Appendix H

Water quality impact assessment

Blast Furnace No. 6 Reline Project

Water Quality Impact Assessment

BlueScope Steel (AIS) Pty Ltd

7 March 2022

→ **The Power of Commitment**

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Executive Summary

GHD has completed a water quality impact assessment of the construction, commissioning, operation and decommissioning of the No. 6 Blast Furnace (6BF) at the Port Kembla Steelworks. The assessment supports the EIS for the project and responds to the SEARs relating to surface and groundwater quality.

The assessment describes the existing ambient and background water quality and assesses the potential impacts to water quality associated with the construction, operational and decommissioning phases of the project with respect to the following guidelines:

– NSW Marine Water Quality Objectives (WQO's) in NSW (DEC, 2006)
– Storing and Handling Liquids: Environmental Protection (DECC, 2007)
– Managing Urban Stormwater: Soils and construction - Volume 2 (DECC, 2008)
– Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2018)

Potential risks to water quality during the construction, commissioning and decommissioning phases are well understood by BlueScope given the experience gained during the successful delivery of the three previous reline projects at the Port Kembla Steel Works (PKSW). Risks to water quality during these phases of the project are proposed to be managed via the existing drainage network and site capture and containment measures, including adequate storage basins, comprehensive monitoring and controlled discharge.

The operation of 6BF following completion of reline activities, commissioning and ramp up will be generally the same as existing operations at No. 5 Blast Furnace (5BF). Specific locations of certain activities within the PKSW site will change due to the transfer of operations to 6BF. However, changes to the quantity or characteristics of water outputs from the blast furnace will be minimal.

Similarly, water uses and discharges from the blast furnace will be consistent with the quantity and quality of those at 5BF. Minor changes to cooling water discharges are expected due to the alternative cooling system associated with 6BF. The stormwater drainage system proposed for the project will enable the capture and reuse of stormwater and containment of any spills, providing an improvement over the current stormwater management capabilities.

An assessment of the future 6BF operations against the above water quality guidelines was undertaken based on the historical 5BF operational monitoring data, previous numerical modelling studies and ecological studies of Allans Creek and the Inner Harbour. Key findings of the assessment are summarised below:

– Relatively few exceedances of the 95% LOSP DGV's occur at the licence discharge point during operations, with the exception of cyanide which nevertheless is compliant with EPL 6092 concentration limits.

  As part of BlueScope's ongoing commitment to improvement and efforts to comply with the NSW WQO's and ANZG guidelines, Pollution Reduction Program (PRP) 182 is currently underway to address the identified gaps in data when comparing the analytes measured at No. 2 Blower Station (2BS) drain, which receives flows from the 6BF drain and discharges to Allans Creek, against the list specified in the water quality guidelines. PRP 182 involves extensive sampling to identify and quantify all sources of pollutants entering, and ultimately discharging from, the 2BS drain to Allans Creek, including from the blast furnace effluent treatment system.

  Investigations are currently underway at 5BF to determine additional, online treatment solutions to reduce the concentration of cyanide in the effluent treatment system blowdown water before it is discharged to the 2BS drain. Learnings and solutions for cyanide treatment will be applied to future operation of 6BF.
– Products added to the effluent treatment system such as scale inhibiter, flocculant, coagulant and biocides will be dosed at rates in accordance with the manufacturer's guidance and BlueScope's current operational procedures such that no significant impacts to water quality when compared to 5BF? are expected at the proposed discharge concentration.
– Whilst the cooling system proposed for 6BF offers the benefits of both reduced energy and water use in comparison to the existing cooling system at 5BF, an increase of approximately 3,000m^3/h of salt water will be required, which represents an increase of around 10% over current operations. At the point of discharge to Allans Creek, these changes are expected to result in a temperature increase of approximately 0.5 – 1°C.

- Numerical modelling previously undertaken on behalf of BlueScope indicates that increased temperatures drop rapidly upon discharge into Allans Creek, with an initial mixing zone of 30m to 40m from the discharge point.
- Allans Creek and the Inner Harbour have been subject to the effects of warmer than ambient industrial discharges for decades and are considered part of a highly disturbed ecosystem. Existing temperatures within 2BS Drain and Allans Creek are not compliant with the default guideline values for temperature and future temperatures are expected to remain non-compliant. However, the predicted increase in temperature at the point of discharge into Allans Creek will comply with the site-specific temperature criteria (an increase of less than 3°C) developed during previous studies and will remain well within the temperature limits that are specified under EPL 6092.
- The risk of negative impacts to groundwater posed by the project is considered low on account of BlueScope's recent and proposed improvements to capture and containment measures and its ongoing groundwater monitoring program.
- Water proposed to be used during the project does not trigger water licencing requirements and will be sourced from an appropriately authorised and reliable supply comprised of both recycled water from the Wollongong Water Recycling Plant (over 85% of the current industrial water mixture) and unfiltered Avon Dam water.

As part of an ongoing commitment to sustainability, BlueScope has successfully completed approximately 77 water-related PRPs and continues to work closely with the EPA to identify opportunities for further improvement. As part of the 6BF reline project, BlueScope has committed to delivering an extensive list of mitigation measures relating to water discharge and water use that will minimise the risk of surface water or groundwater contamination during operation of the project. These include improvements relating to:

- Process and discharge controls
- Stormwater
- Discharge locations
- Water use
- Wastewater management
- Spill management

In addition, the stormwater drainage system proposed for the project will enable the capture and reuse of stormwater, providing improved water cycle management over the current stormwater management capabilities.

Further to the mitigation measures described above, recommendations have been made regarding a number of management plans to be developed following completion of detailed design and implemented during the project.

Based on the investigations and assessment undertaken by GHD and the conclusions drawn in this WQIA, it is considered that, subject to the recommended mitigation measures being applied, the proposed project will not result in any material adverse impacts to water quality, when compared to the current operations of 5BF. Amongst other positive effects, the project will result in reduced water use, improved energy efficiency and improved water capture capability thereby minimising the risk of adverse water quality impacts.

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Abbreviations and acronyms

Term	Definition
AAT	Australian Amalgamated Terminals
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines
AS	Australian Standards
ASS	Acid sulphate soils
BC Act	Biodiversity Conservation Act 2016
BFG	Blast Furnace Gas
BF-BOF operating model	Blast Furnace ironmaking and Basic Oxygen Furnace steelmaking
Biosecurity Act	Biosecurity Act 2015
BS	British Standards
BlueScope	BlueScope Steel (AIS) Pty Ltd
BoM	Bureau of Meteorology
BOS	Basic Oxygen Steelmaking
°C	Degrees Celsius
CEMP	Construction Environmental Management Plan
CLM Act	Contaminated Land Management Act 1997
CO	Carbon monoxide
CO2	Carbon dioxide
Coastal Management SEPP	State Environmental Planning Policy (Coastal Management) 2018
COG	Coke Oven Gas
COPC	Contaminants of Potential Concern
CSSI	Critical State Significant Infrastructure
DEC	Department of Environment and Conservation NSW
DECC	Department of Environment and Climate Change NSW
DECCW	Department of Environment and Climate Change and Water NSW
DGV	Default Guideline Values
DNAPL	Dense Non-Aqueous Phase Liquid
DO	Dissolved oxygen
DP	Deposited Plan
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EPA	Environment Protection Authority NSW
EPL	Environmental Protection Licence

Term	Definition
GHD	Gutteridge Haskins & Davey
IMED	Ironmaking East Drain
ISO	International Organization for Standardisation (Organisation internationale de normalisation)
km	Kilometre
LBL	Load Based Licensing
LNAPL	Light Non-Aqueous Phase Liquid
LOSP	Level of Species Protection
LOR	Limit of reporting
m	Metre
mg/L	Milligrams per litre
mm	Millimetres
m3/hr	Cubic metres per hour
NTU	Nephelometric Turbidity Units
NSW	New South Wales
pH	Acidity
PKSW	Port Kembla Steel Works
PRP	Pollution Reduction Program
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
SWMP	Soil and Water Management Plan
TRT	Top gas recovery turbine
TSS	Total Suspended Solids
µg/L	Micrograms per litre
WGHR	Waste Gas Heat Recovery
WQIA	Water quality impact assessment
5BF	Blast Furnace Number 5
6BF	Blast Furnace Number 6

1. Introduction

1.1 Background and project overview

BlueScope Steel (AIS) Pty Ltd (BlueScope) is one of Australia's leading manufacturers and with its parent company, BlueScope Steel Limited, is a global leader in finished and semi-finished steel products. BlueScope's Port Kembla Steelworks (PKSW) operation in NSW includes two blast furnaces. No. 5 Blast Furnace (5BF) is currently operating, while No. 6 Blast Furnace (6BF) is currently in care and maintenance.

5BF is expected to continue to produce (molten) iron on a continuous basis until it reaches the end of its operational life at some stage between 2026 and 2030. BlueScope is proposing a move of iron production from 5BF to 6BF, after 5BF ceases operation.

6BF last produced iron in 2011, at which point it was taken out of service and placed into care and maintenance. To prepare 6BF to become operational again, major maintenance works are required (the project). The project aims to return 6BF to service through a reline process that will be carried out while 5BF continues to operate.

The project enables critical steelmaking operations to continue whilst BlueScope evaluates innovative "green steel" technologies that are starting to be piloted globally but will not be commercialised at scale in time to maintain production once the current campaign of the 5BF concludes. The project has been declared Critical State Significant Infrastructure (CSSI) in accordance with section 5.13 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and Schedule 5 of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP).

This water quality impact assessment report has been prepared by GHD Pty Ltd (GHD) as part of the EIS for the project. The EIS has been prepared to support the application for project approval and addresses the environmental assessment requirements of the Secretary's Environmental Assessment Requirements (SEARs) pertaining to water quality.

1.2 Purpose of this report

The purpose of this report is to assess the potential water quality impacts from constructing and operating the project. The report:

– Addresses the SEARs (DPIE, 2021) as listed in Section 2.2
– Describes the existing environment with respect to water quality
– Assesses the potential impacts on sensitive receivers of constructing and operating the project
– Recommends measures to mitigate and manage the impacts identified

1.3 Structure of this report

The structure of the report is outlined below.

– **Section 1** – provides an introduction to the report.
– **Section 2** – describes the methodology used to undertake the assessment of water quality impacts.
– **Section 3** – describes the existing water quality environment and the sensitive receivers in the study area.
– **Section 4** – provides a description of the project during the construction, commissioning and operational phases.
– **Section 5** – summarises the outcomes of the assessment and a discusses the potential impacts.
– **Section 6** – provides the mitigation measures recommended to reduce the potential impacts.
– **Section 7** – summarises the key outcomes of the water quality impact assessment.
– **Section 8** – lists the references used in this report.

1.4 Project definitions

For the purposes of this report, the following definitions are employed:

- The project is the development that is the subject of the EIS, being the proposed reline and operation of 6BF and associated supporting infrastructure.
- The project area is the area within which the project is located and which will be directly impacted by the project.
- The study area is the site that was investigated during preparation of the EIS. The study area encompasses the project area and a buffer as relevant to searches and investigations inclusive of the catchment within which the project is situated: Inlet Channel, Allans Creek, Tom Thumb Lagoon and Port Kembla Harbour.

1.5 Limitations

This report has been prepared by GHD for BlueScope Steel (AIS) Pty Ltd and may only be used and relied on by BlueScope Steel (AIS) Pty Ltd for the purpose agreed between GHD and BlueScope Steel (AIS) Pty Ltd as set out in Section 1.2 of this report. GHD otherwise disclaims responsibility to any person other than BlueScope Steel (AIS) Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by BlueScope Steel (AIS) Pty Ltd and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions may change after the date of this report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

2. Methodology

2.1 Overview

This section outlines the methodology used in the water quality impact assessment of the project. The approach included the following key tasks:

Assessment scope:

- Review of potential surface and groundwater impacts of the project.
- Characterisation of water quality discharges, including quality and quantity of all pollutants from the project.
- Documenting details of the stormwater and wastewater management systems.
- Undertaking a site water balance.

Existing environment:

- Identifying the study area relevant to the water quality assessment, including sensitive receiving environments.
- Characterising the existing water quality of Allans Creek and the Inner Harbour based on previous numerical modelling and monitoring programs undertaken in the vicinity of the study area.
- Identifying and classifying existing intake and discharge points within the study area.
- Reviewing the completed and ongoing Pollution Reduction Programs of relevance to the study area.
- Identifying where relevant criteria for receiving waters are being met.
- Identifying where relevant criteria for receiving waters are not being met and what activities are being undertaken to work toward their achievement over time.
- Characterising the nature and extent of any contamination on the site and surrounding area.

Water quality impact assessment:

- Documenting relevant criteria for assessment of potential water quality impacts.
- Comparing expected discharge characteristics and resulting water quality parameters at the edge of the mixing zone and within Allans Creek and the Inner Harbour of Port Kembla to the relevant criteria.
- Where the relevant criteria are not met, describing potential mitigation measures that will limit impacts to water quality and may enable the criteria to be met in time, thereby avoiding or minimising impacts to sensitive receiving environments.
- Describing the proposed erosion and sediment controls during construction.
- Providing recommendations for any required water quality controls for implementation during construction and future operations.

2.2 Legislative and policy context

2.2.1 Secretary’s Environmental Assessment Requirements

The SEARs relevant to water quality impacts, together with a reference to where they are addressed in this report, are outlined in Table 2.1. Consideration has also been given to the EPA’s advice regarding key water quality issues, which have been addressed throughout the Water Quality Impact Assessment (WQIA).

Table 2.1 SEARs relating to water quality

Requirement	Where addressed in this report
Water Quality	
An assessment of potential surface and groundwater impacts of the project	Section 4, Section 5 and Section 9.1 of the EIS
Characterisation of water quality discharges, including quality and quantity of all pollutants from the project for comparison against relevant water quality criteria and details of proposed water quality controls	Section 4 and Section 5
A detailed site water balance and any water licensing requirements	Section 3.9 and Section 4.4
Details of the stormwater and wastewater management systems and measures to treat, reuse or dispose of water	Section 4 and Section 6
Description of the proposed erosion and sediment controls during construction	Section 6
Characterisation of the nature and extent of any contamination on the site and surrounding area	Section 3.4

2.2.2 Guidelines and policies

The assessment was undertaken in accordance with the SEARs and with reference to the requirements of relevant legislation, policies and/or assessment guidelines, including:

– NSW Marine Water Quality Objectives in NSW (DEC, 2006)
– Storing and Handling Liquids: Environmental Protection (DECC, 2007)
– Managing Urban Stormwater: Soils and construction – Volume 1 (Landcom, 2004)
– Australian and New Zealand Guidelines for fresh and marine water quality (ANZG, 2018)
– Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000)
– NSW Environment Protection Authority (EPA) guidance regarding mixing zones (EPA, 2018)

Further details regarding the relevant environmental values, indicators and associated guideline values or criteria for Port Kembla are provided in Section 2.3.

2.3 Guideline assessment criteria

The National Water Quality Management Strategy (NWQMS) provides a national framework for improving water quality in Australia's waterways. The main policy objective of the NWQMS is to achieve sustainable use of the nation's water resources, protecting and enhancing their quality, while maintaining economic and social development.

There are a number of national guideline documents under the NWQMS that aim to provide a consistent approach to the management of significant water quality issues. Those of relevance to the project and this water quality impact assessment are summarised below:

– Management of water quality for natural and semi-natural water resources is guided by the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018 or Water Quality Guidelines).
– Management of groundwater quality is guided by the National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (AG, 2013).

At a state level, the Marine Water Quality Objectives (WQOs) were adopted by the NSW Government in 2005 and are intended as a guideline tool for strategic planning and development assessment (DEC 2005)[1]. The WQO's define the following marine water quality values:

– Aquatic ecosystems i.e. aquatic ecosystem health
– Primary contact recreation i.e. swimming, surfing
– Secondary contact recreation i.e. boating, wading
– Visual amenity i.e. aesthetic qualities of waters
– Aquatic foods i.e. water suitable for growing seafood

In the case of Port Kembla Harbour, the relevant values relate only to Aquatic Ecosystems and Visual Amenity (DECCW, 2006), for which the relevant guideline levels for ambient water quality are presented in Figure 2.1.

Marine Water Quality Objectives	**Aquatic ecosystem health** **To maintain or improve the ecological condition of ocean waters.**	**Visual amenity** **To maintain or improve ocean water quality so that it looks clean and is free of surface films and debris.**
Examples of indicative guideline levels for environmental (ambient) water quality The indicative guideline levels (indicators and numerical criteria) listed are examples only of some of the relevant water quality guideline levels recommended in the ANZECC & ARMCANZ Guidelines 2000. For a full list, refer to the appropriate tables as referenced in the ANZECC & ARMCANZ Guidelines 2000. These are available at www.deh.gov.au/water/quality/nwqms/index.html	**Biological** • Frequency of algal blooms – no change from natural conditions • Bioaccumulation of contaminants – no change from natural conditions. **Physico-chemical** • **Nutrients** Total Nitrogen < 120 µg/L Total Phosphorous < 25 µg/L • **Turbidity** 0.5–10 NTU* **Toxicants in coastal waters** • **Metals** Copper < 1.3 µg/L Lead < 4.4 µg/L Zinc < 15 µg/L • **Pesticides** Chlorpyrifos < 0.009 µg/L **Toxicants in bottom sediments** • **Metals** Copper < 65 mg/kg dry weight Lead < 50 mg/kg dry weight Zinc <200 mg/kg dry weight Mercury < 0.15 mg/kg dry weight • **Organochlorines** Chlordane < 0.5 µg/kg dry weight Total PCBs < 23 µg /kg dry weight	**Indicators to ensure water looks clean and free from pollutants** • **Surface films and debris** Oils and petrochemicals should not be noticeable as a visible film on the water, nor should they be detectable by odour. Waters should be free from floating debris and litter. • **Nuisance organisms** Macrophytes, phytoplankton scums, filamentous algal mats, blue-green algae, and sewage fungus should not be present in unsightly amounts.

Figure 2.1 Relevant guideline levels for ambient water quality (DEC 2006)

[1] It is noted that the NSW Government is reviewing the NSW Water Quality Objectives across coastal catchments, as a key action under Initiative 1 of the NSW Marine Estate Management Strategy 2018–2028. At the time of assessment no updated information was available.

At the time of publication, the WQO's were intended to be used in conjunction with the supporting information provided by the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000), which were superseded by the revised ANZG 2018 Water Quality Guidelines.

It should also be noted that the environmental values and respective numerical indicator values represent objectives for ambient background water quality and are not intended to be applied to point source discharges or mixing zones. Further details are provided in Sections 3.6 and 3.7 regarding the existing water quality conditions and receiving environments of Port Kembla. In summary, Allans Creek and the western portion of the Inner Harbour are considered part of a highly disturbed ecosystem where exceedances of the 95% trigger values for protection of marine waters have been recorded in relation to aluminium, cadmium, copper, lead, zinc, tin and arsenic (refer Section 3.7).

Despite these legacy water quality issues, it is recognised that significant efforts have been made on the part of industry to reduce the level of pollution and improve water quality within Port Kembla. Hence for the purposes of this assessment, with the exception of temperature (which is discussed further after Table 2.2), it is proposed to rely on the WQOs for definition of the relevant values for Port Kembla Harbour (as defined in Figure 2.1) and to rely on the ANZG 2018 Water Quality Guidelines for Default Guideline Values (DGV's) for the Levels of Species Protection (LOSP) summarised in Table 2.1.

Table 2.2 Relevant water quality criteria

Water quality parameter		DGV's (ANZG 2018)[2], [3]		NSW water quality objective
Aquatic ecosystems				
Biological				
Frequency of algal blooms		Not listed		No change from natural conditions
Bioaccumulation of contaminants		Not listed		No change from natural conditions
Physico-chemical and Nutrients				
Dissolved oxygen		90-110 % saturation		Not listed
pH		8.0-8.4		Not listed
Temperature		80th %ile of reference system*		Not listed
Turbidity		0.5-10 NTU		0.5-10 NTU
Total Nitrogen		120 µgN/L		<120 µg/L
Total Phosphorous		25 µgP/L		<25 µg/L
Chlorophyll-a		1 µg/L		Not listed
Toxicants				
	80% LOSP	90% LOSP	95% LOSP	
Ammonia (NH3)	1700 µg/L	1200 µg/L	910 µg/L	Not listed
Cyanide (CN)	14 µg/L	7 µg/L	4 µg/L	Not listed
Cadmium (Cd)	36 µg/L	14 µg/L	5.5 µg/L	Not listed
Chromium(VI) ($Cr6^{+}$)	85 µg/L	20 µg/L	4.4 µg/L	Not listed
Copper (Cu)	8 µg/L	3 µg/L	1.3 µg/L	<1.3 µg/L
Lead (Pb)	12 µg/L	6.6 µg/L	4.4 µg/L	<4.4 µg/L
Zinc (Zn)	43 µg/L	23 µg/L	8 µg/L	<15 µg/L
Mercury (Hg) (inorganic)	1.4 µg/L	0.7 µg/L	0.4 µg/L	Not listed
* Refer discussion of site specific temperature criteria below				

[2] Values, targets and actions in these guidelines are not mandatory, but support a nationally-agreed framework for water quality planning and management.
[3] DGVs for groundwater ecosystems have not been developed as part of the 2018 ANZG. It is noted that generally, the Water Quality Guidelines should apply to the quality of both surface water and of groundwater, since the community values which they protect relate to above-ground uses (e.g. irrigation, drinking water, farm animal or fish production and maintenance of aquatic ecosystems). The 2013 AG groundwater guidelines do not provide guideline values for toxicants in groundwaters, but rather provide guidance on how existing DGV's for other community values might be applied, or where new guideline values might need to be derived, in order to inform the setting of appropriate water quality objectives (ANZG, 2018).

Temperature

Whilst the ANZG 2018 have superseded the ANZECC guidelines, the fact sheets and guideline packages from Volume 2 of the ANZECC guidelines have been referenced for guidance in thermal trigger values (yet to be updated for currency in the ANZG, 2018). The ANZECC guidelines state that two approaches may be taken to derive the most appropriate trigger values for unnatural changes in temperature:

1. *For slightly to moderately disturbed ecosystems or important ecosystems, where appropriate reference system(s) is available, and there are sufficient resources to collect the necessary information for the reference system(s), the trigger values should be determined as follows:*
   hot water discharges should not be permitted to increase the temperature of the aquatic ecosystem above the 80^{th} percentile temperature value obtained from the seasonal distribution of temperature data from the reference system.
2. *For important waterbodies, and those in very poor condition, appropriate site-specific scientific studies should be undertaken, and the information from these studies should be used together with professional judgement and other relevant information, to derive the trigger values. Where local but higher-quality reference data are used, a less stringent cut off than the 20^{th} or 80^{th} percentile value may be used. The 20^{th} or 80^{th} percentile values, however, should be used as a target for site improvement.*

The guidelines recommend a two-step approach to assessment:

1. *Test the performance indicator (temperature) for the ecosystem against the low risk trigger value for that ecosystem type. The median maximum daily temperature should be used for comparison within slightly to moderately disturbed ecosystems.*
2. *If test values are within the $20–80^{th}$ percentile range, there is a low risk of adverse biological effects and the only further action required is regular monitoring of the key performance indicators and condition indicators. If after regular monitoring a 'low risk' outcome is consistently obtained, there is scope to refine the guideline trigger value. If the test values are outside the $20–80^{th}$ percentile range, there is a high risk of adverse biological effects, and management action should occur. This might involve further ecosystem-specific investigation.*

Based on long term seawater temperature measurements outside of the port, the ambient 20^{th} percentile, 50^{th} percentile (median) and 80^{th} percentile seawater temperatures are provided in Table 2.3.

Table 2.3 Ambient seawater temperature offshore of Port Kembla (Cardno, 2019)

Season	Seawater Temperature (°C)		
	20^{th} Percentile	Median	80^{th} Percentile
Summer	20.0	21.2	22.4
Autumn	19.2	20.5	21.8
Winter	15.6	16.6	17.4
Spring	16.4	17.5	18.7

Adopting the two-step approach to the assessment, as recommended by the ANZECC guidelines, first requires testing of the predicted and measured temperatures at the point of discharge to Allans Creek against the 80^{th} percentile temperatures to assess compliance with the low risk trigger values for slightly to moderately disturbed ecosystems.

Table 2.3 indicates that compliance would require the temperature increase at the edge of the nearfield mixing zone to be less than 0.8 (°C) to 1.3 (°C) depending on the season.

As part of investigations into an alternative salt water cooling system undertaken between 2006 and 2008, UNSW completed a study to assess ecological issues in relation to the proposed system and to identify a more suitable guideline trigger value for temperature impacts to Allans Creek and Port Kembla Harbour (CH2MHILL 2008, NSG 2006). The study concluded that ecologically important changes may occur if temperatures are elevated by more than 3˚C. A water temperature trigger value of 3˚C was adopted for the earlier assessment and is considered to be of more relevance to Allans Creek and the Inner Harbour than the default guideline value specified in the 2018 Water Quality Guidelines (ANZG, 2018).

Nevertheless, assessment of the proposed discharge stream associated with the project has also been compared to the 80^{th} percentile values as a target for site improvement.

2.4 Existing discharge concentration limits – EPL 6092

The operations associated with the 6BF will take place within one area within the larger PKSW site. EPL 6092 contains individual discharge concentration limits for 14 surface water locations within the PKSW site. Monitoring conditions specified in the EPL include monitoring parameters, locations, frequencies as well as discharge limits relating to the 50th, 90th and 100th percentile concentrations for each discharge point.

The licence discharge points which will receive flows from the 6BF drain are the No. 2 Blower Station Drain (Point 79) and the Ironmaking East Drain (IMED) (Point 89). During normal operation, water received at the IMED is pumped to the No. 2 Blower Station Drain and therefore, there is no discharge at the licenced discharge point, Point 89. During periods of heavy rainfall, the IMED may overflow into the harbour at the licensed discharge point. The EPL also requires sampling at Point 89 if there is a discharge to the harbour during dry weather conditions. The No. 2 Blower Station Drain is sampled every 8 days as required by the EPL.

Pollutant concentration limits of these drains are specified in Table 2.4 and Table 2.5.

Table 2.4 EPL licence limits – Point 79 No. 2 Blower Station Drain

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	100 percentile concentration limit
Ammonia (Dry)	mg/L	n/a	1.5	5
Ammonia (Wet)	mg/L	n/a	n/a	5
BOD (Dry)	mg/L	5	10	20
BOD (Wet)	mg/L	n/a	n/a	20
Cadmium (Dry)	mg/L	0.01	0.02	0.06
Cadmium (Wet)	mg/L	n/a	n/a	0.06
Cyanide (Dry)	mg/L	n/a	0.05	0.3
Cyanide(Wet)	mg/L	n/a	n/a	0.3
Filtrable iron (Dry)	mg/L	n/a	0.1	0.3
Filtrable iron (Wet)	mg/L	n/a	n/a	0.3
Lead (Dry)	mg/L	n/a	0.05	0.1
Lead (Wet)	mg/L	n/a	n/a	0.1
Oil and grease (Dry)	mg/L	n/a	10	20
Oil and grease (Wet)	mg/L	n/a	n/a	50
pH (Dry)	pH	n/a	n/a	6.5-9.0
pH (Wet)	pH	n/a	n/a	6.5-9.0
Temperature (Dry)	degrees Celsius	n/a	35	40
Temperature (Wet)	degrees Celsius	n/a	n/a	40
Total iron (Dry)	mg/L	n/a	1	3
Total iron (Wet)	mg/L	n/a	n/a	50
Total zinc (Dry)	mg/L	n/a	1	3
Total zinc (Wet)	mg/L	n/a	n/a	3
TSS (Dry)	mg/L	n/a	30	50
TSS (Wet)	mg/L	n/a	n/a	500

Table 2.5 EPL licence limits – Point 89 Ironmaking East Drain

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	100 percentile concentration limit
Ammonia (Dry)	mg/L	3	5	7
Ammonia (Wet)	mg/L	n/a	n/a	7
Arsenic	µg/L			50
Cadmium (Dry)	mg/L	0.01	0.02	0.05
Cadmium (Wet)	mg/L	n/a	n/a	0.05
Chromium (total)	µg/L			350
Copper	mg/L			1
Cyanide (Dry)	mg/L	0.08	0.15	0.2
Cyanide (Wet)	mg/L	n/a	n/a	0.2
Filtrable iron (Dry)	mg/L	n/a	0.1	0.5
Filtrable iron (Wet)	mg/L	n/a	n/a	0.5
Flouride (Dry)	mg/L			50
Flouride (Wet)	mg/L			50
Lead (Dry)	mg/L	0.05	0.1	0.2
Lead (Wet)	mg/L	n/a	n/a	0.2
Mercury (Dry)	µg/L			3
Mercury (Wet)	µg/L			3
Oil and grease (Dry)	mg/L	n/a	10	20
Oil and grease (Wet)	mg/L	n/a	n/a	20
pH (Dry)	pH	n/a	n/a	6.5-9.0
pH (Wet)	pH	n/a	n/a	6.5-9.0
Selenium	µg/L			20
Temperature (Dry)	degrees Celsius	n/a	40	45
Temperature (Wet)	degrees Celsius	n/a	n/a	45
Total iron (Dry)	mg/L	n/a	3	7
Total iron (Wet)	mg/L	n/a	n/a	20
Total zinc (Dry)	mg/L	n/a	1	3
Total zinc (Wet)	mg/L	n/a	n/a	3
TSS (Dry)	mg/L	n/a	30	100
TSS (Wet)	mg/L	n/a	n/a	200

2.5 EPA advice regarding mixing zones

When considering the assessment criteria outlined in Section 2.3, it is important to note the point at which the limits are intended to be applied. Advice on this issue was provided by the EPA in relation to the 2018 EIS for the Port Kembla Gas Terminal, which stated that:

> *"the EPA's policy is that the WQOs should be met at the edge of the area where initial mixing occurs or "near-field" mixing. 'Near Field' relates to initial mixing where the initial characteristics of momentum flux, buoyancy flux and outfall geometry influence the plume trajectory and mixing. Mixing that occurs through buoyant spreading motion and passive diffusion due to ambient turbulence is referred to as 'Far Field' mixing. Mixing zones should not receive concentrations of pollutants that cause acute toxic impacts meaning that acute impacts should be assessed at end-of -pipe." (EPA, 2018)*

When considering mixing zones and the potential impacts within a mixing area, the EPA recommended several principles be adopted, including:

1. *The area or volume of an individual zone or group of zones should be limited to an area or volume as small as practicable that will not interfere with the designated uses or with the established community of aquatic life of the receiving waters.*
2. *The shape of the mixing zone should be a simple configuration that is easy to locate in the body of water and avoids impingement on biologically important areas.*
3. *Shore hugging plumes should be avoided.*
4. *The mixing zone should avoid impinging on sensitive biological features.*
5. *Impacts within mixing zones should be reversible.*
6. *Mixing zones should not be used for chemicals which bioaccumulate.*
7. *Mixing zones should not be used to manage the biostimulant impacts of nutrients, since the stimulation of algae (e.g. phytoplankton) may occur at considerable distances away from the nutrient source and is mediated by the biological characteristics of the waterbody as a whole.*
8. *Mixing zones should not receive concentrations of pollutants that cause acute toxic impacts. (EPA, 2018).*

This advice has been considered in the water quality impact assessment outlined in Section 5.

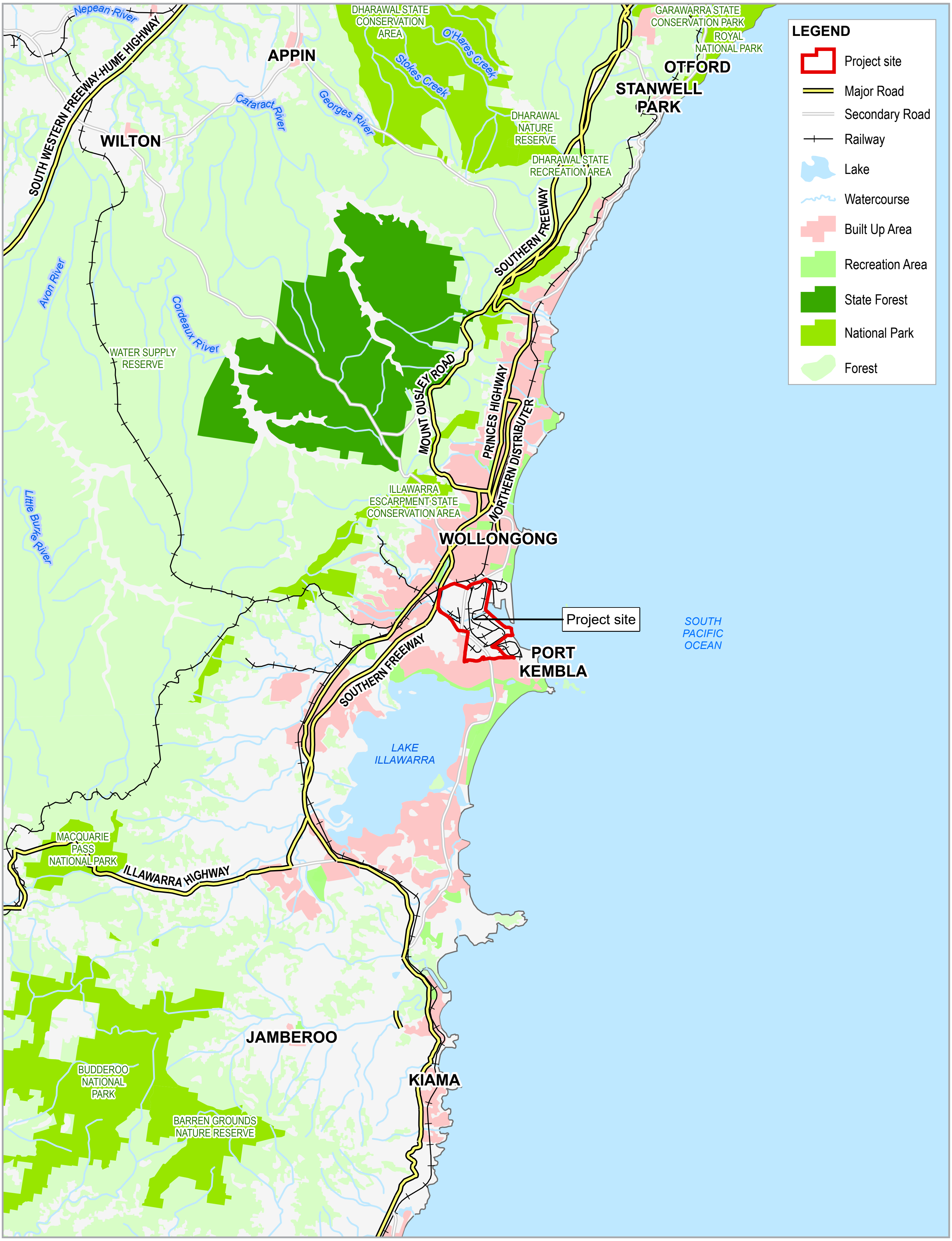
3. Existing environment

3.1 Project location

PKSW is located within an industrial site of approximately 750 hectares in the Wollongong Local Government Area (LGA), approximately 80 kms from Sydney and 2.5 kms from the City of Wollongong. Refer to Figure 3.1.

The PKSW site comprises the No.1 Works, No.2 Works, Steelhaven and the Recycling area as shown in Figure 3.2. The No.2 Works is divided into two sections by Allans Creek. The southern half of the No.2 Works comprises the Cokemaking, Ironmaking and Steelmaking facilities, while the northern half contains the Recycling Area and the Rolling Mills section. All sectors of PKSW are internally linked by road and rail and are currently supplied with electricity, water and gas services.

The land to which this project applies, including all connecting infrastructure and materials handling elements that require upgrades as part of the project, is within the southern section of the No.2 Works, and part of the Ironmaking facilities, which is located within Lot 1 DP 606434. Ancillary construction facilities will also be required and will be located within the wider PKSW site as shown in Figure 3.3. Key project features relating to water quality are presented in Figure 3.4.



Paper Size ISO A4

0 1.5 3 4.5 6

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Water Quality Impact Assessment

Regional Location

Project No. 12541101
Revision No. 0
Date 25/11/2021

FIGURE 3-1

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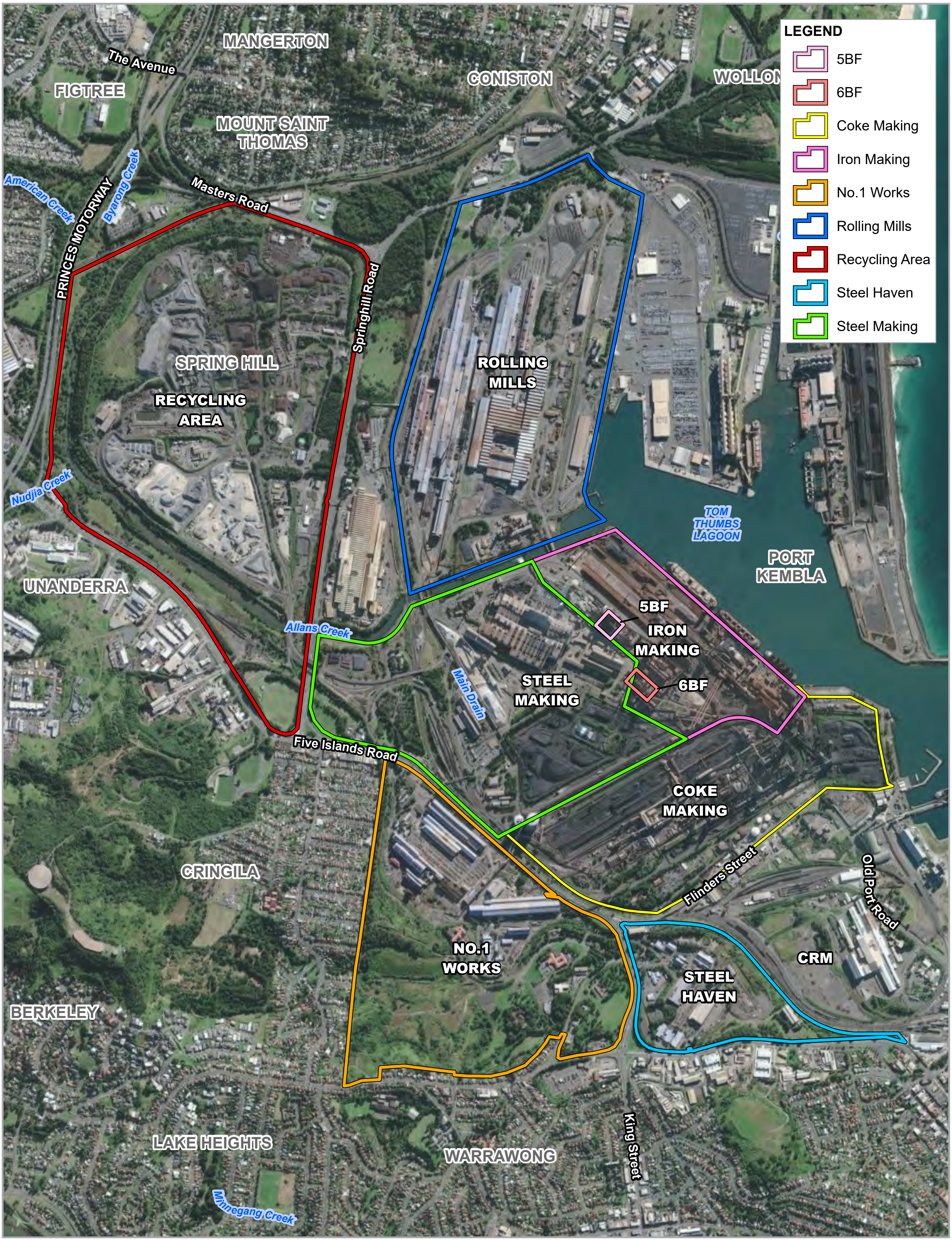

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Water Quality Impact Assessment

Port Kembla Steelworks site layout and locality

Project No. 12541101
Revision No. 0
Date 25/11/2021

FIGURE 3-2

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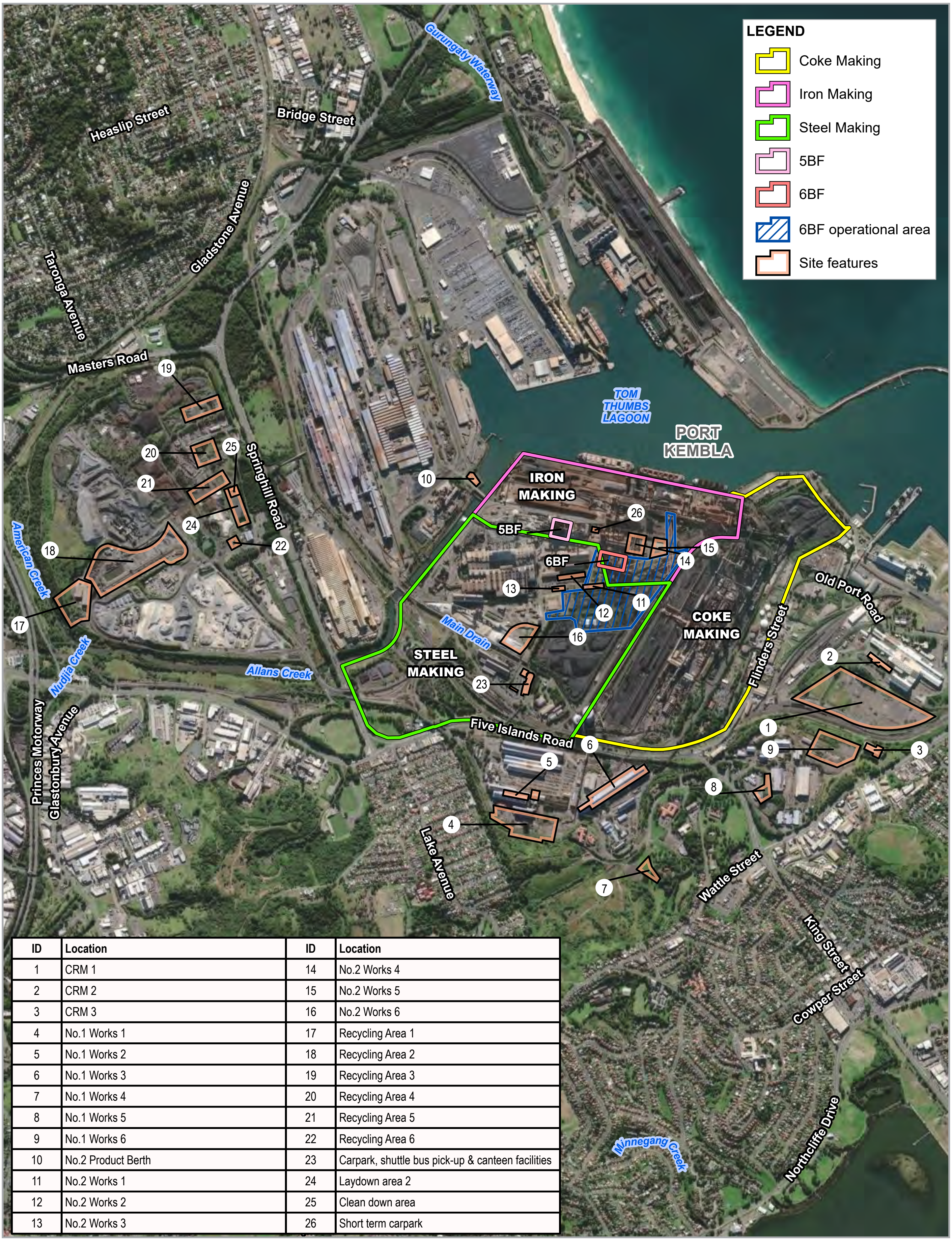

ID	Location	ID	Location
1	CRM 1	14	No.2 Works 4
2	CRM 2	15	No.2 Works 5
3	CRM 3	16	No.2 Works 6
4	No.1 Works 1	17	Recycling Area 1
5	No.1 Works 2	18	Recycling Area 2
6	No.1 Works 3	19	Recycling Area 3
7	No.1 Works 4	20	Recycling Area 4
8	No.1 Works 5	21	Recycling Area 5
9	No.1 Works 6	22	Recycling Area 6
10	No.2 Product Berth	23	Carpark, shuttle bus pick-up & canteen facilities
11	No.2 Works 1	24	Laydown area 2
12	No.2 Works 2	25	Clean down area
13	No.2 Works 3	26	Short term carpark

Paper Size ISO A4

0 0.2 0.4 0.6 0.8 1

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Water Quality Impact Assessment

Key project features

Project No. 12541101
Revision No. 0
Date 25/11/2021

FIGURE 3-3

G:\22\12541101\GIS\Maps\WQIA_0.aprx\12541101_WQ003_KeyFeatures_0
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Data source: LPI: DTDB/DCDB, 2017. World Imagery: Maxar.
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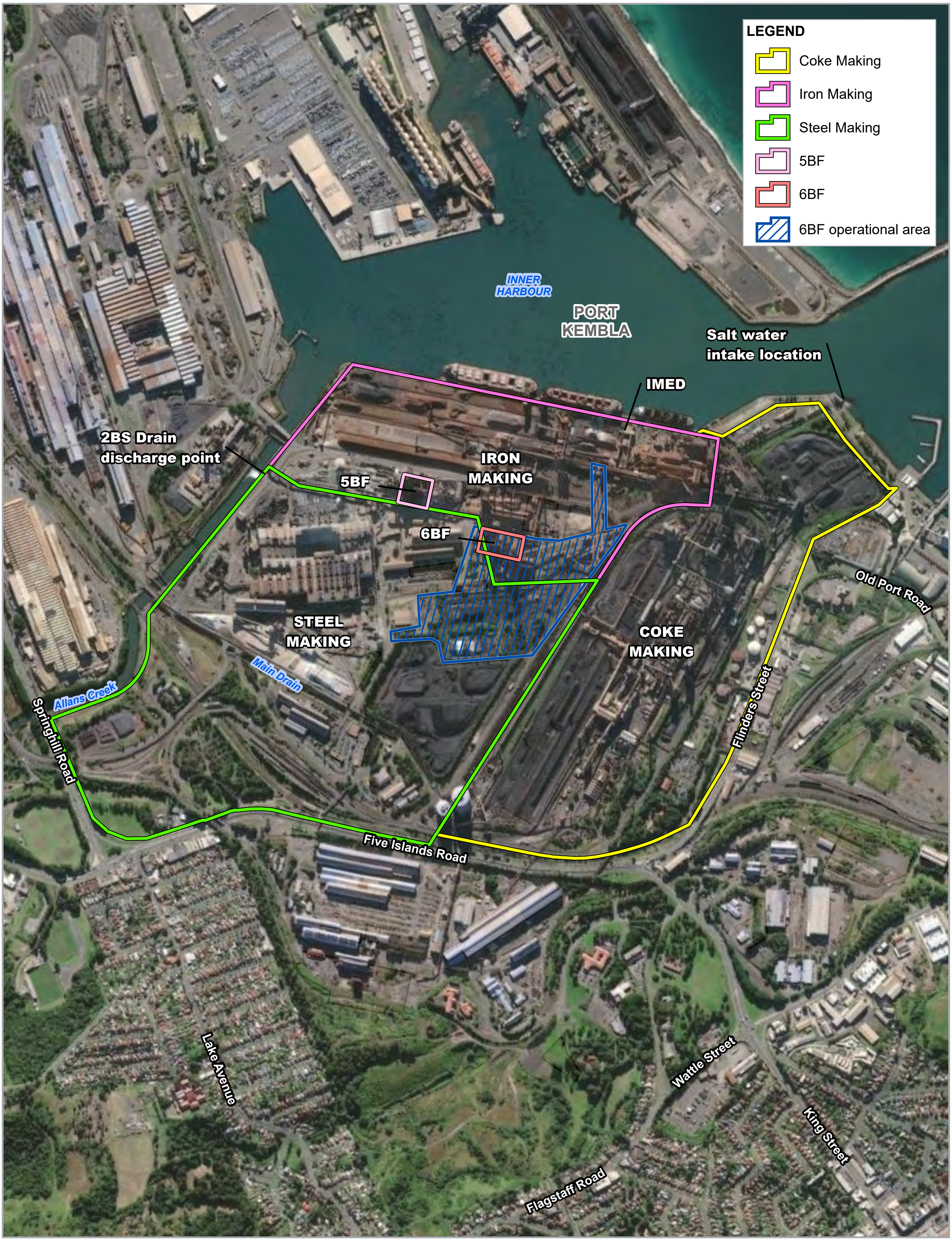

Paper Size ISO A4

0 100 200 300 400 500 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

BlueScope Steel Ltd
No.6 Blast Furnace Reline and Operations
Water Quality Impact Assessment

Key project features relating to water quality

Project No. 12541101
Revision No. 0
Date 25/11/2021

FIGURE 3-4

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Data source: LPI: DTDB/DCDB, 2017. World Imagery: Maxar. Created by: tmorton

3.2 Land use

The PKSW site is zoned IN3 – Heavy Industrial under *State Environmental Planning Policy (Three Ports) 2013* (Three Ports SEPP). PKSW and the adjacent Springhill Works together comprise the largest site in the Port Kembla industrial area, occupying approximately 750 ha and are mostly built around the western and northern side of Port Kembla's Inner Harbour. The PKSW site is a multi-use industrial area which includes storage, manufacturing, port berths, private internal roads and offices. Access to PKSW is provided by Springhill Road, Five Islands Road, Flinders Street, and Christy Drive, and private internal roads within PKSW.

The port of Port Kembla is located between the Pacific Ocean and the Port Kembla heavy industrial area and is zoned SP1 – Special Activities. The Inner Harbour, specifically developed as an all-weather shipping port, covers approximately 60 ha with around 2,900 m of commercial shipping berths. BlueScope operates five berths in the Inner Harbour that supply materials for PKSW.

More broadly, NSW Ports and the Port Authority of NSW manage the development and operation of the Port. Adjacent berths and trade types are shown in Figure 3.5 and summarised below (NSW Ports, 2021):

– Australian Amalgamated Terminals (AAT) manage Berths 103, 105, 106 and 107 located within the north portion of the Inner Harbour. The terminal is designed as a multi-purpose facility, handling motor vehicles and general cargo.
– Graincorp and Quattro Ports operate grain handling facilities through Berth 104 and Berth 103 respectively, which are located within the northern portion of the Inner Harbour. Berth 104 is a common user berth operated by NSW Ports and includes a bulk liquid facility, which handles a range of liquid products including chemicals and oils.
– Port Kembla Coal Terminal (PKCT) operates a coal exporting facility from Berth 102 located on the eastern shoreline of the Inner Harbour.
– Australian Industrial Energy has signed a long-term lease for Berth 101 and is proposing to develop a gas import terminal on the eastern shoreline of the Inner Harbour.

Figure 3.5 Map of surrounding port users (modified from NSWPorts, 2020)

3.3 Existing No. 5 Blast Furnace operations and drainage network

Ironmaking at PKSW is conducted via a thermochemical process of reduction of iron ore within the blast furnace. In general, iron ore, coke and other raw materials are charged into the blast furnace for smelting and a mixture of elemental iron (Fe), slag (mineral by-products), and Blast Furnace Gas (BFG) is generated from the blast furnace. Number 5 Blast Furnace (5BF) is the furnace currently in operation at PKSW.

Fine iron ore particles and other materials are first processed in the Sinter Plant to provide a permeable blend of raw materials for the smelting process. Following the smelting process, molten iron is cast via tapholes located near the base of the blast furnace into waiting rail-mounted torpedo ladles. The ladles transport the molten iron to other plants within PKSW for processing into steel.

The major by-products from the blast furnace operation are BFG and slag. Both of these by-products require the use and management of water. The hot gases leaving the top of the blast furnace are cooled and cleaned then piped through the interworks blast furnace gas main to other plants within PKSW for use as an energy source to the maximum practical extent. The molten slag stream is exposed to a continuous stream of high pressure water to generate slag sand, whilst the water is collected, cooled and reused in a closed loop system.

Further details regarding key elements of the existing 5BF operations relating to water quality are provided in Sections 3.3.1 to 3.3.4.

3.3.1 Existing 5BF gas cleaning

Condensate that is generated in the gas main is collected in seal pots. All the BFG condensate is collected and returned to the effluent treatment system via a series of collection tanks and pumps.

A wet scrubber is used to cool and clean the BFG exiting the top of the furnace. The resulting scrubber water reports to an effluent treatment system, where it is treated and cooled so it may be reused for further gas cleaning. A portion of the treated water is ‘blowndown’ (discharged) at a rate of 30 – 45 m^3/hr into the Outlet Channel (as shown in Figure 3.7) where it combines with approximately 26,000 m^3/hr of salt water used for cooling in other plant areas and discharges into Allans Creek and the Inner Harbour via the No. 2 Blower Station Drain. Flocculant and coagulant are added to the effluent treatment system to assist with the settling of solids in the clarifier (part of the effluent treatment system) and prevent excessive scaling. The slurry formed in the clarifier is sent via pipework for dewatering at the sinter plant, with recovered water returned to the effluent treatment system and the remaining solids transported to the PKSW Recycling Area.

During abnormal furnace operation, the chemical composition of the water may vary; in this circumstance, the blowdown water from the effluent treatment system is diverted to contingency storage to prevent release to the environment; it is then stored until such time as the quality of the water is confirmed to be acceptable for discharge in accordance with EPL 6092.

3.3.2 Existing 5BF cooling systems

The furnace cooling systems are all a fully closed loop design with heat exchangers. The closed loop design is a safety feature of the blast furnace allowing high accuracy leak detection and has the added benefit of minimising water loss. An evaporative cooling tower provides the heat sink for the closed loop cooling systems at 5BF. The cooling tower requires fresh water to replenish water lost through evaporation, and chemical treatment to comply with statutory requirements. A blowdown stream is recycled through the effluent treatment system.

Salt water sourced from the Outer Harbour is used for once-through cooling of the heat exchangers at the 5BF effluent treatment system and is subsequently discharged to Allans Creek and the Inner Harbour via No. 2 Blower Station Drain. Stormwater drains at 5BF discharge directly to the No. 2 Blower Station Drain or to the No.5 Blast Furnace Drain, both of which report to the Inner Harbour via Allans Creek.

A catchment map is presented in Figure 3.7 and schematic drawing showing inputs to the No. 2 Blower Station Drain, including from 5BF, is shown in Figure 3.8.

3.3.3 Existing 5BF slag granulation

Slag produced by the blast furnace is either formed into rock or granulated slag for sale as construction materials. Granulated slag is formed by subjecting the molten slag stream to a continuous stream of high pressure water. The water used for granulation is collected, cooled and reused in a closed loop system.

3.3.4 Existing 5BF stormwater drainage

Stormwater drains at 5BF discharge directly to the No.2 Blower Station Drain or to the No.5 Blast Furnace Drain, both of which report to the Inner Harbour via Allans Creek. EPL 6092 contains individual discharge concentration limits for 14 surface water locations within the PKSW site, 12 of which relate to water quality within the drainage network. The location of the water quality monitoring points identified in the licence are shown in Figure 3.6. Monitoring conditions specified in EPL 6092 include monitoring parameters, locations, frequencies as well as discharge limits relating to the 50th, 90th and 100th percentile concentrations for each discharge point as described in Section 5.

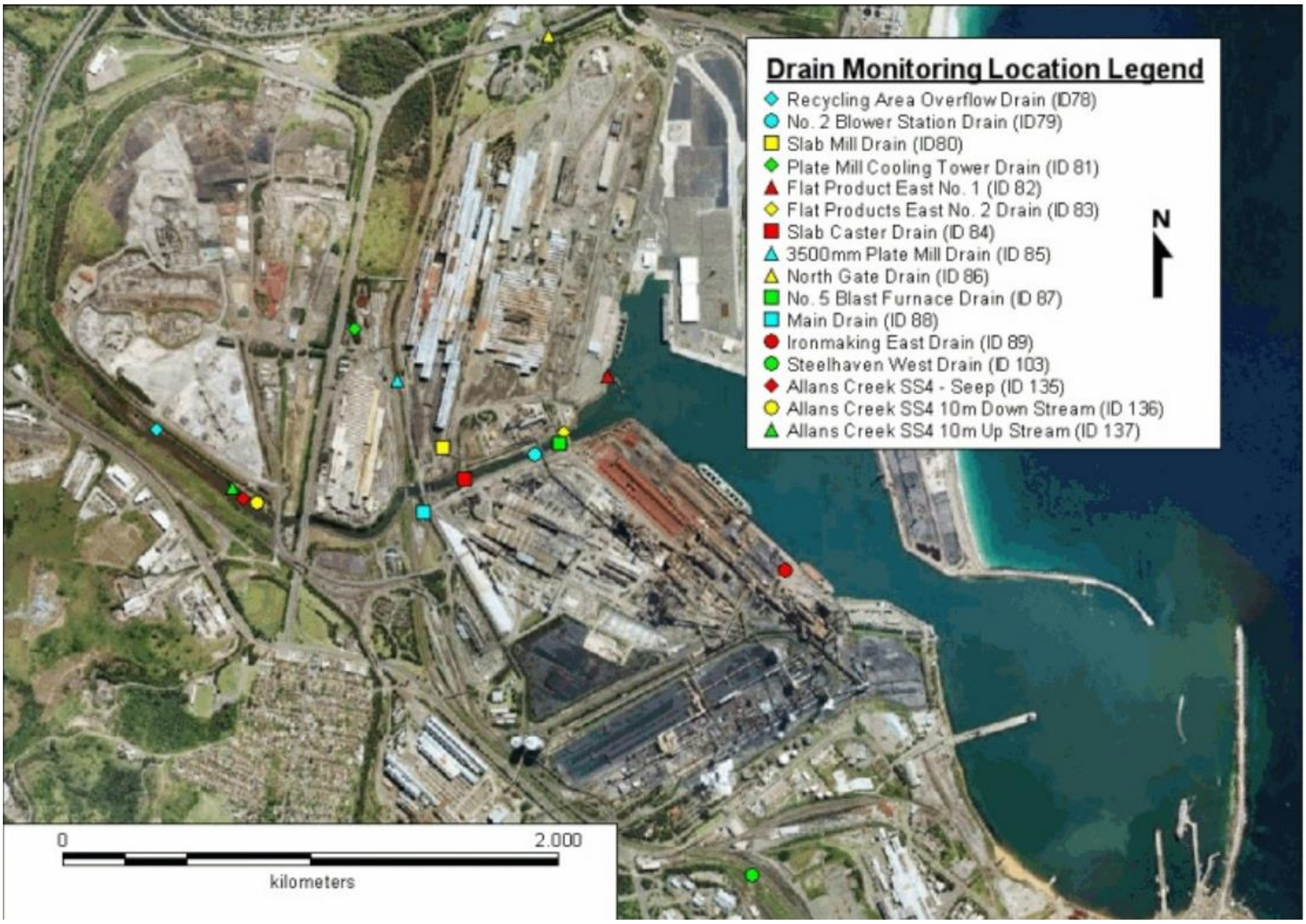

Figure 3.6 Water quality monitoring locations (including EPL identification numbers)

	Cokemaking Catchment Area
	Ore Preparation Catchment Area
	Blower Station Catchment Area
	5BF Catchment Area
	BOS/ASMS Catchment Area

Figure 3.7 ***Drain catchment map***

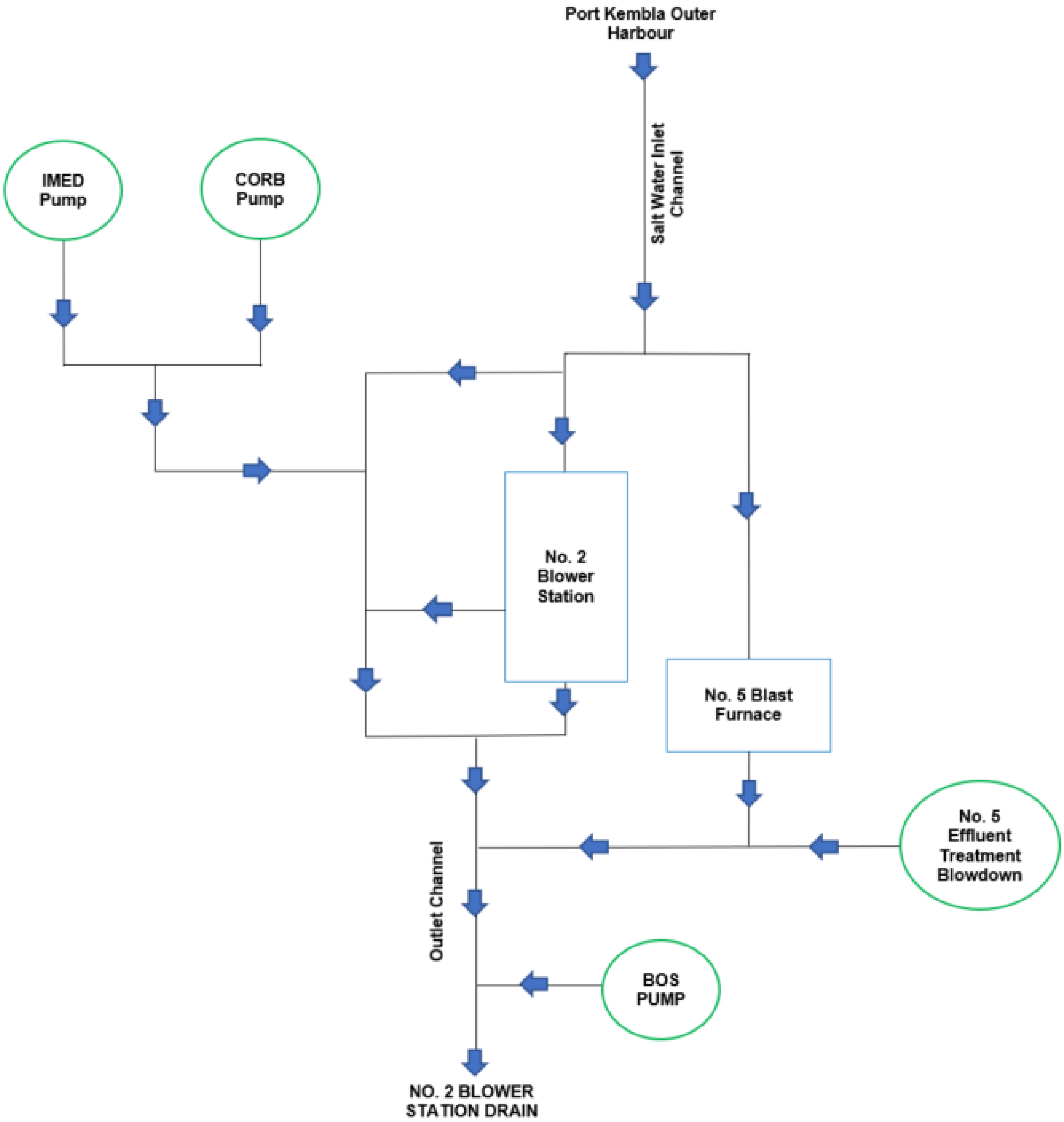

Figure 3.8 Schematic drawing of current 2BS Drain inputs

3.4 Contamination overview

A search of contaminated land records of notices and records of sites notified to the Environment Protection Authority (EPA) was conducted on 24 March 2021. The PKSW site is listed as a contaminated site by the EPA. The site has had four notices issued to it, the last being in March 2018, which was a notification to cease the Voluntary Management Plan for the site on the basis that regulation of the site under the *Contaminated Land Management Act 1997* (CLM Act) is no longer warranted. Ongoing management of site contamination occurs under EPL 6092.

Previous investigations undertaken at the project site (Egis, 2001; GHD, 2004; GHD, 2009; JBS&G, 2016) have identified potentially contaminated areas and Contaminants of Potential Concern (COPC) within the project site. The 6BF area was identified as a moderate contamination risk for heavy metals, total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene and xylenes (BTEX), polyaromatic hydrocarbons (PAHs), and volatile organic compounds (VOCs).

JBS&G (2016) found areas of hydrocarbon contamination in soils around the Sinter Plant and Cokemaking area, approximately 250 metres to the east and south of the project site, respectively. Elevated levels of heavy metals, benzene, ammonia and fluoride were also found in soils in these areas.

Elevated concentrations of heavy metals, TPH, PAHs, VOCs, cyanide, ammonia, nitrate, nitrogen and fluoride have been found within groundwater across the PKSW site (JBS&G, 2016; Senversa, 2019). Additionally, the hydrocarbon contamination at the Sinter Plant, Cokemaking and Gas Processing area has resulted in associated groundwater impacts, with a light non-aqueous phase liquid (LNAPL) plume identified in each of these areas (JBS&G, 2016; Senversa, 2019). BlueScope undertakes regular monitoring and remediation of this known contamination and provides annual reporting to the EPA.

Further discussion regarding levels of contaminants within groundwater and surface waters is provided in Section 3.4 and Section 3.5 and Section 3.6.

3.5 Groundwater

A Conceptual Site Model of groundwater at PKSW was developed in 2004 and refined in 2009 (GHD, 2009). This Conceptual Site Model was used as the basis for development of later targeted groundwater investigations (JBS&G 2016). The site's aquifer system can be summarised as comprising two primary aquifers overlying bedrock:

– A combined fill / shallow estuarine aquifer (the estuarine component of which comprises mostly sands and silts), underlain by;
– A deeper estuarine aquifer (predominantly comprising estuarine clays and muds) (JBS&G 2016).

Groundwater recharge predominantly occurs from rainfall infiltration and infiltration of water used for operational purposes, including dust suppression water (used primarily on raw materials stockpiles) and drainage waters. Groundwater recharge may also occur via the deeper (bedrock) aquifers (GHD, 2009).

Groundwater flow at the site generally trends in an easterly direction toward the inner harbour. However, topography, subsurface geology, and unlined surface water drainage channels result in localised variations to this trend, particularly along the perimeter of the site and adjacent to Allans Creek. The central portions of the site, characterized by extensive deposits of graded fill and deeper clay deposits, exhibit much flatter and more uniform hydraulic gradients (GHD, 2004).

BlueScope undertakes a groundwater monitoring program in line with condition E3.1 of EPL 6092 *Contamination Monitoring and Assessment Program*. This condition requires BlueScope to assess groundwater monitoring results against relevant criteria, assess for changes against historical results and evaluate the effectiveness of the monitoring well network. Wells which contain COPC are monitored annually while other wells are monitored less frequently. Monitoring is undertaken to inform assessment of the following:

– The nature and extent of groundwater contamination across PKSW.
– The direction of groundwater movement.
– The potential risks posed by the contamination to sensitive receiving environments.
– Changes in groundwater contaminant concentration over time.
– Surface water contaminant concentrations within Allans Creek to assess the potential for groundwater contamination to impact adjacent waterways.

Targeted groundwater investigations were undertaken in the vicinity of 6BF during 2016. These investigations defined COPC within PKSW groundwater as heavy metals, TPH/BTEX, PAHs, VOCs, OCPs, phenols, PCB's, ammonia, benzene, cyanide, fluoride. Within the BF6 area, COPC were limited to heavy metals, TPH/BTEX, PAHs, VOCs (JBS&G 2016).

Two wells, G24 and NT-MW09, are located within the 6BF project area to the east and west of the slag handling area. Testing in 2016 revealed exceedances of groundwater assessment criteria for manganese, cyanide, ammonia and nitrogen (JBS&G 2016).

Locations of groundwater monitoring wells are presented in Figure 3.9.

Figure 3.9 Groundwater sampling locations (modified from JBS&G, 2016)

3.6 Receiving environment

The PKSW site is generally flat and resides upon a base of artificial fill, including dredged sand and mud, rocks and local soil materials. The site is generally sealed, with small areas of exposed soil. Soils on site are classified as disturbed terrain, have a low probability of acid sulphate soils, and are generally susceptible to erosion, subsidence and lack permeability. The PKSW site is listed as a contaminated site on the EPA's register of contaminated sites, with contamination managed and regulated under licence conditions attached to BlueScope's EPL 6092. The site drains into two creeks, Main Drain and Allans Creek, which run into Tom Thumb Lagoon and Port Kembla Inner Harbour.

Allans Creek is a heavily modified waterway measuring approximately 30 m to 35 m in width with less than two metres of water depth at lowest astronomical tide in the vicinity of PKSW (Australian Hydrographic Service Chart AUS194). Allans Creek is the predominant source of freshwater inflow into Port Kembla Harbour and is subject to elevated temperature industrial discharges. Previous numerical modelling undertaken on behalf of BlueScope indicated that cooling water processes and recirculation are primarily controlled by harbour flushing, with notable differences at each level in the water column. The modelling revealed that wind and tidal influences play a significant role in the rate at which cooling waters discharged to Allans Creek are conveyed to the Inner Harbour (Cardno, 2006).

As a result, water temperatures within the Inner Harbour are generally one to two degrees warmer than sea temperatures beyond the entrance to the harbour.

Detailed studies into the ecology of Allans Creek and the Inner Harbour were undertaken as part of BlueScope's investigations into a once-through seawater cooling system (NSG, 2006). Key findings were summarised as follows (CH2M HILL, 2008):

– The Inner Harbour of Port Kembla is indicative of a stressful environment.
– Many species present in the Outer Harbour are not found within the Inner Harbour.
– Sessile invertebrate assemblages of Port Kembla demonstrated smaller numbers and varieties of sponges and ascidians than in slightly to moderately disturbed systems.
– Species more often associated with tropical waters are found in the Inner Harbour, possibly due to the warm cooling water.
– Fish assemblages resemble other estuaries within NSW.

A follow up study was completed in June 2012 as part of PRP 146: Assessment of the ecological condition of Port Kembla (UNSW, 2012). The objective of the study was to describe ecological communities and contaminant concentrations at multiple study locations in Port Kembla for comparison with study locations from reference estuaries and creeks. Key findings of the ecological health report cards for Port Kembla and Allans Creek are summarised in Table 3.1 and Table 3.2 respectively.

Table 3.1 Summary of Port Kembla ecological health report card findings (modified from UNSW, 2012)

Ecological community	Summary of historical results
Benthic larval fish	Communities are different, but no evidence of reduced ecological condition
Benthic and pelagic adult fish	Communities do not differ in composition or diversity measures
Planktonic larval fish	Communities may differ and evidence of reduced ecological condition
Epibiota	Communities are different, but no evidence of reduced ecological condition
Infauna	Communities may differ and evidence of improved ecological condition
Phytoplankton and microphytobenthos	Communities may differ and evidence of reduced ecological condition

Table 3.2 Summary of Allans Creek ecological health report card findings (modified from UNSW, 2012)

Ecological community	Summary of historical results
Epibiota	Communities are different, but no evidence of reduced ecological condition
Infauna	Communities do not differ in composition or diversity measures
Phytoplankton and microphytobenthos	Communities may differ and evidence of reduced ecological condition

The project site drains into the IMED which is pumped to the No. 2 Blower Station Drain and discharged to Allans Creek, before draining into the Inner Harbour. Allans Creek is classed as Good Freshwater Fish Community Status and Allans Creek and the Inner Harbour (former areas of Tom Thumb Lagoon) are key fish habitats (DPI, 2016). As a result, both are considered sensitive receiving environments and consideration has been given to strategies to avoid or minimise impacts to these waterways.

3.7 Water quality within Port Kembla

Water quality within Allans Creek and the Inner and Outer Harbours of Port Kembla has been historically impacted by urban and industrial discharges as well as ongoing port activities. These past activities led to contamination of marine sediments, groundwater and harbour waters.

Water quality monitoring studies have been previously undertaken to define ambient water quality within the port and to monitor water quality parameters during previous dredging campaigns. Key water quality monitoring programs undertaken within the Inner Harbour and Outer Harbour of Port Kembla since 2002 are summarised below:

- Monitoring and Assessing the Water and Sediment Quality of Port Kembla Harbour According to the ANZECC & ARMCANZ (2000) Guidelines undertaken by M. Phillips (2002).
- Port Kembla Harbour Water Quality Monitoring Program undertaken by the Port Kembla Harbour Environment Group[4] between 2002 and 2005.
- Berth 107 Dredging Water Quality Monitoring Program undertaken by Cleary Bros on behalf of Port Kembla Port Corporation between 2006 and 2008.
- Outer Harbour Tug Berth Dredging Water Quality Monitoring Program undertaken on behalf of Port Kembla Port Corporation in 2011.
- Outer Harbour Stage 1A Reclamation Water Quality Monitoring Program (including baseline and impact monitoring) undertaken on behalf of Port Kembla Port Corporation between 2011 and 2012.
- Maintenance Dredging Water Quality Monitoring Program undertaken by ENRS on behalf of NSW Ports in late 2014.
- Port Kembla Berth 103 Stage 2 Dredging and Spoil Disposal turbidity monitoring undertaken by Boskalis Australia 2015.
- AIE Port Kembla Gas Terminal Construction Water Quality Monitoring Program under EPL21529 June 2021 – September 2021 (ongoing at the time of issue of this report)

In many instances the historical laboratory Limits of Reporting (LOR) adopted during the previous studies listed above were greater than the assessment criteria, meaning that it was not possible to assess whether contaminant concentrations were above or below the current relevant criteria (GHD, 2018a). Consequently, the results of detailed analysis of the full data set may be misleading and would be considered of relatively little value. Nevertheless, it is possible to summarise the key issues relating to existing water quality within the port through review of these previous investigations which are summarised in Table 3.3.

The 2002-2005 monitoring program undertaken by the Port Kembla Harbour Environment Group is considered the most comprehensive study of ambient water quality conditions within the broader harbour. The program aimed to establish benchmarks to determine trends and future improvements in water quality and assess whether contaminant concentrations exceed the ANZECC / ARMCANZ Guidelines (2000). The program identified monitoring locations within the Inner and Outer Harbours of Port Kembla which have been subsequently adopted by a number of programs and are presented below in Figure 3.10.

Results of the 2002 – 2005 sampling were compared to relevant trigger values for the following analytes:

- Metals (Al, Cr, Mn, Fe, Ni, Cu, Zn, Sn, Pb, Cd, As, Se)
- Total Suspended Solids (TSS)
- Cyanide
- Ammonia
- Phenols

The most recent water quality monitoring data collected by AIE under EPL21529 between June and September 2021, shows that whilst background concentrations of aluminium, copper, lead and zinc have been recorded in excess of relevant DGV's in some instances, no exceedances have been recorded in relation to a number of traditional problematic contaminants such as cadmium, tin and arsenic.

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[4] The Port Kembla Harbour Environment Group (PKHEG) was formed in 1998 from the previous Port Kembla Harbour Catchment Management Committee as a forum for port stakeholders and community to work collaboratively towards a sustainable and healthy waterway and harbourside environment (NSW Ports, 2020).

Figure 3.10 ***Monitoring locations within the broader port***

Table 3.3 Historical water quality (GHD, 2018a)

Parameter	Summary of historical results
Contaminants	Water samples collected under ambient conditions during the 2002-2005 monitoring program undertaken by the Port Kembla Harbour Environment Group identified concentrations of aluminium, cadmium, copper, lead, zinc, tin and arsenic in excess of the 95% trigger values for protection of marine waters. Concentrations of all other analytes were below the adopted trigger values. Elevated levels of adverse water quality parameters were generally found in the vicinity of creeks and waterways that drain industrial and stockpile areas such as the entrance to Allans Creek (Site 1), Gurangaty Waterway (Site 5), near No. 1 Products Berth (Site 3), the Cut (Site 7) and Darcy Road Drain (Site 15).
Suspended Solids / Turbidity	Total Suspended Solids concentrations are known to be influenced by shipping movements and freshwater flood events. Long term data collected during the 2002-2005 monitoring program undertaken by the Port Kembla Harbour Environment Group measured average TSS concentrations of 5.9mg/L and 3.2mg/L within the Inner and Outer Harbours respectively. TSS concentrations within the Inner Harbour were shown to vary between 1.0mg/L and 17.9mg/L. TSS concentrations within the Outer Harbour were shown to vary between 0.5mg/L and 11.8mg/L. Previous dredging campaigns (Berth 103) established a relationship between Nephelometric Turbidity Units (NTU) and TSS of 1 NTU = 2mg/L TSS. It is critical to note that the relationship between NTU and TSS is highly dependent on the material properties of the sediments in suspension.
pH	Previous monitoring campaigns have recorded pH levels within the Inner and Outer Harbour ranging between 7.6 and 8.1, and in some instances below the recommended ANZECC criteria for harbour waters (8.0-8.5). Previous investigations concluded that pH levels are lower in the Inner Harbour than the Outer Harbour, indicating pH levels within the Inner Harbour are likely influenced by freshwater discharges from existing waterways.
Temperature	Water temperatures within Port Kembla are generally higher than those measured offshore due to tidal flushing patterns and existing industrial discharges to the Inner Harbour. As a result, water temperatures within the Inner Harbour are generally one to two degrees warmer than sea temperatures beyond the entrance to the harbour. The Outer Harbour benefits from greater tidal flushing and is generally less than 0.25 degrees warmer than sea temperatures beyond the entrance to the harbour.
Salinity	Total Dissolved Solids (TDS) concentrations assessed during the 2014 maintenance dredging campaign ranged from 31.15g/L to 35.38g/L. Concentrations have been shown to vary with depth indicating density stratification within the water column. Concentrations are also known to be influenced by freshwater flood events.

3.8 PKSW water quality Pollution Reduction Programs

BlueScope has completed 77 water related Pollution Reduction Programs (PRPs) since its initial engagement with the EPA in 1976. Key water programs completed by BlueScope relevant to the project include the following:

– PRP 54 – Blast Furnace Gas Cleaning Effluent
– PRP 96 – Toxicity Testing of No. 2 Blower Station Drain Water
– PRP 146 – Port Kembla Inner Harbour Flora and Fauna Study
– PRP 147 – Investigate Stormwater First Flush Impact
– PRP 175 – (Pollution Study) – Diversion of Iron Ore Road Drain
– PRP 176 – Ironmaking East Drain Drainage Diversion Project (Environmental Improvement Program)

Ongoing monitoring programs and PRPs relating to water quality risks associated with current and future blast furnace operation are summarised below:

– **PRP 181 – Seal Pot System Risk Assessment**
  - The aim of this PRP is to assess the environmental risk and the feasibility of mitigation works for seal pots across PKSW, and to implement a works program to install mitigation works at the premises.
– **PRP 182 – Wastewater Assessment Program for Number 2 Blower Station (2BS) Drain**
  - The aim of this PRP is to investigate and assess the pollutant discharges to the 2BS drain by identifying sources, quantifying pollutants, assessing against relevant, contemporary environmental criteria.
– **PRP 183 – Blast Furnace Gas Condensate Toxicity Assessment**
  - The aim of this PRP is to develop and implement a methodology to characterise the blast furnace gas condensate produced under a range of operating scenarios and assess the toxicity of the gas condensate.

In addition, an investigation into online treatment of blast furnace process water is currently underway at 5BF. Learnings from this investigation will be applied to 6BF operation.

PKSW operates under a Water Stewardship Plan (Plan) which sets out the catchment and site challenges at the PKSW site. The purpose of this Plan is to define key targets in relation to water management which will be reviewed regularly both internally and externally with key stakeholders. The Plan has been developed using the International Water Stewardship Standard as a basis and in collaboration with various stakeholder groups. As a Water Steward, BlueScope is committed to sustainable water management for the PKSW site, in addition to contributing to efforts within the catchment and region. The Plan identifies the site and catchment risks, key stakeholders and water-related environmental and social adverse impacts.

3.9 Existing site water balance

PKSW sources industrial and domestic water from Sydney Water, which is Australia's largest water utility provider and owned by the NSW Government. All water supplied by Sydney Water is from appropriately authorised sources. Approximately 600 m^3/d of potable water is used at PKSW.

PKSW uses industrial water in the steel manufacturing process, which is comprised of both recycled water and unfiltered Avon Dam water. Recycled water comprises over 85% of the current industrial water mixture and is sourced from the Wollongong Water Recycling Plant. The dual recycled / dam water supply provides the reliability required for the steel manufacturing process, and Sydney Water is able to adjust supply volumes to reflect PKSW's site needs. Domestic water is a less significant water input to PKSW, comprising less than 3% of the total industrial and domestic water consumption and is a minor component of the overall domestic water reticulation network across the Illawarra region.

Approximately 26,000 m^3/h of seawater from the Outer Harbour is used at PKSW for salt water cooling. This water is returned to the Inner Harbour after use.

A diagram of the existing site water balance is shown in Figure 3.11.

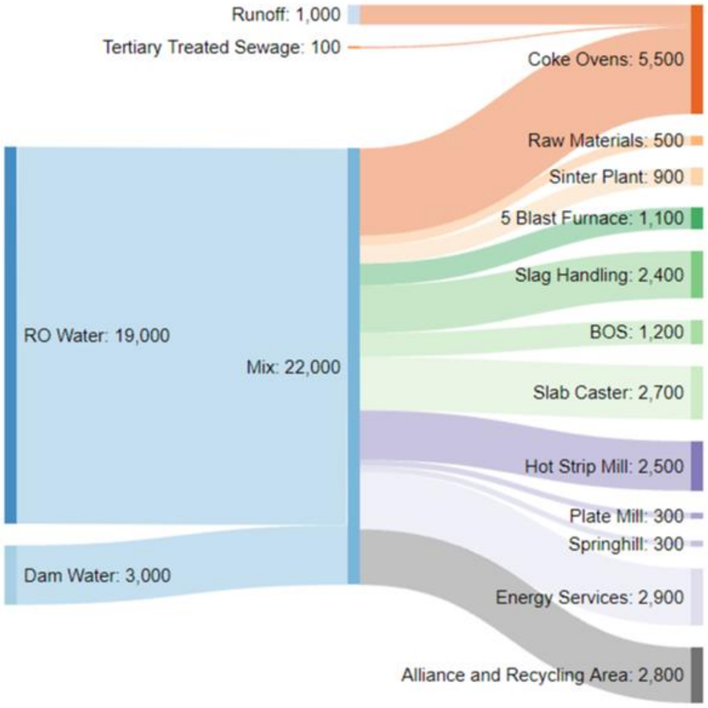

Figure 3.11 Existing site water balance at PKSW

4. Project description

4.1 Project Summary

To prepare 6BF to become operational again, major maintenance works are required as part of a reline process (the project).

The operation of 6BF following completion of reline activities, commissioning and ramp up will be generally the same as existing operations at 5BF. Specific locations of certain activities within the PKSW site will change due to the transfer of operations to 6BF. However, changes to the quantity or characteristics of water outputs from the blast furnace will be minimal.

Water uses and discharges from the blast furnace will be consistent with the quantity and quality of those at 5BF. Minor changes to cooling water discharges are expected due to the alternative cooling system associated with 6BF (refer Section 5.3). The stormwater drainage system proposed for the project will enable the capture and reuse of stormwater and containment of any spills, providing an improvement over the current stormwater management capabilities.

Table 4.1 provides a summary of the key elements of the project. Key features of the project are shown in Figure 3.3. Further details regarding the construction, commissioning, operations and decommissioning phases of the project are described in Sections 4.2 to 4.5.

Table 4.1 Project summary

Project element	Summary
6BF operational area and construction footprint location	Lot 1 DP 606434
Construction	Major construction work will be required within the blast furnace and surrounding facilities, and will involve removing the remaining burden materials, refractory bricks and blocks and staves within the interior of the blast furnace for replacement. Any required repairs or replacement of ancillary equipment or structures will also be carried out.
Access	The majority of the construction traffic will access the site via the major roads that service the Port Kembla industrial area, including the Princes Motorway and Princes Highway, Shellharbour Road, Springhill Road, Five Islands Road and Masters Road. No changes to existing access arrangements are proposed.
Ancillary construction facilities	Various locations within the PKSW site within Lot 1 DP 606434, Lot 1 DP 606432, Lot 1 DP 595307 and Lot 1 DP 606430.
Ironmaking components and systems	– Raw materials handling – Sinter Plant – PCI Plant – Blast furnace – Stockhouse and charging system – Blast furnace vessel – Cooling system – Casthouses – Hot blast system – Off gas system – Slag handling
Commissioning	Commissioning involves the following: – All services brought back into live condition – Various parts of plant re-heated – Pressure and leak tests conducted – Cooling systems filled and flushed – Furnace dried out and charged with kindling and burden material – Gas system purged and furnace ‘blown in’ – Furnace progressively heated until regular casting of iron and slag commences – Full production reached within one to two months

Project element	Summary
Operations	Operation of 6BF will be generally the same as existing operations utilised at 5BF (24-hour operation), including: – Processing and transport of raw materials (iron ore, coal, coke, fluxes). – Production of sinter (agglomeration of iron ore, coke and limestone dust) for use within the blast furnace. – Production of approximately 2.7 Mtpa of iron from 6BF. – Processing of approximately 0.88 Mtpa of blast furnace slag for use as construction product.
Construction work hours	Where practical, and subject to the final construction program, construction will be carried out during the following construction hours: – Monday to Friday: 7.00 am to 6.00 pm – Saturday: 7.00 am to 6.00 pm – Sundays and public holidays: no work A number of construction activities will be scheduled to be undertaken as night works. Final construction phase will require 24 hour construction (estimated to be a period of 5 months). Further, 24 hour construction may be required for an extended period if 6BF is required online earlier than 2026.
Construction duration	Approximately 3 years
Operational duration	Approximately 20 years

4.2 Construction overview

The reline and transition to operation of 6BF will be completed over a period of approximately three years which, assuming a construction start in 2023, would see construction completed in 2026. The actual construction start and completion dates will depend on the operational performance of the 5BF facility and its ability to complete its planned campaign life.

Construction will commence once all necessary approvals are obtained. Detailed construction planning, including timing, staging and work sequencing, will be confirmed once construction contractors have been engaged.

The construction information described in this chapter is preliminary and is based on the current stage of the design. It provides an indicative construction method that retains flexibility for the successful contractor to refine and optimise aspects of the approach. The construction methodology will be refined as the design progresses, and once the construction contractor is engaged. A final construction methodology and program will be developed by the construction contractor based on the conditions of approval and the mitigation and management measures provided in this document.

Major construction work will be required within the blast furnace and surrounding facilities and will involve:

– Removal of the remaining burden materials
– Removal of the iron skull
– Removal of worn carbon block refractories in the hearth
– Removal of worn refractories in the remainder of the vessel
– Demolition of other equipment including:
  - Cooling staves which protect the blast furnace shell
  - Hot blast main refractory lining, including the expansion joints
  - Clarifier tank and associated equipment where required
– Repairs to the blast furnace shell where required
– Installation of a new clarifier tank and associated equipment
– Installation of the new hearth, sidewall refractories and staves
– Repair/replacement of tuyeres, tapholes and instrumentation

– Repair, maintenance and/or upgrade of ancillary equipment including:
  - Furnace cooling systems
  - Hot blast system including the stoves
  - Gas system, with addition of a Top Gas Recovery Turbine (TRT)
  - Furnace top, including the charging equipment, bleeder valves and outrigger crane
  - Casthouse floors and associated equipment
  - Stockhouse (raw materials feed system)
  - Automation and power systems
  - Services
– Construction of a new primary ferrous feed system in the Raw Materials Handling area
– Civil works for the new slag handling area
– Installation of a new slag granulation system
– Commissioning and ramp up of 6BF operations

The overall construction program is anticipated to be around 3 years. An indicative construction timeline showing the duration of key activities is provided below in Table 4.2.

Table 4.2 Indicative works schedule

Project stage	Activities	Approximate duration
1	– Progress with refurbishment activities that do not require long-lead items. – Early works commence for enabling activities including cranes, lifts, casthouse roof replacement, drainage, construction facilities.	24 to 30 months
2	– Construction activities including demolition, civils, stockhouse, slag handling, hot blast system, gas system, cooling system, wreck out of furnace, furnace top. – Control system and automation upgrade.	24 months
3	– Construction activities including relining of furnace initiated with twelve months advance notice of end of 5BF operations. – Pre-commissioning and commissioning of 6BF.	12 months
4	– Managed transition of operations from 5BF to 6BF with ramp-down of 5BF followed by ramp-up production of 6BF. – 5BF decommissioned and made safe on ceasing operation.	6 – 8 weeks

4.2.1 Construction areas

Construction areas generally fall within two categories:

– Construction activities in the immediate vicinity of 6BF.
– Additional construction of ancillary facilities across the wider PKSW site comprising a mix of indoor and outdoor areas.

The delivery of materials and equipment to the work sites will be staged as required with minimal storage available in the area immediately adjacent to 6BF. Indicative laydown areas are shown on Figure 3.2.

The identified construction support facilities, car parks and laydown areas are on areas of the PKSW site that have been historically used for similar activities including during previous reline events and have existing stormwater controls. A summary of proposed laydown areas is provided in Table 4.3.

Table 4.3 Ancillary facilities

Location	Activity	Size (m^2)	Indoor/Outdoor
No.1 Works 1	Storage	28,500	Outdoor
No.1 Works 2	Storage	5,000	Indoor
No.1 Works 3	Storage	36,500	20,000 indoor 16,500 outdoor
No.1 Works 4	Storage	6,400	Outdoor
No.1 Works 5	Storage	4,000	500 indoor 3,500 outdoor
No.1 Works 6	Storage	17,000	Outdoor
CRM 1	Storage	80,000	Outdoor
CRM2	Storage	3,000	Indoor
CRM3	Storage	2,800	Indoor
No.2 Works 1	Construction	1,000	Outdoor
No.2 Works 2	Construction	3,000	Outdoor
No.2 Works 3	Construction	1,500	Outdoor
No.2 Works 4	Storage	3,000	Outdoor
No.2 Works 5	Storage	7,000	Outdoor
No.2 Works 6	Storage	7,000	Outdoor
No.2 Products Berth	Storage	2,500	Outdoor
Recycling Area 1	Storage / cleaning	14,000	3,000 indoor 11,000 outdoor
Recycling Area 2	Processing	88,000	Outdoor
Recycling Area 3	Processing	25,000	Outdoor
Recycling Area 4	Storage / Processing	11,000	Outdoor
Recycling Area 5	Storage / Processing	20,000	Outdoor
Recycling Area 6	Storage	4,500	Outdoor
Springhill Electrical	Storage	3,000	Indoor

4.3 Commissioning overview

Prior to operation, the project will undergo a period of commissioning which is a once off process that is necessary to allow operation of the blast furnace. It is anticipated the commissioning process will take several months to complete, after which the furnace will be gradually uprated over a period of approximately 6 weeks until full production is achieved.

The commissioning process is outlined as follows:

- All services brought back into live condition
- Various parts of plant reheated
- Pressure and leak tests conducted
- Cooling systems filled and flushed.

The furnace proper will be dried out using hot blast at limited temperatures, then charged with kindling (comprising firewood/railway sleepers and coke) and filled with a mix of burden material (coke and iron ore).

The gas systems will be purged ready for use and the furnace will be ‘blown in’. This involves the introduction of hot blast air through the tuyeres, with gas initially discharged until its composition is satisfactory for internal use, at which time the gas is then diverted into the gas cleaning system.

The furnace will be progressively heated until regular casting of iron and slag commences, although the iron quality is not usable initially, and it will take several days to produce useable iron which can be converted to steel.

The furnace will then be uprated to target production over the following weeks, reaching full production within one or two months.

4.4 Operational overview

Following the completion of reline activities, commissioning and ramp up, operation of 6BF will be the same as existing operations utilised at 5BF. Specific locations of certain activities within the PKSW site will be relocated due to the transfer of operations to 6BF. Changes to the quantity or characteristics of water outputs from the blast furnace will be minimal. Minor changes to cooling water discharges are expected due to the alternative cooling system associated with 6BF, and an improvement in stormwater management compared to existing operations will be realised.

The hot gases leaving the top of the blast furnace will be cooled and cleaned then piped through the gas main to other plants within PKSW for use as an energy source to the maximum practical extent. Condensate that is generated in the gas main will be collected in seal pots. All the condensate will be collected from the seal pots and returned to the effluent treatment system via a series of collection tanks and pumps. The design of the BFG seal pots proposed for the 6BF area are 'no-blow' seal pots which will reduce the risk of gas condensate overflows when compared to traditional seal pots.

4.4.1 Future site water balance

PKSW will continue to source industrial and domestic water from Sydney Water, which is Australia's largest water utility provider and owned by the NSW Government. All water supplied by Sydney Water is from appropriately authorised sources. A diagram of the future site water balance is shown in Figure 4.1.

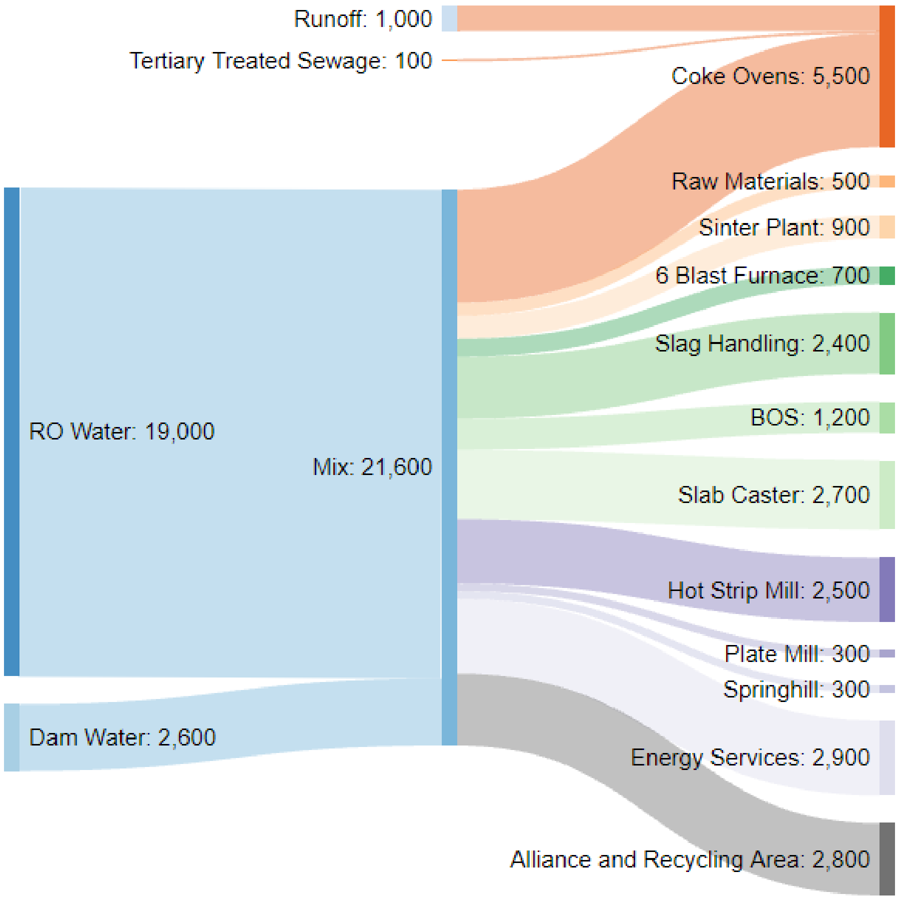

Figure 4.1 Future site water balance at PKSW

4.4.2 Gas cleaning

Consistent with current 5BF operation, the BFG exiting the top of the 6BF will be cooled and cleaned utilising a wet scrubber. The clean gas will then be piped through the gas main to other plants within PKSW for continued use as an energy source to the maximum practical extent. The effluent from the scrubber will be cooled and cleaned for reuse in the gas cleaning process. Blowdown water from the effluent treatment system will be discharged at a rate of approximately 30 – 45 m^3/h into the Outlet Channel where it will combine with approximately 26,000 m^3/h of salt water before discharging to Allans Creek and the Inner Harbour via the No. 2 Blower Station Drain. Flocculant and coagulant that will be added to the effluent treatment system to assist with settling of solids comply with statutory requirements (contained in AS/NZS 3666.1:2011) and assist in preventing excessive scale build up. Specific products used in the effluent treatment system are described in Section 5.3.1. The slurry formed in the effluent treatment system will be sent via pipework to dewatering at the Sinter Plant, with recovered water returned to the effluent treatment system and the remaining slurry taken to the PKSW Recycling Area.

During abnormal furnace operation, the chemical composition of the water may vary in which case, the blowdown water from the effluent treatment system will be diverted to contingency storage to prevent release to the environment and stored until such time as the quality of the water is confirmed to be acceptable for discharge in accordance with EPL 6092.

4.4.3 Cooling systems

The 6BF furnace cooling systems are all a fully closed loop design with heat exchangers. Once through salt water is used as the heat sink for the 6BF closed loop cooling systems on the secondary cooling or cold side of the heat exchangers. This differs from the evaporative cooling tower currently utilised at 5BF.

The closed loop design is a safety feature of the blast furnace allowing high accuracy leak detection and has the added benefit of minimising water loss. The additional salt water required will result in an increased volume of salt cooling water discharge (approximately 10%) compared to current operations, with a minor temperature increase predicted at the No. 2 Blower Station Drain discharge point.

Due to the potential for temperature increases in discharges to Allans Creek, evaporative and air-cooling towers were considered as part of the project. It was determined that an air cooling tower was unfeasible due to the unreliability of maintaining the temperature required for cooling supply in hot weather, and high water usage required for operation of an air to water cooling tower. An evaporative cooling tower is currently utilised at 5BF. Evaporative cooling towers require fresh water to replenish water lost through evaporation and are more energy intensive than the cooling system proposed for 6BF. It is therefore proposed that a once through salt water cooling system is used for 6BF, as it does not require regular freshwater make-up for its operation and is less energy intensive than an evaporative tower.

4.4.4 Slag granulation

Slag produced by the blast furnace is either formed into rock or granulated slag for sale as construction material. Granulated slag is formed by subjecting the molten slag stream to a continuous stream of high pressure water. The water used for granulation is collected, cooled and reused in a closed loop system.

4.4.5 Stormwater drainage

The project site has established stormwater drainage consisting of a series of sumps and collection tanks which capture the ‘first flush’ of rainfall events and any potential spills. These sumps are capable of pumping back to the effluent treatment system should further treatment be required. In a rain event, a “first flush” of stormwater (10mm in a day) is collected in sumps and tanks in the stormwater drainage system. Following the first flush and when sumps reach capacity, stormwater drains to IMED and is subsequently pumped to the No. 2 Blower Station Drain for release to Allans Creek. During major rainfall events, the IMED weir can overtop leading to discharge to the Inner Harbour at licence discharge Point 89.

As part of the project, the slag handling area will be prepared with hardstand graded to new internal drains and will include a truck wheel wash and a large collection tank for water recycling. All drains in the area will flow into either a new slag pit settling pond or the granulator settling pond. The new slag pit settling pond will capture all slag handling surface drainage (slag pit, adjacent slag pit roads and slag haulage truck wash areas) and will provide additional capacity to capture first flush during rain events. During normal operations, collected water will be recycled as make-up water to the granulator or as slag pit sprays. In a rain event, the first flush will be collected in the new slag pit settling pond; this settling pond will then overflow into a drain which flows into the plant stormwater drain before draining to IMED and will be subsequently pumped to the No. 2 Blower Station Drain for release to Allans Creek. A simplified block flow diagram showing the 6BF drainage is shown in Figure 5.1.

The No. 2 Blower Station Drain and Allans Creek have been selected as the proposed discharge locations following consideration of the following:

- Utilising existing infrastructure minimises impacts during the construction phase. In particular, this approach reduces the need to excavate, treat and dispose of materials on site, thereby minimising the risk of mobilising any existing contamination within soils and groundwater.
- Allans Creek and the western portion of the Inner Harbour have been subject to the effects of warmer than ambient industrial discharges for decades and are considered part of a highly disturbed ecosystem (NSG, 2006). The ecology of Allans Creek and the Inner Harbour are well understood following previous detailed studies which indicated that the receiving environment exhibits key differences to other reference environments partly as a result of these historical discharges (NSG, 2006), (CH2M HILL, 2008), (UNSW, 2012).
- Selecting the No. 2 Blower Station Drain and Allans Creek as the ongoing discharge location provides the greatest separation distance from higher value ecosystems within the Outer Harbour and areas beyond port limits, allowing for greater mixing within the Harbour.
- The water discharges from existing blast furnace operations are currently released at the No. 2 Blower Station Drain. As the quality of the water of the proposed project will be similar to that of existing conditions, there will be no changes to the waterways as a result of the project.

A simplified diagram of the inputs to the No.2 Blower Station Drain proposed by the project is presented in Figure 4.2.

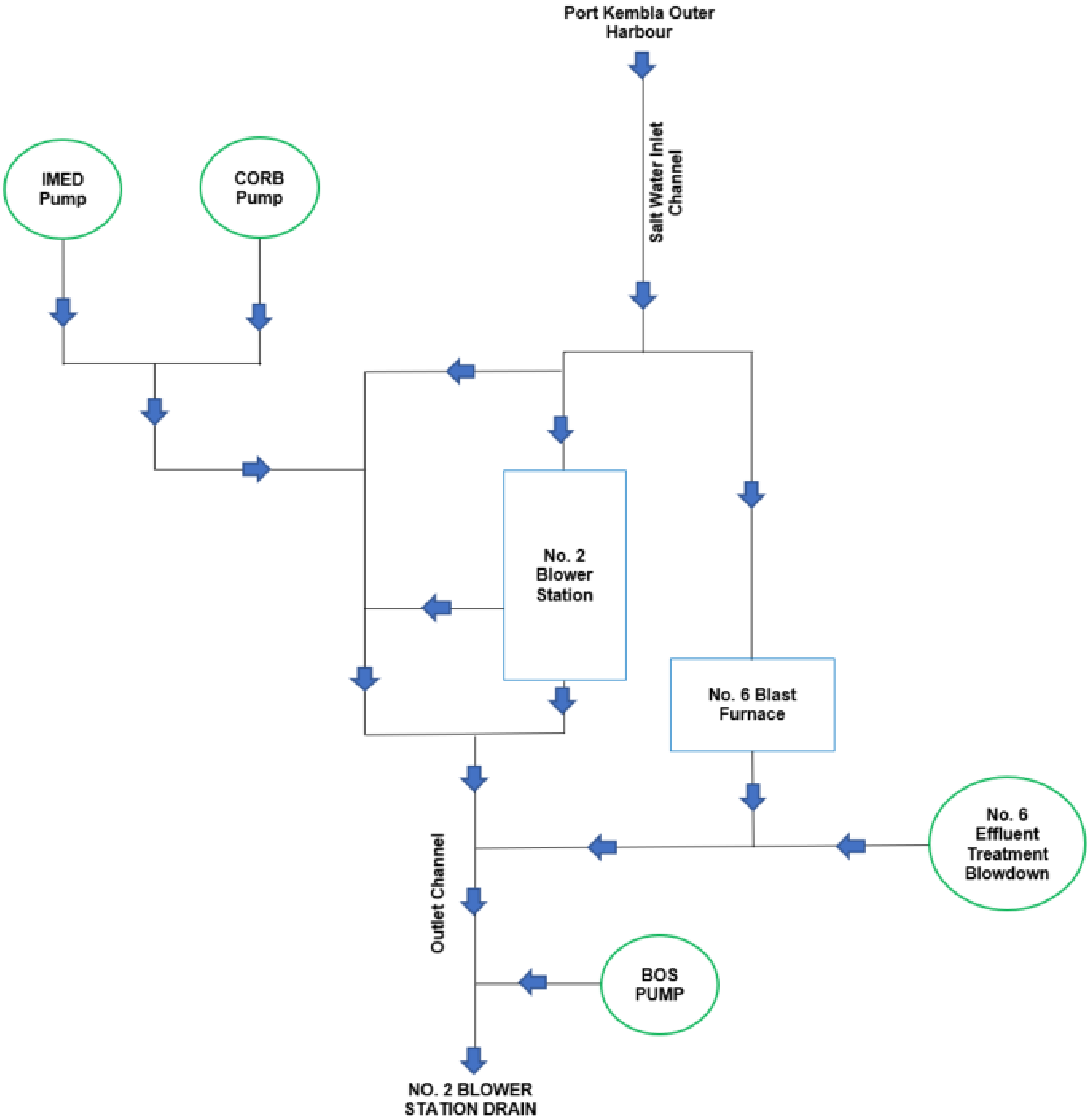

Figure 4.2 Schematic drawing of current 2BS Drain inputs

4.5 Decommissioning overview

A campaign is the period of time (measured in years) during which the furnace operates before needing to be relined. The target campaign duration for 6BF will be 20 years after which time furnace conditions would dictate relining or decommissioning requirements.

5. Water quality impact assessment

5.1 Project Construction WQIA

5.1.1 Construction impacts to surface water quality

Potential risks to water quality during the construction phase are well understood given the experience gained during the successful delivery of the three previous reline projects at PKSW. Specific risks include:

– Release of poor quality stormwater into drains and waterways where it is impacted by excavation works and other construction activities. This may include elevated TSS, reduced DO, pH impacts and the presence of organic matter and other debris.
– Mobilisation of existing contamination within soils.

All construction activities are proposed to take place in established areas. As mentioned in Section 4.2, the proposed laydown areas and carparks are existing infrastructure on the site with existing water management controls in place.

Similarly, the 6BF, its Stockhouse, and roadways within PKSW have existing stormwater drainage systems. The 6BF yard area is sealed and the drainage system includes a series of sumps designed to contain the ‘first flush’ of rainfall events and spills (refer to Section 4.4).

A site-specific Soil and Water Management Plan (SWMP) will be developed and implemented prior to construction in accordance with the *Managing Urban Stormwater: Soils & Construction, vol. 1* (Landcom 2004). This plan will outline the established controls that will be in place for the duration of construction works, as well as any targeted controls specific to the project. For example, bunding and storage requirements for chemical management will be in accordance with the relevant EPA requirements, Australian Standards and manufacturers’ requirements.

5.1.2 Construction impacts to groundwater

The project will require some~~,~~ excavation and ground disturbance, including for the slag handling civils and roads, slag granulator foundations, new Highline Switchroom foundations, foundations for the Waste Gas Heat Recovery system, clarifier foundations, TRT foundations, replacement of rail line ballast and rail, Main Control Building foundations, and Primary Ferrous Feed Conveyor foundations (in RMH). These areas will be within the footprint of the 6BF area shown on Figure 3.3 and will be confirmed during detailed design.

Vehicle movements may also disturb the ground, however, as the majority of the site is currently sealed, disturbance is expected to be minimal. Soil disturbance associated with the project has limited potential to cause localised soil erosion. The erosion risk is relatively low as the site is flat, and predominantly sealed with concrete or bitumen and the level of disturbance is expected to be minor.

Excavation or disturbance to natural material below the level of fill (approximately 5-8 metres below existing ground level) may be required, however the location and extent of excavation will be determined during detailed design once additional geotechnical site investigations have been completed.

The potential groundwater contaminants that may be encountered or mobilised by excavation works are well understood through BlueScope’s detailed and ongoing groundwater monitoring program. Following confirmation of the excavation requirements, an excavation and groundwater management plan (or similar) will be prepared outlining specific measures to be adopted during any excavation and dewatering activities required. It is therefore expected that any impacts to groundwater quality will be able to be readily managed during the construction phase. The implementation of a site specific SWMP will include measures to prevent spills which have the potential to result in groundwater impacts.

5.2 Project commissioning WQIA

5.2.1 Commissioning impacts to surface water quality

During commissioning, cooling water systems will be filled and flushed with industrial water in a controlled manner to drain. There is potential for foaming to occur within the gas system during start up due to the use of kindling and initial fill, which may require discharge into storage basins. Site containment measures will be developed during the detailed design phase to ensure that any overflows due to foaming are able to be contained on site.

During charging, purging and heating of the furnace, as much exhaust gas as possible will be directed through the gas cleaning systems. Similar to 5BF, the dust will be removed from the waste gas by way of a wet scrubber and the resulting scrubber water treated and recycled in the effluent system as described in Section 4.4.2. It is possible that the volume and chemical composition of the blowdown water generated during the commissioning phase will vary from that associated with full scale operations. A commissioning Water Quality Management Plan (WQMP) (or similar) will be developed during detailed design to assess the likely composition of effluent treatment plant water, including the potential for foaming. Where required, monitoring programs and corrective measures, such as the use of antifoam, will be developed to ensure that discharges to No.2 Blower Station drain and Allans Creek are in accordance with EPL 6092.

Commissioning of the granulator will be undertaken using industrial water within sealed hardstand areas in the vicinity of 6BF where drainage systems will be in place. Any potential impacts to surface water will be monitored and managed through either the commissioning WQMP or SWMP, which will be prepared following completion of detailed design.

5.2.2 Commissioning impacts to groundwater

Commissioning of the granulator will be undertaken using industrial water within sealed and hardstand areas in the vicinity of 6BF where drainage systems will be in place. Any potential impacts to groundwater recharge will be monitored and managed through either the commissioning WQMP or SWMP, which will be prepared following completion of detailed design.

5.3 Project operation WQIA

5.3.1 Operational impacts to surface water quality

Water uses and discharges from 6BF will be consistent with the quantity and quality of that which is currently discharged from 5BF, with minor changes to cooling water discharges expected due to the alternative cooling system associated with the project. A simplified block flow diagram for 6BF is presented in Figure 5.1. Discharges with potential impacts have been assessed in Sections 5.3.1.1 to 5.3.1.3 and an assessment of the resulting discharges against the relevant assessment criteria is presented in Section 5.3.3.

5.3.1.1 Blowdown

The effluent treatment system proposed for 6BF is consistent with the effluent treatment system used for existing operations and the discharge location will remain as the 2BS drain which discharges to Allans Creek.

The rate of future 6BF blowdown discharge is expected to be approximately 30 – 45 m^3/h, which is in accordance with existing discharge rates associated with 5BF operations. This rate represents a very small component (< 0.2%) of the broader flow rate within No. 2 Blower Station drain of approximately 26,000 m^3/h.

Flocculant and coagulant will be added to the effluent treatment system to assist with settling of solids, in compliance with statutory requirements (contained in AS/NZS 3666.1:2011) and prevent excessive scale build up. Specific products are assessed in Table 5.1.

Table 5.1 Assessment of products used within the effluent treatment system

Product name and manufacturer	Use, dosing and expected discharge concentration	Potential impacts to water quality
CAT-FLOC 8103 PLUS NALCO Water	– Water clarification aid (coagulant) – Dosing rate: 1.5 mg/L – Discharge concentration: 0.0026mg/L	Summary of ecological information (Nalco, 2020): – No known ecotoxicological effects. – Lowest reported NOEC Ceriodaphnia dubia: 1.25 mg/L. – Poorly biodegradable. – Not expected to bioaccumulate. – Manufacturer's assessment of potential environmental hazard is: Low. WQIA conclusion: No significant impacts to water quality expected at proposed discharge concentration.
HI-TEX 82220 NALCO Water	– Anionic flocculant – Dosing rate: 1.5 mg/L – Discharge concentration: 0.0026mg/L	Summary of ecological information (Nalco, 2017): – Considered harmful to aquatic life if released to waterways in sufficient concentrations – Lowest reported LC50 / EC50: > 1,000 mg/L – Poorly biodegradable but rapidly eliminated from the aquatic environment by adsorption onto organic particulate matter and sediment. – Not expected to bioaccumulate. – Manufacturer's assessment of potential environmental hazard is: Low. WQIA conclusion: No significant impacts to water quality expected at proposed discharge concentration.
ACTI-BROM™ 7342 NALCO Water	– Biocide precursor, biodispersant – 0.25 - 0.3 mg/L bromine based on a dosing rate of 0.6 - 0.8 mg/l and ~40% actives. – Discharge concentration: 0.0014mg/L	Summary of ecological information (Nalco, 2021a): – Considered harmful to aquatic life with long lasting effects if released to waterways in sufficient concentrations. – Lowest reported NOEC Lepomis macrochirus: 1,000 mg/L. – Lowest reported LC50 Daphnia magna: 0.038 mg/L – Inorganic substances for which a biodegradation value is not applicable. – Not expected to persist in the environment. – Not expected to bioaccumulate. – Manufacturer's assessment of potential environmental hazard is: Low. WQIA conclusion: No significant impacts to water quality expected at proposed discharge concentration.
NALCO® 1392 NALCO Water	– Scale inhibitor – Dosing rate 0.8 – 1.3 mg/L – Discharge concentration: 0.0023mg/L	Summary of ecological information (Nalco, 2021b): – No known ecotoxicological effects. – Lowest reported LC50 Green Algae: 20 mg/L. – Inherently biodegradable. – Not expected to bioaccumulate. – Manufacturer's assessment of potential environmental hazard is: Low. WQIA conclusion: No significant impacts to water quality expected at proposed discharge concentration.

Product name and manufacturer	Use, dosing and expected discharge concentration	Potential impacts to water quality
Sodium hypochlorite Solution (10-15% available chlorine) Ixom Operations Pty Ltd	– Sanitising agent, biocide – 0.5 mg/L chlorine based on a dosing rate of 4mg/L with ~12.5% available chlorine – Discharge concentration 0.0069mg/L	Summary of ecological information (IXOM,2019): – Considered very toxic to aquatic life with long lasting effects if released to waterways in sufficient concentrations – Lowest reported 96hr LC50 (fish): 0.065 mg/L (sodium hypochlorite) – Biodegradable – Does not bioaccumulate. – Acute Aquatic Toxicity – Category 1 – Chronic Aquatic Toxicity – Category 1 – WQIA conclusion: No significant impacts to water quality expected at proposed discharge concentration.

Notes: Expected discharge concentrations based on conservative assumptions of maximum discharge of 45 m^3/hr from blowdown and no loss of product during processing into 2BS drain flow of 26,000 m^3/hr. In reality, the majority of sodium hypochlorite, ACTI-BROM™ and NALCO® 1392 will be consumed in the process and the majority of CAT-FLOC 8103 PLUS and HI-TEX 82220 will bind to slurry solids and settle out in the filter cake.

The concentrations of pollutants in future water discharges are therefore expected to be comparable with existing discharges, and no adverse impacts are anticipated in Allans Creek or the Inner Harbour as a result of the project when compared to existing operations.

A detailed assessment of the key discharge characteristics against relevant water quality criteria is provided in Section 5.3.3.

5.3.1.2 Cooling water

The quality of the water discharging from 6BF will be consistent with the existing discharge from 5BF, except for temperature, which will be slightly elevated due to the salt water heat exchanger cooling system proposed for 6BF (refer Section 4.4 regarding operational overview). It is predicted that this will result in an increase of approximately 0.5 – 1°C at the licence discharge point, No. 2 Blower Station drain (Point 79).

Cooling water discharges will increase by approximately 3,000m^3/h, which represents an increase of around 10% over current operations associated with 5BF.

An assessment of the expected thermal discharge characteristics against relevant water quality criteria is provided in Section 5.3.3.

5.3.1.3 Gas condensate

BFG condensate from 6BF is expected to be of a similar composition to that associated with 5BF operations. There will be no change to Coke Ovens Gas (COG)[5] condensate as a result of the project. The 'no-blow' design of the BFG seal pots proposed for the 6BF area will reduce the risk of gas condensate overflows when compared to traditional seal pot design.

All gas condensate collection tanks will be fitted with remote level monitoring and alarming to reduce the risk of overflows. As occurs with existing operations, the BFG condensate will be collected in tanks and pumped to the effluent treatment system and COG condensate will be collected and trucked for processing at the Cokemaking facility.

[5] COG is gas generated from cokemaking processes and is used as a fuel at the blast furnace. As such, there is a COG main with seal pots in the blast furnace yard from which COG condensate is collected.

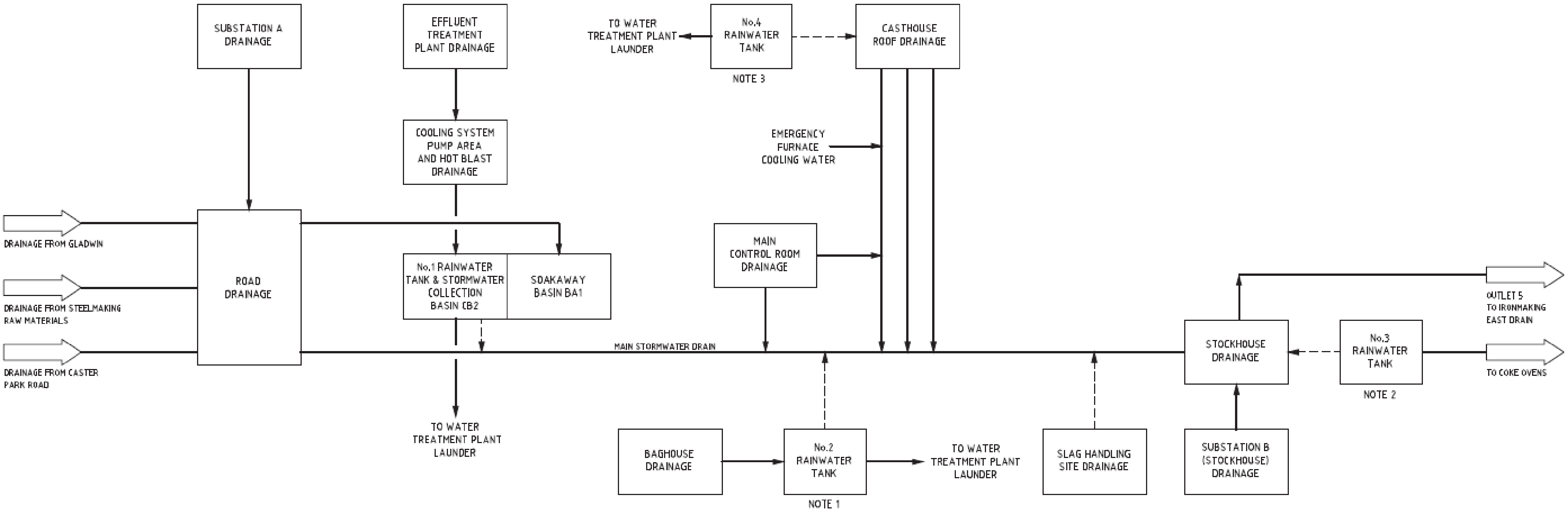

Figure 5.1 Simplified No. 6 Blast Furnace Block Flow Diagram RevB

5.3.2 Operational impacts to groundwater

Potential impacts to groundwater during the operational phase relate to the quantity and quality of groundwater recharge from infiltration of rainfall and water used for the operational purposes described in Section 4.4.

The 6BF site will include a significant amount of drainage infrastructure to ensure that water from rainfall and potential spills can be effectively captured and/or appropriately drained from the site. This drainage is an improvement in stormwater management compared to existing operations.

Given the extensive drainage controls, potential impacts to groundwater quality are expected to be adequately monitored and managed through ongoing groundwater monitoring under condition E3.1 of EPL 6092, the PKSW Water Stewardship Plan and the continued implementation of BlueScope's ongoing ISO 14001 certified Environmental Management System and associated processes.[6]

5.3.3 Assessment against relevant water quality criteria

An assessment of the key operational impacts described in Section 5.3.1 has been undertaken against the relevant assessment criteria relating to temperature (refer Section 5.3.3.1) and contaminants (refer Section 5.3.3.3) expected to be released to Allans Creek and the Inner Harbour.

5.3.3.1 Temperature – Assessment against water quality criteria

As discussed in Section 5.3.1, the quality of the water discharging from 6BF will be consistent with the existing discharge from 5BF with the exception of temperature which will be slightly elevated due to the salt water heat exchanger cooling system proposed for 6BF. With an increase in cooling water discharge of approximately 10% from 6BF compared to the existing discharge, it is predicted that this will result in an increase of approximately 0.5 – 1°C at the licence discharge point, No. 2 Blower Station drain (EPL 6092 Point 79).

Whilst the cooling system proposed for 6BF offers the benefits of reduced energy use and water use in comparison to the existing cooling system at 5BF, it is necessary to assess the increased discharge temperature against the relevant water quality criteria.

As noted in Section 2.5, the EPA's policy is that the WQOs should be met at the edge of the area where initial mixing or "near-field" mixing occurs, (in this context, 'near field' relates to initial mixing where the initial characteristics of momentum flux, buoyancy flux and outfall geometry influence the plume trajectory and mixing). Mixing that occurs through buoyant spreading motion and passive diffusion due to ambient turbulence is referred to as 'far field' mixing. Mixing zones should not receive concentrations of pollutants that cause acute toxic impacts meaning that acute impacts should be assessed at the point of release (EPA, 2018).

Adopting the two-step approach to the assessment recommended by the Water Quality Guidelines first requires comparison of the future temperatures at the point of discharge to Allans Creek to the 80th percentile temperatures of the reference system as a target for improvement. Table 2.3 indicates that compliance would require the temperature increase at the edge of the nearfield mixing zone to be less than 0.8 (^{o}C) to 1.3 (^{o}C) above ambient temperatures of the reference system depending on the season.

Given the multiple discharges to Allans Creek with temperature differentials of approximately six to seven degrees Celsius, it is considered highly unlikely that the existing or proposed discharge streams comply with the low risk 80th percentile trigger values for slightly to moderately disturbed ecosystems at the edge of the nearfield mixing zone. Previous modelling results (refer Section 5.3.3.2) predict that average heat loads associated with PKSW operations during summer would result in exceedances of the 80th percentile trigger values at a surface output point in the Inner Harbour located approximately 250 m from the entrance to Allans Creek.

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[6] ISO 14001 is the international standard that specifies requirements for an effective environmental management system (EMS).

Based on these results, both the existing and proposed discharge streams exceed the default assessment criteria relating to slightly, to moderately, disturbed ecosystems. Allans Creek and the Inner Harbour have, however, been subject to the effects of warmer than ambient industrial discharges for decades and are considered part of a highly disturbed ecosystem (NSG, 2006). Given the history of the PKSW site, it is considered appropriate to rely on site-specific scientific studies, together with professional judgement and other relevant information, to derive site-specific trigger values in accordance with the approach adopted by previous assessments completed on behalf of BlueScope (CH2MHILL, 2008).

The Water Quality Guidelines note that where local but higher-quality reference data are used, a less stringent cut off than the 20th or 80th percentile value may be used. The 20th or 80th percentile values, however, should be used as a target for site improvement.

In this regard, the predicted increase in temperature at the point of discharge from No. 2 Blower Station (2BS) drain into Allans Creek will comply with the temperature limits specified under Clause L3.5 of EPL 6092 as described in Section 2.4. Similarly, the predicted increase in temperature at the point of discharge into Allans Creek will comply with the site-specific temperature criteria (an increase of less than 3°C) developed during the 2006 studies discussed in Section 3.6.

Nevertheless, in the interests of site improvement as recommended for assessment under the Water Quality Guidelines, consideration has been given to the potential mitigation options for secondary cooling systems at the 6BF as summarised in Section 6.3.

5.3.3.2 Numerical modelling of cooling water discharge

Historical investigations

BlueScope has previously undertaken detailed numerical modelling of cooling water discharges to the Inner Harbour as part of proposed upgrade projects. Between 2006 and 2008, Cardno Lawson Treloar issued a series of reports documenting the findings of numerical cooling water studies into the proposed salt water cooling of the then-proposed Steelworks Co-Generation Plant (SCP) (Cardno, 2006a, 2006b, 2008).

The modelling in 2006 – 2008 was undertaken using a combination of near and far-field models (CORMIX and Delft 3D respectively) and was calibrated against earlier records of measured temperature data (operational data and field data collected using ADCP's within Allans Creek and the Inner Harbour). The model has since been used by other proponents to assess the potential water quality impacts associated with the discharge of thermal plumes and their chemical constituents to Port Kembla Harbour (Cardno, 2019). On account of the recent use of the model by other major projects, the modelling approach and software used in the 2006 and 2008 BlueScope studies can be considered an acceptable approach for the current assessment. Since the earlier modelling was completed, no projects have been constructed or approved that would significantly alter ambient temperatures within Port Kembla.[7]

The modelling completed between 2006 and 2008 considered a variety of operating scenarios relating to typical and maximum heat loads during summer and winter conditions to account for seasonal variability. Importantly, all scenarios involved the operation of two blast furnaces (5BF and 6BF), which represents a worst-case scenario when compared to the proposed operations following completion of the 6BF reline project. It is also important to note that the Cogeneration Plant Project (for which the modelling was completed) was approved (Application Number: MP08_0132-Mod-1) but was not progressed; meaning that the previously proposed additional heat load was not applied to Allans Creek and the Inner Harbour. The flow and temperature data used for the modelling assessment is provided in Table 5.2 and Table 5.3.

[7] The proposed warming water discharge associated with the AIE Gas Import Terminal will partially offset BlueScope's cooling water discharge, however it would not be appropriate to include these benefits in the current assessment. It is also noted that the proposed AIP power station will discharge cooling water to the open coast beyond the Coal Loader Seawall, thus minimising the potential for any cumulative impacts to the Inner and Outer Harbours of Port Kembla.

Table 5.2 Modelled drain flows – Existing summer conditions (Cardno, 2006)

Modelled Drain Flows - Existing Summer Conditions					
Model Source No	Drain	Average Condition		Peak Condition	
		Flow (m^3/s)	ΔT(°C)	Flow (m^3/s)	ΔT(°C)
1	Main Drain	1.174	7.1	1.431	9.5
2	No.2 Blower Station	7.953	6.44	8.233	8.5
3	Iron Making East	0.208	4.05	0.232	7.5
4	3500mm Plate Mill Drain	0.395	2.84	0.43	3.5
5	Slab Mill Drain	0.013	31.41*	0.013	32.68*
6	No. 1 Flat Products East Drain	0.112	4.64	0.112	10.5
7	Allans Creek Flow	0.17	22.5*	0.17	22.5*
8	North Gate Drain	0.077	28.06*	0.13	30.22*

* presented as absolute temperature rather than excess

Table 5.3 Modelled drain flows – Existing winter conditions (Cardno, 2006)

Modelled Drain Flows - Existing Winter Conditions					
Model Source No	Drain	Average Condition		Peak Condition	
		Flow (m^3/s)	ΔT(°C)	Flow (m^3/s)	ΔT(°C)
1	Main Drain	1.517	6.28	2.993	6.2
2	No.2 Blower Station	8.211	7.11	8.413	13.2
3	Iron Making East	0.100	3.06	0.127	4.2
4	3500mm Plate Mill Drain	0.408	2.41	0.405	4.21
5	Slab Mill Drain	0.016	21.37*	0.081	22.0*
6	No. 1 Flat Products East Drain	0.196	4.35	0.189	9.21
7	Allans Creek Flow	0.170	16.80*	0.170	16.8*
8	North Gate Drain	0.102	17.98*	0.172	17.0*

* presented as absolute temperature rather than excess

The 2008 modelling exercise assessed a new discharge point to Allans Creek with a temperature differential (ΔT) of 10.29°C and a discharge rate of 8.682 m^3/s. The previously assessed increased heat load is significantly higher than the predicted increase associated with the current project of approximately 0.5 – 1°C. Nevertheless, the following general observations regarding the previously predicted mixing zone behaviours are of relevance to the current project (Cardno, 2008):

- The previously proposed discharge point to Allans Creek resulted in an average mid-depth temperature increase near the discharge point in Allans Creek of approximately 3°C, indicating a rapid drop in temperature increases upon discharge.
- The initial mixing zone may extend between 30 m to 40 m from the discharge point in Allans Creek, indicating a limited area where the initial characteristics of momentum flux, buoyancy flux and outfall geometry influence the plume trajectory and mixing.
- Within the Inner Harbour, resulting average temperatures were generally less than 1.5°C for the surface layers and less than 0.5°C in the mid to bottom layers. Within the Outer Harbour, resulting average temperatures were generally less than 0.5°C for the surface layers and less than 0.2°C in the mid to bottom layers. Inner and Outer Harbour temperature increases indicate that far field mixing behaviours continue throughout the broader Port through buoyant spreading motion and passive diffusion due to ambient turbulence.

Whilst the previously assessed increased heat load was significantly higher than the predicted increase associated with the current project, Figure 5.2 provides an indication of the mixing behaviours and extent of the previously predicted thermal plume within the surface, mid-depth and bottom layers of the water column for the previously assessed peak summer load scenario.

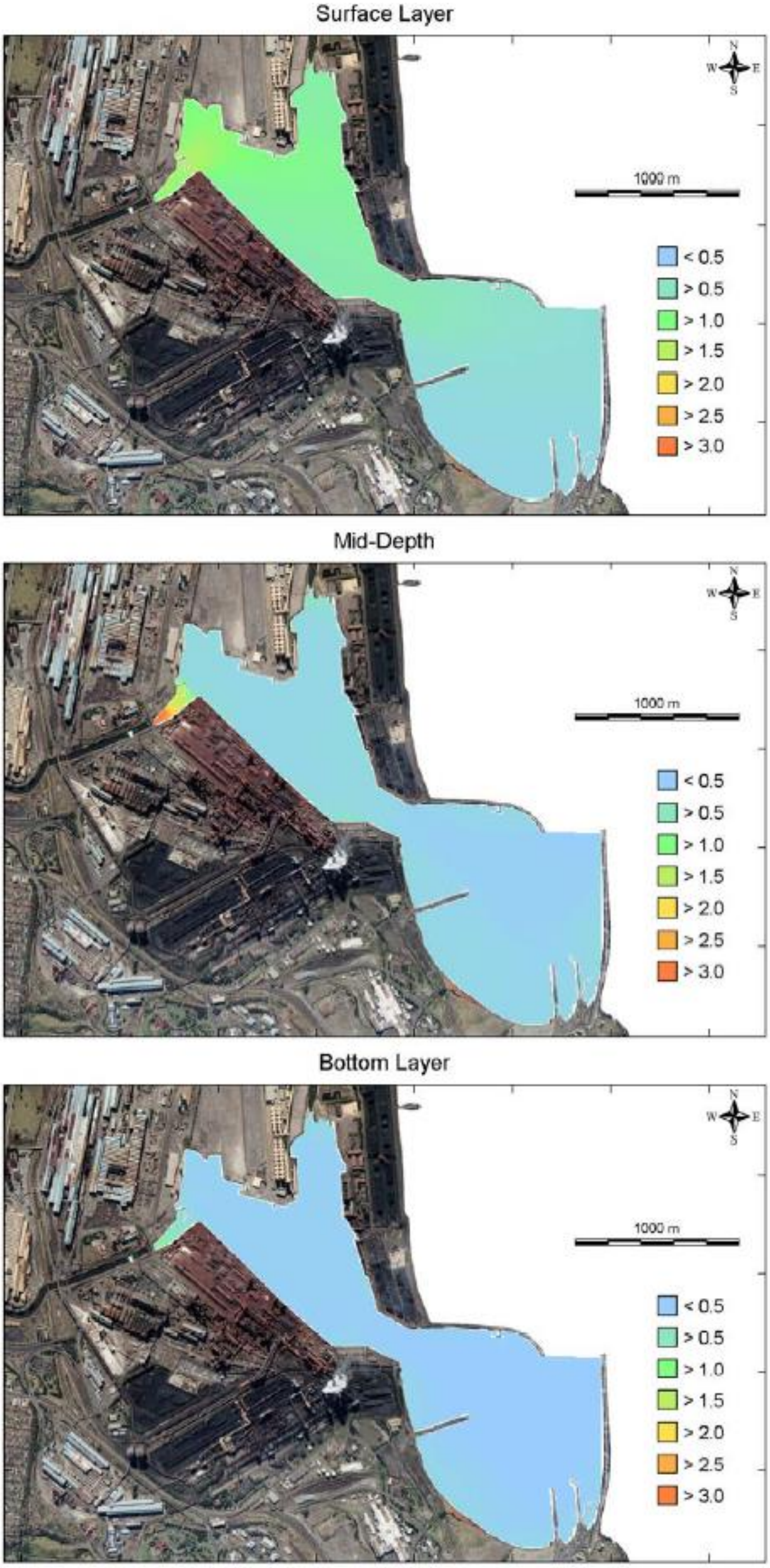

Figure 5.2 ***Average change in water temperature from the previously proposed peak summer load conditions associated with the Cogeneration Project (Cardno, 2008)***

Resulting 50th percentile temperatures from the surface, mid-depth and bottom layers of the model were compared to summer and winter 80th percentile trigger values in accordance with the WQO's (DEC, 2006). Key findings of the 2008 salt water cooling assessment (CH2MHILL, 2008) are summarised below:

– Discharges generally exceed trigger values under summer and winter conditions at all locations within Allans Creek and at some locations within the Inner Harbour.
– The extent of the mixing zone was predicted to be within 40 m of the discharge point.
– No major losses of biota from the Inner Harbour or Allans Creek were anticipated as a result of the thermal discharges.
– It was considered unlikely that the predicted temperature increases would cause a significant increase in the effects (toxic or bioaccumulation) of the heavy metals or PAHs at the entrance to Allans Creek or the Inner Harbour.
– The expected temperature changes were considered unlikely to influence potential for invasion of marine pest species.
– Plankton blooms were considered unlikely to occur as a result of the predicted temperature increases.
– Temperature impacts are noticeably different at each level within the water column.
– The highest absolute temperatures occur in the surface layers but the largest impacts to temperature may occur at the surface, mid-water column or near the seabed.
– Behaviour of the discharge plume is dominated by the stage of tide and wind conditions.
– Tidal influences result in previously discharged cooling water being transported backwards and forwards through the discharge points.

Current monitoring data and predications

Temperature data from 2BS drain discharge point is collected every 8 days by BlueScope as required by monitoring conditions contained in EPL 6092. Continuous flow data at the 2BS drain discharge point is also measured in accordance with condition M8 of EPL 6092. Table 5.4 displays the average and maximum summer and winter results collected at this discharge point using data collected between 2016 and 2021, and includes the predicted temperature conditions as a result of the project. A comparison of the existing and predicted temperatures at the discharge point with values used for previous modelling demonstrate that the anticipated minor increase in temperature is similar to the modelled data. As no significant impacts to marine life were found in the previous modelling study, no significant impacts are anticipated due to the proposed discharges from operation of 6BF.

Table 5.4 Measured and predicted temperature conditions at the 2BS drain discharge point

Condition	Existing Flow (m^3/s)	Existing ΔT°C	Predicted Flow (m^3/s)	Predicted ΔT°C
Summer Average	7.291	6.5	7.314	7.0
Summer Maximum	9.090	7.2	9.170	8.2
Winter Average	7.242	6.1	7.322	6.6
Winter Maximum	9.385	6.7	9.465	7.7

5.3.3.3 Contaminants - Assessment against water quality criteria

An assessment of the future discharge to Allans Creek and the Inner Harbour has been undertaken on the basis that the 6BF discharge contribution to the 2BS drain will be the same as that associated with 5BF.

Data acquired from licence monitoring and load based licencing requirements at the 2BS drain at the point of discharge to Allans Creek (EPL 6092 Point 79) has been used to inform this assessment. Licence testing is undertaken every 8 days, while samples for load based licencing requirements are collected per 'The Protocol' (Load Based Licencing, June 2009) using NATA accredited laboratories.

Results of the assessment are presented in Table 5.5 and Table 5.6. The data has been compared against the ANZG (2018) Default Value Guidelines (DGVs) for marine waters at the 80%, 90% and 95% LOSP.

Only data from the period 2016 – 2021 has been used due to the following operational changes made prior to 2016:

– 2009 – Recirculating clarified water system installed at 5BF
– 2009 – Seal pot condensate containment system installed at 5BF
– 2011 – 6BF ceases operation
– 2016 – Ironmaking East Drain diverted to the 2BS drain
– 2016 – Coke Ovens Recovery Basin overflows diverted from the Main Drain (Point 78) to the 2BS drain

Table 5.5 No. 2 Blower Station Drain data assessment summary (2016 – 2021)

Parameter	80% LOSP	90% LOSP	95% LOSP
Ammonia	✓	✓	✓
Anthracene	✓	✓	✓
Arsenic (AsIII)*	✓	✓	✓
Arsenic (AsV)*	✓	✓	✓
Benzo(a)pyrene	✓	✓	✓
Cadmium	✓	✓	✓
Chromium (CrIII)	✓	✓	✓
Chromium (CrVI)	✓	✓	✓
Copper	⦿	⦿	⦿
Cyanide	✓	×	⦿
Fluoranthene	✓	✓	✓
Lead	⦿	⦿	⦿
Mercury (inorganic)	✓	✓	✓
Naphthalene	✓	✓	✓
Phenanthrene	✓	✓	✓
Selenium (total)*	✓	✓	✓
Zinc	⦿	⦿	⦿

Notes:

✓Complies with assessment criteria
× - *Does not comply with the assessment criteria*
⦿ - *Limit of Reporting is not sufficiently low to assess compliance*

**Freshwater value has been used in absence of a marine water value*

Table 5.6 No. 2 Blower Station Drain data assessment against DGV (2016 – 2021)

Parameter / units	No. samples	Min value	Av. value	Max. value	100% EPL	80% LOSP	90% LOSP	95% LOSP
Ammonia (Nitrogen) (µg/l)	253	<60	<60	310	5000	1700	1200	910
Anthracene (µg/l)	4	<0.05	<0.05	<0.05	--	7	1.5	0.4
Arsenic* (µg/l)	23	<10	<10	<10	--	140	42	13
Benzo(a)pyrene (µg/l)	4	<0.05	<0.05	<0.05	--	0.7	0.4	0.2
BOD (mg/l)	1	<2	<2	<2	20	--	--	--
Cadmium (µg/l)	24	<5	<5	<5	60	36	14	5.5
Chromium (Total) (µg/l)	24	<10	<10	<10	--	85	20	4.4
Copper (µg/l)	24	<10	<10	<10	--	8	3	1.3
Cyanide (Total) (µg/l)	253	<5	<5	11.3	300	14	7	4
Flouranthene (µg/l)	4	<0.05	<0.05	0.06	--	2	1.7	1.4

Parameter / units	No. samples	Min value	Av. value	Max. value	100% EPL	80% LOSP	90% LOSP	95% LOSP
Filtrable Iron (mg/l)	253	<0.01	<0.01	0.16	0.3	--	--	--
Fluoride (mg/l)	5	<0.1	0.68	1.40	--	--	--	--
Hexavalent Chromium (mg/l)	21	<0.001	<0.001	<0.001	--	--	--	--
Lead (µg/l)	24	<20	<20	<20	100	12	6.6	4.4
Mercury (µg/l)	26	<0.20	<0.20	0.27	--	1.4	0.7	0.4
Naphthalene (µg/l)	4	<0.05	<0.05	0.15	--	120	90	70
Oil and Grease (mg/l)	253	<5	<5	<5	50	--	--	--
Phenanthrene (µg/l)	4	<0.05	<0.05	0.1	--	8	4	2
Selenium* (µg/l)	23	<10	<10	<10	--	34	18	11
Total Iron (mg/l)	253	0.06	0.19	1.4	--	--	--	--
TSS (mg/l)	253	<2	10.28	29	500	--	--	--
Zinc (Total) (µg/l)	253	<50	<50	520	3000	21	12	8

*Notes:

– Freshwater DGV's for As(V), Se

– Where individual readings were below LOR, a value of zero has been adopted in calculating average values

– Where all readings were below LOR, average value has been reported as <LOR

From examination of the above data, it is apparent that relatively few exceedances of the 95% LOSP DGV's occur during operations, with the exception of cyanide. The cyanide concentrations detected were all compliant with EPL 6092 concentration limits. The laboratory Limit of Reporting (LOR) for copper, lead and zinc is not sufficiently low to assess compliance against the DGVs.

Cyanide is present in the blowdown water discharged from the blast furnace effluent treatment system. Investigations are currently underway at 5BF to determine additional, online treatment solutions to reduce the concentration of cyanide in the blowdown water before it is discharged to the 2BS drain. Solutions identified through the investigations will be implemented at 5BF. Learnings and solutions for cyanide treatment at the 5BF will be applied to future operation of the 6BF.

The existing data set does not include several of the DGVs and, as already highlighted, in some cases the LOR is not sufficiently low to compare against DGVs. A project, PRP 182, is currently underway to address the identified gaps in data when comparing the analytes measured at the 2BS drain against the list specified in the ANZG (2018) DGVs. For this program, BlueScope is undertaking extensive sampling to identify and quantify all sources of pollutants entering, and ultimately discharging from the 2BS drain to Allans Creek, including from the blast furnace effluent treatment system. PRP 182 includes assessment of the potential impact of discharges on the environmental values of the receiving waters with reference to the relevant criteria relating to levels of aquatic ecosystem protection defined in ANZG (2018).

The findings of this ongoing program will provide critical inputs to the assessment and ongoing management of the potential water quality impacts of discharges to Allans Creek.

5.4 Project rundown and decommissioning WQIA

The target campaign duration for 6BF will be 20 years after which time furnace conditions will dictate relining or decommissioning requirements.

The risks to water quality associated with the rundown and decommissioning are well understood by BlueScope given the experience gained during the successful delivery of the three previous reline projects. During decommissioning, rundown water is captured, treated and tested prior to discharge to ensure compliance with EPL 6092.

As a result, risks to water quality associated with the rundown and decommissioning phase are able to be effectively managed through a rundown and decommissioning strategy (or similar) which will be developed at a future date, in consultation with the EPA as described in Section 6.4.

6. Mitigation measures

6.1 Mitigation measures during construction

BlueScope has committed to developing and implementing a Construction Environmental Management Plan (CEMP) to manage potential impacts during the construction phase. To manage impacts to water quality during the construction phase, it is recommended that the CEMP include a site specific SWMP outlining site management requirements, specific controls, environmental inspection requirements, roles and responsibilities, health and safety, incident management and emergency response including arrangements for managing wet weather events. The SWMP will include an Erosion and Sediment Control Plan (ESCP) which will be prepared in accordance with the *Blue Book -Managing Urban Stormwater: Soils and Construction* (4th edition, Landcom, 2004).

6.2 Mitigation measures during commissioning

A commissioning Water Quality Management Plan (WQMP) (or similar) will be developed following investigations during detailed design to assess the likely composition of initial flushing water, the potential for foaming, the characteristics of the start-up blowdown water and commissioning of the granulator. Where required monitoring programs and corrective measures will be developed to ensure that discharges to groundwater, No.2 Blower Station Drain and Allans Creek are in accordance with EPL 6092. The commissioning WQMP may be a standalone document or may form part of the SWMP.

6.3 Mitigation measures during operation

BlueScope has completed approximately 77 water-related PRPs and continues to work closely with the EPA to address issues associated with historical discharges and identify opportunities for ongoing improvement, including monitoring changes, retention or revision of concentration limits, load limits for specific pollutants, or changes to discharge locations. The following sections detail the water discharge and water use mitigation measures that will minimise the risk of surface water or groundwater contamination during operation of the project.

6.3.1 Process and discharge controls

The type of water discharges from 6BF will be consistent with the quantity and quality currently discharged from 5BF. The only direct discharge to the 2BS drain will be from the effluent treatment system as described in Section 5.3.1.1. All other discharges will be directed to IMED a secondary containment basin, which will then be pumped to the 2BS drain. In the event of a spill to drain, the IMED pumps can be turned off, ensuring the spill is captured and does not leave the site.

The slag handling area will include hardstand surfaces graded to internal drains in the area so surface water will flow into either the new slag pit settling pond or the granulator settling pond. Collected water from the water sprays in the area will be recycled as make-up water to the granulator or as slag pit sprays. In a rain event, the first flush will be collected in the new slag pit settling pond, which will flow into the plant stormwater drain before draining to IMED and subsequently be pumped to 2BS for release to Allans Creek.

The effluent treatment system will be above ground and bunded underneath to capture any flows. Any spillage will be captured and directed back into the effluent treatment system. Additional paving between the effluent treatment system and the road on the east side of the plant will cover the unsealed area.

COG and BFG condensate will be managed with the controls that have previously been identified as part of PRP181-Seal Pot Risk Assessment. 'No-blow' seal pots will be installed for BFG seal pots which will reduce the risk of gas condensate overflows, and collection tanks will be bunded and level detection with alarming installed to avoid over fill events.

The effluent treatment system will discharge cleaned and treated water to 2BS, however if the water quality is variable, this will be directed to contingency storage for further treatment and reassessment.

6.3.2 Stormwater

Drainage from 6BF area is directed to IMED which is a basin with a capacity of 7,556 kL that under dry weather conditions, does not flow directly to the harbour and is instead pumped to 2BS drain. In major rainfall events when the capacity of the basin is exceeded, the water overflows directly to the harbour over a weir at licensed discharge point, Point 89.

In a rain event a "first flush" of stormwater from process areas is collected in sumps and tanks in the drainage system. The proposed slag pit settling pond is designed to provide additional capacity to capture the first flush from rainfall events. The 6BF site has established stormwater drainage consisting of a series of sumps and collection tanks which capture first flush events and potential spills. Following the first flush and when sumps reach capacity, stormwater drains to IMED and is subsequently pumped to the No. 2 Blower Station Drain for release to Allans Creek. These rainwater sumps local to the blast furnace have the capability to pump back to the effluent treatment system.

There will be roof protection over the main chemical bunding to prevent excessive rainwater entering bunded areas.

	Cokemaking Catchment Area
	Ore Preparation/6BF Catchment Area
	Blower Station Catchment Area
	5BF Catchment Area
	BOS/ASMS Catchment Area

Figure 6.1 Drain catchment map following changes made by the project

6.3.3 Discharge locations

The two licenced discharge locations that service the 6BF catchment area (refer Figure 3.6) are Point 79: 2BS drain and Point 88: IMED.

Blowdown from the effluent treatment system will be directly discharged to 2BS drain, which flows to Allans Creek. All other discharges, including stormwater will flow to IMED when rainwater collection sumps have filled.

2BS and IMED drains are currently monitored in compliance with EPL 6092. Water quality indicators (cyanide, ammonia, metals) are included in existing tests.

Further discussion regarding the reasons for selecting the proposed discharge locations is provided in Section 4.4.5.

6.3.4 Water use

Water uses associated with 6BF will be slightly different to those associated with the existing 5BF operations. Less fresh water will be required due to the use of a once through salt water cooling system instead of an evaporative cooling tower. This will result in approximately 10% additional salt water requirements at 6BF compared to 5BF as discussed in Section 5.3.1.2. The industrial and drinking (domestic) water supplier will continue to be Sydney Water. The water use and re-use processes will be as follows:

– The water used for granulation will be collected, cooled and reused in a closed loop system. Some water loss will occur due to moisture retained in the granulated slag.
– Slag handling water used to cool the slag pits will be reused. Some water loss will occur due to evaporation.
– Water from gas cleaning will be reused for further gas cleaning.
– The furnace cooling system will be a closed loop cooling system.
– Rainwater tanks will collect drainage from the site and can pump collected water back to the effluent treatment system.
– Heat exchanger cooling from salt water sourced from and returned to Port Kembla Outer Harbour.

Overall, the proposed cooling system will offer reduced water use and does not require a water licence from Water NSW.

6.3.5 Wastewater management

All process wastewater within the 6BF area will be either captured or treated and then discharged as summarised below:

– Blowdown water from the effluent treatment system is discharged to the 2BS drain following the treatment process.
– Contingency storage for all discharges will be used when water quality is variable.
– Collection of blast furnace gas seal pot water and return to the effluent treatment system.
– Collection of COG seal pot water with pick up by truck.[8]
– Seal pot tanks will have bunds installed and level detection with alarming on collection tanks to avoid over fill events.
– Online treatment for cyanide is currently under investigation at 5BF. Learnings will be applied to 6BF.

[8] COG is gas generated from cokemaking processes and is used as a fuel at the blast furnace. As such, there is a COG main with seal pots in the blast furnace yard from which COG condensate is collected.

6.3.6 Spill management

There are a number of spill mitigation measures that will be implemented during the project for ongoing operational benefit. These include:

- EPA compliant bunding of all hazardous chemicals.
- Spill kits readily available.
- High risk process areas sealed.
- All runoff, including spills, from the gas cleaning and effluent treatment plants will be collected and returned to the water treatment plant during normal operation.
- Spill containment and additional paving between effluent treatment system and road on the east side of the plant.
- No-blow seal pots installed on blast furnace gas mains reducing the chance of make-up water being left on for extended periods of time.
- Level detection and alarming on gas condensate collection tanks.
- Seal pot tanks will have bunds installed and level detection with alarming on collection tanks to avoid over-fill events.
- Above ground effluent treatment system clarifier with bunding underneath to capture any overflows.

6.3.7 Ongoing monitoring programs

Monitoring programs have been developed and refined based on previous modelling and measured data collected to date. These are described in Section 3.7 and summarised in Table 6.1.

Table 6.1 Summary of ongoing monitoring programs

Area	Monitoring Programs
Surface waters	EPL 6092 contains individual discharge concentration limits for 14 surface water locations within the Port Kembla Steelworks site, 12 of which relate to water quality within the drainage network. Monitoring conditions specified in the EPL include monitoring parameters, locations, frequencies as well as discharge limits relating to the 50, 90 and 100 percentile concentrations for each discharge point. The No. 2 Blower Station drain (Point 79) is sampled every 8 days for an agreed suite of contaminants. As the quality of the discharges from 6BF won't be any different to 5BF, it is anticipated the suite of contaminants will remain the same. The Ironmaking East Drain is sampled for a similar suite of contaminants on a daily basis during dry weather discharge events.
Groundwater	BlueScope undertakes a groundwater monitoring program in line with condition E3.1 of EPL 6092, Contamination Monitoring and Assessment Program. This condition requires BlueScope to assess groundwater monitoring results against relevant criteria, assess for changes against historical results and evaluate the effectiveness of the monitoring well network. Wells which contain COPC are monitored annually while other wells are monitored less often. Monitoring is undertaken to inform assessment of the following: – The nature and extent of groundwater contamination utilising existing monitoring wells nominated by BlueScope. – The direction of groundwater movement. – The potential risks posed by the contamination, where present, to off-site ecological receptors. – Key changes (trends) in groundwater contaminant concentration. – The presence of surface water contamination in Allans Creek at prescribed sample locations.

BlueScope is undertaking extensive sampling under PRP182 to identify and quantify all sources of pollutants entering, and ultimately discharging from the 2BS drain to Allans Creek, including from the blast furnace effluent treatment system. The program includes assessment of the potential impact of discharges on the environmental values of the receiving waters with reference to the relevant criteria relating to levels of aquatic ecosystem protection defined in ANZG (2018). The findings of these ongoing programs, particularly PRP 182, will provide critical inputs to the assessment of the potential water quality impacts of discharges to Allans Creek.

6.4 Mitigation measures during decommissioning

Based on the experience gained during previous rundown and relining projects, drains used during typical operations would be delinked from the 6BF area during the rundown and decommissioning phase. This approach allows BlueScope to capture, test and treat all rundown effluent waters to ensure compliance with EPL 6092.

A rundown and decommissioning strategy (or similar) will be developed at a future date, in consultation with the EPA. The strategy will describe the water dosage and treatment processes during the rundown phase and management measures that will be implemented during decommissioning to ensure that water quality in the 2BS drain meets EPL conditions throughout the rundown process.

7. Evaluation and conclusion

This water quality impact assessment (WQIA) report has been prepared on behalf of BlueScope to support the EIS for the project and responds to the SEARs relating to surface and groundwater quality. It describes the existing ambient and background water quality and assesses the potential impacts to water quality associated with the construction, operational and decommissioning phases of the project with respect to the following guidelines:

- NSW Marine WQO's in NSW (DEC, 2006)
- Storing and Handling Liquids: Environmental Protection (DECC, 2007)
- Managing Urban Stormwater: Soils and construction - Volume 2 (DECC, 2008)
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2018)

Recommended mitigation and management measures were identified in response to the impact assessment findings.

7.1 Impacts from the project during construction

Potential risks to water quality during the construction phase relate to the potential release of poor quality stormwater into drains and waterways and the risk of mobilising existing contamination within soils and groundwater. These risks will be managed through the existing stormwater drainage network that will enable capture of stormwater prior to release to the environment.

All construction activities are proposed to take place in established areas with existing water management controls in place.

As a result, potential impacts to surface and groundwater quality during the construction phase are expected to be readily manageable through development and implementation of a site specific SWMP in accordance with the *Managing Urban Stormwater: Soils & Construction, vol. 1* (Landcom 2004).

7.2 Impacts from the project during commissioning

Potential risks to water quality during the commissioning phase relate to management of water used in initial flushing of cooling systems, management of potential foaming during start-up of the gas system, commissioning of the granulator and the potential for variable volume and chemical composition of blowdown waters during initial charging, purging and heating of the furnace.

These risks are well understood by BlueScope given the experience gained during the successful delivery of the three previous reline projects at PKSW and are proposed to be managed via the existing drainage network and site capture and containment measures, adequate storage basins, comprehensive monitoring and controlled discharge.

Subject to the development and implementation of a detailed commissioning WQMP or SWMP, these risks are expected to be able to be managed such that there are no adverse impacts to surface and groundwater quality during the commissioning phase except in accordance with EPL 6092 issued by the EPA.

Noting BlueScope's commitment to sustainable water management for the site, industrial water is proposed to be used for initial flushing of cooling systems and commissioning of the granulator. As a result, water proposed to be used during the commissioning phase will be sourced from an appropriately authorised and reliable supply.

7.3 Impacts of the project during operation

Returning 6BF to service and ceasing 5BF operations is expected to result in minor differences to BlueScope's future water uses and discharges. In particular, minor changes to cooling water discharges are expected due to the alternative cooling system associated with 6BF and locations of certain activities within the PKSW site will change due to the transfer of operations to 6BF.

Consideration has been given to potential impacts to water quality resulting from the project, including potential impacts to sensitive receiving environments as well as proposed improvements over existing operations.

Potential impacts to Allans Creek and the Inner Harbour relate to the temperature and chemical composition of discharges to 2BS drain. Recent monitoring data collected between 2016 and 2021 indicates that relatively few exceedances of the 95% LOSP DGV's occur during operations, with the exception of cyanide which nevertheless remains compliant with EPL 6092 concentration limits).

As part of BlueScope's ongoing commitment to improvement and efforts to comply with the NSW WQO's and ANZG guidelines, PRP 182 is currently underway to address the identified gaps in data when comparing the analytes measured at 2BS drain against the list specified in the ANZG (2018) DGVs. PRP 182 involves extensive sampling to identify and quantify all sources of pollutants entering, and ultimately discharging from the 2BS drain to Allans Creek, including from the blast furnace effluent treatment system.

Similarly, investigations are currently underway at 5BF to determine online, additional treatment solutions to reduce the concentration of cyanide in the blowdown water before it is discharged to the 2BS drain. Solutions identified through the investigations will be implemented at 5BF. Learnings and solutions for additional, online treatment at 5BF will be applied to future operation of 6BF.

The findings of these ongoing investigations will provide critical inputs to the assessment and ongoing management of the potential water quality impacts of discharges to Allans Creek and the Inner Harbour.

In relation to the temperature of future discharges to Allans Creek, the salt water heat exchanger cooling system proposed for 6BF requires an increased rate of salt water intake of approximately 3,000m^3/h, which represents an increase of around 10% over current operations associated with 5BF. Whilst the cooling system proposed for 6BF offers the benefits of reduced energy use, reduced water use, and reduced chemical treatment requirements in comparison to the existing cooling system at 5BF, it is predicted to result in an increase of approximately 0.5 - 1°C at the licence discharge point, No. 2 Blower Station drain (ID79).

Based on previous numerical modelling and water quality monitoring results, neither the existing or proposed discharge streams are expected to comply with the assessment criteria for slightly to moderately disturbed ecosystems. Allans Creek and the Inner Harbour have, however, been subject to the effects of warmer than ambient industrial discharges for decades and are considered part of a highly disturbed ecosystem (NSG, 2006). Given the history of the site, it is considered appropriate to rely on site-specific scientific studies, together with professional judgement and other relevant information, to derive site-specific trigger values.

In this regard, the predicted increase in temperature at the point of discharge from the 2BS drain into Allans Creek will comply with the temperature limits specified under Clause L3.5 of EPL 6092. Similarly, the predicted increase in temperature at the point of discharge into Allans Creek will comply with the site-specific temperature criteria (an increase of less than 3°C) developed during detailed studies into the ecology of Allans Creek and the Inner Harbour.

The risk of negative impacts to groundwater during operations is considered low on account of BlueScope's ongoing groundwater monitoring program and the recent and proposed improvements to capture and containment measures.

As part of an ongoing commitment to sustainability, BlueScope has completed approximately 77 water-related PRPs and continues to work closely with the EPA to identify opportunities for further improvement. As part of the current project, BlueScope has committed to delivering an extensive list of mitigation measures relating to water discharge and water use that will minimise the risk of surface water or groundwater contamination during operation of the project. These include improvements relating to:

- Process and discharge controls
- Stormwater
- Discharge locations
- Water use
- Wastewater management
- Spill management

Noting BlueScope's commitment to sustainable water management for the site, 6BF operations will continue to use industrial water in the steel manufacturing process; comprised of both recycled water from the Wollongong Water Recycling Plant (over 85% of the current industrial water mixture) and unfiltered Avon Dam water.

In addition, the stormwater drainage system proposed for the project will enable the capture and reuse of stormwater, providing improved water cycle management over the current stormwater management capabilities. As a result, water use during the operation of the project will be sourced from an appropriately authorised and reliable supply.

Subject to BlueScope's implementation of the proposed mitigation measures and ongoing efforts to characterise and reduce pollutants introduced to the water cycle, 6BF operations are expected to maintain compliance with EPL 6092 issued by the EPA such that there are no adverse impacts to surface and groundwater quality.

7.4 Impacts from the project during decommissioning

6BF is expected to operate for 20 years after which time furnace conditions would dictate relining or decommissioning requirements. Potential impacts to surface and groundwater quality during the decommissioning phase are expected to be readily manageable through development and implementation of a rundown and decommissioning strategy (or similar).

7.5 Final conclusion

Based on the investigations and assessment undertaken by GHD and the conclusions drawn in this WQIA report, it is considered that, subject to the recommended mitigation measures being applied, the proposed project will not result in any material adverse impacts to water quality, when compared to the current operations of 5BF. Amongst other positive effects, the project will result in reduced water use, improved energy efficiency and improved water capture capability thereby minimising the risk of adverse water quality impacts.

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