the controlled release strategy to clearly outline how potential impacts will be monitored and assessed on an ongoing basis.

11.1.2 Groundwater

Potential induced flow/hydraulic connectivity changes between the pits and surface water (Copperfield River) will be further considered in the IAR. Any relevant recommendations to manage groundwater impacts will be addressed through the EMP.

11.2 Other Aspects of the Project

Table 4 outlines key aspects, proposed management measures, mitigation and further assessment requirements. Certain aspects will form part of the IAR process, while other aspects will be dealt with through a separate approval processes (as discussed in Section 12.0). In most instances, the aspects are managed through a Construction Environmental Management Plan (CEMP) and/or Receiving Environment Monitoring Program (REMP). The list below will provide a guide to other approvals required for the Project, however the list is not exhaustive.

Table 4 Impact assessments, management plans and recommended mitigation measures

Aspect	IAR / Other	Management Plans	Example Mitigation / Further Study
Land	Other	CEMP	• Land use planning assessment • Contaminated land management through construction • Standard soil and land management mitigation measures such as erosion and sediment control
Water	IAR	CEMP, REMP	• Surface water assessment • Sensitive design principles • Management of works to accommodate season conditions • Standard soil and land management and mitigation measures such as erosion and sediment control
Air Quality	Other	CEMP	• Standard air quality management measures during construction
Noise and vibration	Other	CEMP	• Standard noise and vibration management measures during construction
Visual Amenity	Other	N/A	• N/A
Terrestrial Ecology	Other	CEMP	• Retention of native vegetation through design planning and construction phases where possible • Supplementary planting and revegetation were appropriate • Preclearing surveys
Aquatic Ecology	IAR	CEMP, REMP	• Aquatic ecology assessment
Cultural Heritage	Other	Cultural Heritage Management Plan (where required) CEMP	• Duty of care assessment • Direct negotiations with traditional owners and the State • An unexpected finds protocol will be implemented during construction
Traffic and Transport	Other	Traffic Management Plan for both construction and operation	• Traffic Impact Assessment • Road User Agreement with Council

12.0 Approvals Required for Project

The following section summarises the approvals requirements for the Project. An approvals summary table is provided in Appendix A.

12.1 Commonwealth Legislation

12.1.1 Environment Protection and Biodiversity Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Commonwealth Government's central piece of environmental legislation. The EPBC Act protects nine Matters of National Environmental Significance (MNES) including:

- listed threatened species and communities
- listed migratory species
- ramsar wetlands of international importance
- Commonwealth marine environment
- world heritage properties
- national heritage places
- the Great Barrier Reef Marine Park
- nuclear actions
- a water resource, in relation to coal seam gas development and large coal mining development.

The EPBC Act provides a process for environmental assessment and approval of proposed actions that may have a significant impact on MNES, known as 'controlled actions'. Under the EPBC Act, proponents proposing an action that may impact upon a MNES must refer the proposal to the Commonwealth Department of the Environment and Energy. This referral is used by the Commonwealth Minister for Environment to assist in deciding whether the proposal requires assessment and approval under the EPBC Act.

MNES which may be impacted by the wider Project are discussed in Section 10.4 and include protected flora and fauna species. Given the level of historical disturbance over the majority of the Project area (mining lease), a significant impact on protected species is considered unlikely.

Potential construction and operational impacts of the spillway infrastructure on any protected species (if present), aquatic or terrestrial, are likely to be able to be managed through avoidance, mitigation measures and management plans. Aquatic ecology assessments to be undertaken during the IAR will investigate the presence of any protected species under the EPBC Act. Based on previous aquatic investigations in the wider area, presence of protected aquatic species is considered unlikely.

An assessment will be undertaken to consider the Project against the significant impact guidelines under the EPBC Act. Based on the current known information and nature of the receiving environment, the Project will not be referred under the EPBC Act.

12.1.2 Native Title Act 1993

The *Native Title Act 1993* provides for the recognition and protection of Native Title rights for Australia's Indigenous people, as well as providing a legislative approach to address issues concerning Native Title. The legislation provides for the determination of Native Title claims, the treatment of future acts, which may impact on native title rights, and consultation and/or notification of relevant Native Title claimants where future acts are involved.

Native Title is discussed in Section 10.1.5 of the IAS. The majority of the Project area is not included within the surrounding Native Title claims. However, the area over which Native Title has been determined includes the Copperfield River and its northern banks. Depending on the extent of works intended for the end of the spillway, this area of Native Title may be impacted and if so would be addressed accordingly.

12.1.3 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The purpose of this act is to preserve and protect places, areas and objects of particular significance to Aboriginal people. This act is normally implemented through the provisions of the *Queensland Aboriginal Cultural Heritage Act 2003*.

A number of consultation activities have been undertaken with the indigenous party for the area, being the Ewamian People #3. A Cultural Heritage Management Agreement has been executed between Genex and the Ewamian People for K2S, which covers relevant areas of the Project.

12.2 State Legislation

The Project presents a unique situation, in which a new non-resource project is proposed over existing resource tenure. The Queensland legislative framework currently does not make provision for the land use transition of decommissioned mine sites to renewable energy projects, and as such no existing legislative mechanism allows for the approval and regulation water releases required for the Project.

Through extensive consultation with government regulators in relation to approval mechanisms and best practice assessment for the Project, an approval pathway has been agreed between Genex and the relevant State government regulators. The following is a high level summary of the approval elements for the Project.

- Coordinated Project, IAR process under the *State Development and Public Works Organisation Act 1971* – to assess the proposed **water discharges** from the Project
- Development Permit under *Planning Act 2016*:
  - to assess the **change in land use** under the ESC planning scheme and clearing of native vegetation managed under *Vegetation Management Act 1994*
  - to assess the **dam design, risks and operation** managed under the *Water Supply (Safety and Reliability) Act 2008*.

As highlighted above, the three key elements of the approval process for the Kidston Project, includes:

1. water discharge
2. change in the land use of the Project area
3. design, construction and operation of the dam structure requiring failure impact assessment under the relevant legislation.

Items 2 and 3 above will not form part of the IAR process, as there is a clear delineation and process in the Queensland legislation for assessment of these elements. These approvals have been obtained ahead of the IAR process, and are not anticipated to conflict with any conditions that may be issued by the Coordinator-General.

12.2.1 State Development and Public Works Organisation Act 1971

This IAS has been prepared to address the requirements of the SDPWO Act coordinated project process. Discussion on the coordinated project and proposed IAR process are discussed in Section 12.1 and Section 12.2.

The IAR will closely follow the Department of Environment and Science *Technical Guideline: Wastewater Release to Queensland Waters (ESR/2015/1654)*. Assessment against the guideline, where relevant, has been agreed as appropriate methodology for the Project with State government regulators.

13.0 Community and Stakeholder Consultation

A number of consultation activities have been undertaken by Genex to date. Consultation has largely included the following stakeholders:

- directly affected land owners
- local, State and Commonwealth government regulators
- relevant infrastructure providers.

Consultation activities have been undertaken with the Etheridge Shire Council and State Government stakeholders. Genex met with Etheridge Shire Council formally to discuss the Project in a pre-lodgement forum and as part of the Material Change of Use development approval which was granted on 19 September 2018.

State Government regulators have also been consulted through the application stage of the Project. State Government regulators include:

- Coordinator-General
- Department of State Development, Manufacturing, Infrastructure and Planning
- Department of Natural Resource, Mines and Energy
- Department of Environment and Science
- Department of Agriculture and Fisheries
- Ergon Energy
- Powerlink Queensland.

A number of consultation activities have been undertaken with the indigenous party for the area, being the Ewamian People. A Cultural Heritage Management Agreement has been executed between Genex and the Ewamian People for the wider Project.

14.0 Glossary, Acronyms and Abbreviations

Term	Definition
ACH Act	*Aboriginal Cultural Heritage Act 2003*
AHD	Australian Height Datum
ARENA	Australian Renewable Energy Agency
ASS	Acid Sulfate Soil
ASX	Australian Securities Exchange
BoM	Bureau of Meteorology
CEFC	Clean Energy Finance Corporation
CEMP	Construction Environmental Management Plan
CHMA	Cultural Heritage Management Agreement
CLR	Contaminated Land Register
CSR	Corridor Selection Report
DAF	Department of Agriculture and Fisheries
DATSIP	Department of Aboriginal and Torres Strait Islander Partnerships
DES	Department of Environment and Science
DLGRMA	Department of Local Government, Racing and Multicultural Affairs
DNRME	Department of Natural Resources, Mines and Energy
DSDMIP	Department of State Development, Manufacturing, Infrastructure and Planning
DTMR	Department of Transport and Main Roads
EA	Environmental Authority
EAR	Environmental Assessment Report
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMR	Environmental Management Register
EP Act	*Environmental Protection Act 1994*
EPBC Act	*Environment Protection and Biodiversity Act 1999*
EPC	Engineering, Procurement and Construction
ESC	Etheridge Shire Council
EVs	Environmental Values
EVNT	Endangered, Vulnerable and Near Threatened
FSL	Full Supply Level

Term	Definition
Genex	Genex Power Limited
GL	Gigalitre
HDPE	High-density Polyethylene
IAR	Impact Assessment Report
IAS	Initial Advice State
K2H	Kidston Pumped Storage Hydro Project
K2S	Kidston Solar Farm Stage Two Project
KGML	Kidston Gold Mines Limited
km	Kilometres
km2	Square Kilometre
KS1	Kidston Solar Farm Stage One Project
kV	Kilovolts
LGA	Local Government Area
LNG	Liquid Natural Gas
m	Meters
mm	Millimetre
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
MVA	Mega Volt Amp
MW	Megawatts
NC Act	*Nature Conservation Act 1992*
NDRRA	Natural Disaster Relief and Recovery Arrangements
Powerlink	Powerlink Queensland
the Kidston Project	Kidston Pumped Storage Hydro Project
QLD	Queensland
QLUMP	Queensland Land Use Mapping Program
QRA	Queensland Reconstruction Authority
RE	Regional Ecosystem

Term	Definition
REMP	Receiving Environment Monitoring Program
REZ	Renewable Energy Zone
RL	Relative Level
SDPWO Act	*State Development and Public Works Act 1971*
SHR	State Heritage Listed
ToR	Terms of Reference
VM Act	*Vegetation Management Act 1994*
WQO	Water Quality Objectives

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Appendix A

Approvals Summary Table

Appendix A Approvals Summary Table

Legislation	Approval	Comment
Environment Protection and Biodiversity Conservation Act 1999	Referral	An EPBC Act Referral is unlikely to be required as the site has been heavily disturbed and will utilise existing infrastructure over the site.
State Development and Public Works Organisation Act 1971	Coordinated Project Approval	The Project is proposed to be assessed through the Coordinated Project approval pathway.
Planning Act 2016 Planning Scheme	Development Permit for a Material Change of Use	The Project will trigger a material change of use application to change the use from pit voids to K2H. The application will be code assessable and referrals include: • Referrable Dam • Clearing native vegetation • Electricity infrastructure referral.
Planning Act 2016	Development Permit – Removal of quarry material from a watercourse	Sand may be required for concrete batching activities. The location of the extraction area is unknown, however it is assumed that water will be extracted from the Copperfield River or Charles Creek.
Planning Act 2016; *Environmental Protection Act 1992*	Development Permit - ERA 16 (Dredging)	As above.
Water Act 2000	Quarry Material Allocation – Permit	As above.
Planning Act 2016	Development Permit – Waterway Barrier Works *Constructing or raising PERMANENT waterway barrier works within an assessable waterway.*	There are a number of assessable waterways in the Project area. The nature of the current design does not allow for a firm conclusion of whether waterway barrier works will be required, however the following activities are likely to require approval: • Spillway infrastructure (where it intrudes substantially beyond the bank and impacts the flow of waterer and fish movement). • Extraction infrastructure within a waterway (related to sand extraction) • New or upgraded access to or across a waterway.
Planning Act 2016 Planning Scheme	Development Permit – Building Works	The Project is likely to involve building works which are deemed assessable.
Planning Act 2016 Planning Scheme	Development Permit – Drainage Works and Plumbing Works	The Project is likely to involve plumbing and drainage works which are deemed assessable.