

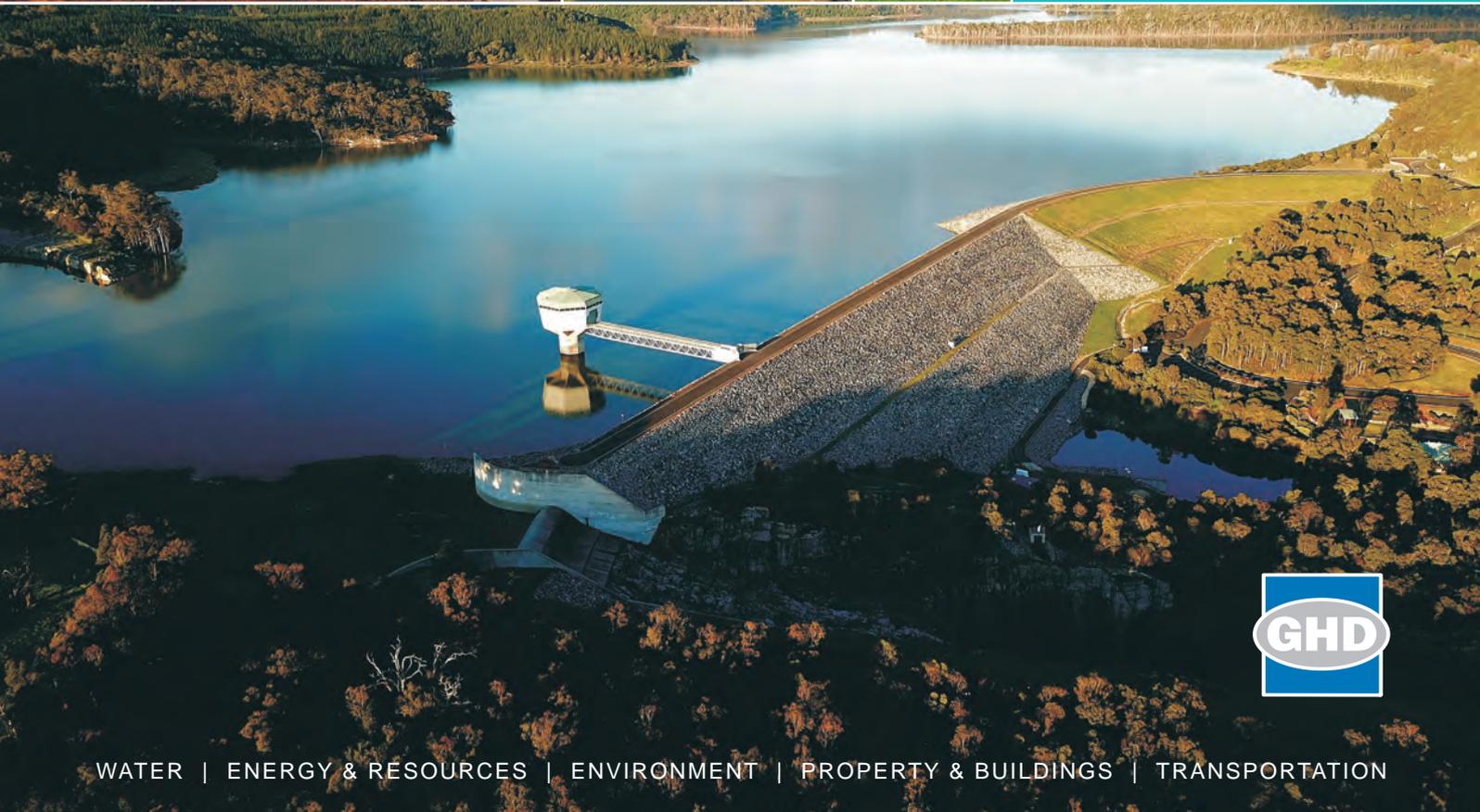


# Appendix E

## Discharge Monitoring and Management Plan

# Brine Pipeline and Outfall

February 2021



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# Abbreviations

Abbreviation	Definition
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
COC	Chain of Custody
DMMP	Discharge Monitoring and Management Plan
EPA	Environmental Protection Authority
EPIRB	Emergency Position Indicating Radio Beacon
EQC	Environmental Quality Criteria
HSE	Health Safety and Environmental
IUCN	International Union for the Conservation of Nature
JHA	Job Hazard Analysis
km	kilometres
KSIA	Kemerton Strategic Industrial Area
LOR	Limit of Reporting
m	Metres
NATA	National Association of Testing Authorities
NWQMS	National Water Quality Management Strategy
PPE	Personal Protective Equipment
PSU	Practical Salinity Units
QA/QC	Quality Assurance/ Quality Control
RIB	Rigid Inflatable Boat
RPD	Relative Percentage Difference
RO	Reverse Osmosis
SDS	Safety Data Sheet
TDS	Total Dissolved Solids
UM3	Update Merge 3
WA	Western Australia
WET	Whole Effluent Toxicity
WQO	Water Quality Objective

# 1. Introduction

## 1.1 The Harvey Water KSIA Project

Harvey Water supplies non-potable water to rural areas in the south-west region primarily for agricultural industry use. Water is drawn under license from Waroona, Drakesbrook, Logue Brook, Harvey and Wellington Dams, and the Wokalup pipe head. Water is piped under gravity pressure through 495 kilometres (km) of closed pipelines and 256 km of open channels to its customers (*Harvey Water, 2020*).

Harvey Water is constructing enabling infrastructure at the Kemerton Strategic Industrial Area (KSIA), Western Australia (WA) to provide wastewater disposal services to customers established in the KSIA. This enabling infrastructure consists of a pipeline, approximately 9.5 km long, connecting to an existing 1.5 km section. The final pipeline is approximately 11 km in length and extends from the Kemerton Strategic Industry Area to the Indian Ocean. The proposed pipeline route and ocean outfall (the Proposal) are shown in Figure 1-1.

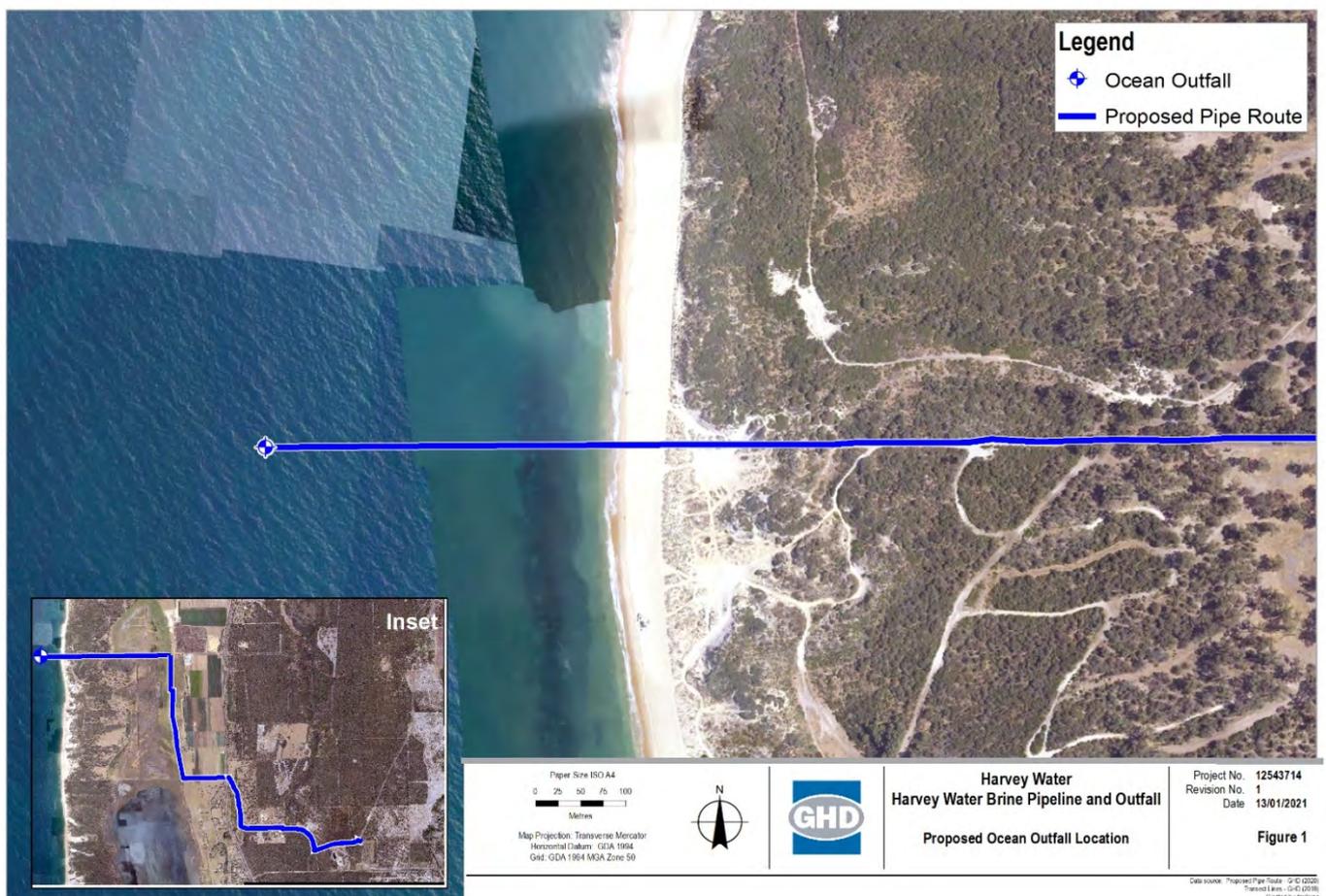


Figure 1-1 Proposed wastewater pipeline and ocean outfall location

## 1.2 Document Purpose

Harvey Water has a planning proposal for the construction of the KSIA pipeline and marine outfall that will be submitted to the responsible authority (Shire of Harvey Planning and Environment Department). The Proposal will also be referred to the Environmental Protection

Authority (EPA) for assessment under Section 38 of the *Environmental Protection Act 1986* (Government of Western Australia, 2020).

The EPA has stated that a Discharge Monitoring and Management Plan (DMMP) is required for the Proposal. The Proposal will operate with a peak discharge of 15 liters per second (L/s). The pipeline infrastructure has a maximum flow capacity of 72 L/s which may be utilised in the event of a future expansion of the customer base, noting that the initial flow rates once commissioned and operational, will be in line with the peak flow rate referred to the EPA for the Proposal (15 L/s).

The purpose of this document is to provide the foundation for a long-term monitoring framework and satisfy the EPA monitoring requirements.

### 1.3 Scope

The scope of this DMMP is for the proposed KSIA pipeline outfall at the location shown in Table 1-1 and Figure 1-1, which lies 3.3 km west of Parkfield, and approximately 2.5 km south of Binningup, WA. The outfall will be buried and extend from the shoreline to approximately 400 metres (m), where it will emerge from the seabed. The outfall will lie on the seabed in approximately 8 m of water.

Table 1-1 Location of proposed Harvey Water KSIA outfall

	Easting	Northing	Geodetic Reference
Proposed Harvey Water KSIA outfall location	115.678997	-33.175668	GDA94, MGA Zone 50

This DMMP covers the monitoring of discharge into the Indian Ocean from this specific location from the proposed KSIA pipeline outfall.

### 1.4 Assumptions and limitations

It should be noted that no specific baseline data are available for water quality in the vicinity of the proposed KSIA outfall, as no baseline water quality monitoring has been undertaken to date. Baseline reference data may be available from outfalls in the wider area; Harvey Water is currently investigating to determine if such data is available from other operators.

Criteria for monitoring have been derived based upon relevant guidelines. Further criteria can also be derived from future reference water sampling once a suitable number of samples have been obtained.

The monitoring programme proposes taking measurements and samples of surface waters in the field in the vicinity of the discharge that will require the use of a small vessel. This has the potential to affect the measurements and samples, and hence affect the monitoring results. Consideration of this has been taken into account in the procedures developed for the monitoring programme.

### 1.5 Review Period

This document should be reviewed in accordance with applicable Harvey Water internal policies and procedures. As the monitoring programme will be ongoing on a quarterly basis the DMMP be reviewed annually to ensure that the monitoring programme is achieving its objectives.

The review period acknowledges the likelihood that the customer base of the KSIA system is likely to increase in the future, and hence the wastewater discharge rate has potential to

increase. The DMMP be reviewed each time a significant change to the KSIA system is proposed.

## 1.6 Limitation of Liability

*This report: has been prepared by GHD for Harvey Water and may only be used and relied on by Harvey Water for the purpose agreed between GHD and Harvey Water as set out in section 1.3 of this report.*

*GHD otherwise disclaims responsibility to any person other than Harvey Water 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 Harvey Water 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.*

## 2. Regulatory Regime

### 2.1 Environmental Protection Act 1986

The Environmental Protection Authority exercises its powers under the *Environmental Protection Act 1986* (Government of Western Australia, 2020). Section 44 (2) establishes that the EPA must make reference to key environmental factors when assessing the potential environmental impacts of a referred proposal.

Environmental factors are those parts of the environment that may be impacted by an aspect of a proposal or scheme. The EPA has 14 environmental factors, organised into five themes: Sea, Land, Water, Air and People. The factors and objectives for sea are set out in Table 2-1.

Table 2-1 Environmental factors and objectives for theme 'Sea' (EPA, 2020a)

Theme	Factor	Objective
Sea	<b>1. Benthic Communities and Habitats</b>	To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained.
	<b>2. Coastal Processes</b>	To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected.
	<b>3. Marine Environmental Quality</b>	To maintain the quality of water, sediment and biota so that environmental values are protected.
	<b>4. Marine Fauna</b>	To protect marine fauna so that biological diversity and ecological integrity are maintained.

Of particular relevance to this DMMP are 'to protect benthic communities and habitats' (factor 1), and 'to maintain the quality of water' (factor 3). These are the key EPA considerations around which the monitoring programme defined within this DMMP has been designed.

#### 2.1.1 Water Quality

The EPA environmental factor guideline for marine environmental quality (EPA, 2016a) applies to the State's coastal waters and estuaries. Environmental quality refers to the level of contaminants in water, sediments or biota or to changes in the physical or chemical properties of waters and sediments relative to a natural state; in the context of marine water quality, emissions or discharges that can cause water quality deterioration are the key considerations. The National Water Quality Management Strategy (NWQMS) defines five nationally agreed (i.e. applicable to all States) environmental values that must be protected:

- Ecosystem health;
- Fishing and aquaculture;
- Recreation and aesthetics;
- Industrial water supply;
- Cultural and spiritual.

#### 2.1.2 Benthic Communities and Habitats

The environmental factor guideline for benthic communities and habitats recognises that benthic habitats and communities are important components of all marine ecosystems and are

fundamental to the maintenance of ecological integrity and biological diversity of the marine environment as a whole. Wastewater discharges have the potential to affect the quality of water, sediment and biota in the vicinity of the discharge and impact on the health of benthic communities (EPA, 2016b).

When considering potential impacts to benthic communities the EPA is mainly concerned with changes that are likely to significantly impact biological diversity and ecological integrity and is therefore focused on the extent, severity and duration of impacts and whether any consequent losses to benthic communities are temporary or permanent.

## 2.2 Environmental Quality Criteria

Environmental quality criteria (EQC) are scientifically derived limits of acceptable change ( $\Delta$ ) to a measurable environmental quality indicator that is important for the protection of the associated environmental value (EPA, 2016c). EQC are commonly applied through a risk-based approach intended to capture uncertainty around the level of impact by staging monitoring and management responses according to the degree of risk to environmental quality (EPA, 2016b), which in the case of the KSIA outfall is deemed as low risk due to the make-up of the wastewater discharge, the relatively modest flow rate and the dispersive nature of the receiving environment.

For the proposed KSIA outfall, a low level of ecological protection is proposed that is defined by the zone of initial dilution. Relevant water quality objectives (WQOs) have been defined based upon the make-up of the wastewater discharge and using a precautionary approach (refer to section 3).

## 3. Water Quality Objectives

### 3.1 Defining Water Quality Objectives

The Water Quality Objectives (WQOs) at the edge of the mixing zone for key parameters of concern in the wastewater discharge were developed as follows:

- For toxicants or physical and chemical stressors, the mixing zone criteria are adopted from the ANZG (2018) guidelines.<sup>1</sup>
- For water treatment chemicals, ecotoxicity information was sourced from Safety Data Sheets (SDSs) of each chemical for various marine species. As a conservative measure, the lowest toxicity concentration (i.e. requiring the highest dilution) was adopted as the WQO for each water treatment chemical. Ecotoxicity dosages are dependent on concentration and exposure time (e.g. 50 mg/L over 96 hours). The time component was not considered during modelling, so the concentration was conservatively assumed to be toxic for instantaneous exposure.
- For salinity, a conservative salinity target of <0.5 Practical Salinity Units (PSU) decrease from ambient conditions was selected as the target. For reference, the Southern Seawater Desalination Plant (which has an ocean outfall approximately 5 km to the north of the proposed Harvey Water ocean outfall) operates at a target of not more than  $\Delta 1.0$  PSU 95% of the time, and a maximum instantaneous salinity target of  $\Delta 1.3$  PSU, both to be achieved at the edge of the mixing zone (*Water Corporation, 2009*). This is significantly higher than the target adopted for this assessment.

The WQOs are expressed as a required dilution factor of the wastewater discharge by the ambient marine waters to meet the relevant water quality targets.

### 3.2 Modelling-based WQO considerations

In order to characterise the behaviour of the wastewater discharge from the KSIA outfall, modelling was undertaken. Three discharge rates were considered in the modelling analysis including referred Proposal moderate flow (5 L sec<sup>-1</sup>), referred Proposal ultimate peak flow (15 L sec<sup>-1</sup>) and stage 2 ultimate peak flow (72 L sec<sup>-1</sup>).

The near-field dilution of the ocean outfall wastewater plume was simulated with Update Merge 3 (UM3) by GHD (refer to GHD report 12543714-REP\_Near and Far-Field Plume Dispersion Modelling [*GHD, 2021a*]). UM3 is a model used to predict the degree of dilution and the spatial extent of the near-field mixing zone from the jet- (due to the momentum of the discharge emanating from the outlet pipe into the marine waters) and buoyancy- (in this case mixing that the buoyant wastewater plume undergoes as it rises through the seawater column) driven mixing of the wastewater discharge during operation.

To predict additional dilution due to ambient dispersion beyond the near-field zone, a far-field modelling assessment with the three-dimensional (3D) MIKE3 FM (flexible mesh) hydrodynamic model was used to simulate wind and tide-induced currents.

The dilution factors to define the edge of the mixing zone are calculated using the below formula:

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<sup>1</sup> ANZG (2018) does not have any marine trigger values for nitrate and boron, whereas ANZECC & ARMCANZ (2000) does have low reliability trigger values that are used within this DMMP.

$$D = \frac{C_O - C_A}{C_T - C_A}$$

where:

D = Target dilution factor

C<sub>O</sub> = Outlet concentration

C<sub>T</sub> = Target concentration to achieve the WQO

C<sub>A</sub> = Ambient (background) concentration

At the time of the modelling assessment, no ambient data for the discharge site were available, therefore dilution targets are calculated on the basis of assumed ambient concentrations using professional judgement.

Concentrations for each analyte are provided in Table 3-1. For the water treatment chemicals, concentrations were given for the feedwater to the reverse osmosis (RO) plant (not the outlet concentrations). Therefore, outlet concentrations for water treatment chemicals were estimated on the following basis:

- The treatment chemical is assumed to be conserved (i.e. not degraded) throughout the RO process and within the wastewater holding tanks and discharge pipe. This assumption is very conservative, as these chemicals are highly reactive.
- The entire mass of the chemical is assumed to be removed from the RO product water and transmitted entirely to the wastewater stream (i.e. the outlet). The concentration in the RO feed water was therefore assumed to increase in the wastewater discharge proportionally to the ratio of RO feedwater flow-rate to the wastewater discharge flow-rate (a factor of 7.7).

The calculated dilution targets for the analytes of interest are summarised in Table 3-1.

Table 3-1 Summary of water quality data and dilution calculations

Parameter	Units	C <sub>O</sub>	C <sub>T</sub>	C <sub>A</sub>	D
Total Dissolved Solids (TDS)	mg/L	11,996.0	Refer to Salinity	Refer to Salinity	Refer to Salinity
pH	unitless	8.51	8.0-8.4	8.3 <sup>2</sup>	2 <sup>3</sup>
Temperature	°C	20-25	Not Assessed <sup>4</sup>		
Hardness as CaCO <sub>3</sub>	mg/L	7,798.6	No Criterion <sup>5</sup>	NA	
Calcium	mg/L	899.5	No Criterion <sup>5</sup>	NA	
Magnesium	mg/L	1,354.2	No Criterion <sup>5</sup>	NA	
Sodium	mg/L	7,488.3	No Criterion <sup>5</sup>	NA	
Potassium	mg/L	229.1	No Criterion <sup>5</sup>	NA	
Barium	mg/L	1.9	No Criterion <sup>5</sup>	NA	
Alkalinity	mg/L	3,650.5	No Criterion <sup>5</sup>	NA	
Sulphate	mg/L	1,796.6	No Criterion <sup>5</sup>	NA	
Chloride	mg/L	13,572.8	No Criterion <sup>5</sup>	NA	
Fluoride	mg/L	9.8	No Criterion <sup>5</sup>	NA	

<sup>2</sup> Ambient pH assumed to be 75<sup>th</sup> percentile of the acceptable water quality range.

<sup>3</sup> Dilution was calculated on the basis of H<sup>+</sup> ion concentrations (not pH directly, since pH is a logarithmic scale).

<sup>4</sup> Discharged water will have a similar temperature to the ambient air temperature. No significant differences are expected between the discharge and the near-shore coastal water.

<sup>5</sup> Parameter is not classed as a marine toxicant – no criterion available.

Parameter	Units	C <sub>0</sub>	C <sub>T</sub>	C <sub>A</sub>	D
Nitrate	mg/L	2.8	0.70	0.0025 <sup>6</sup>	4
Phosphate	mg/L	0.2	No Criterion <sup>5</sup>	NA	
Silica	mg/L	356.1	No Criterion <sup>5</sup>	NA	
Boron	mg/L	2.0	5.10	NA	NA <sup>7</sup>
Salinity	PSU	11.91 <sup>8</sup>	34.5 <sup>9</sup>	35 <sup>9</sup>	<b>46</b>
<b>Water Treatment Chemicals</b>					
Sodium Molybdate	mg/L	152.7 <sup>10</sup>	50 ( <i>Acohs, 2014</i> )	0	3
THPS (Biocide)	mg/L	381.7 <sup>10</sup>	15 ( <i>Frayne, 2017</i> )	0	25
Phosphonates (PBTC)	mg/L	77.4 <sup>10</sup>	33.3 ( <i>NM&amp;C Co., 2015</i> )	0	2
Phosphonates (HEDP)	mg/L	77.4 <sup>10</sup>	3 ( <i>SPE Chemicals, 2020</i> )	0	26
Polyacrylate	mg/L	2.9 <sup>10</sup>	100 ( <i>Recyc PHP, 2020</i> )	0	No dilution required
Azole	mg/L	38.2 <sup>10</sup>	100 ( <i>Ibis Water, 2019</i> )	0	No dilution required
Molybdate	mg/L	119.1 <sup>10</sup>	41 ( <i>HACH, 2017</i> )	0	3
<b>Colour Legend:</b>					
ANZECC & ARMCANZ (2000) Physical and Chemical Stressors for Inshore Marine Water – south-west Australia.					
ANZECC & ARMCANZ (2000) Low reliability trigger value for marine waters.					
Conservative mixing zone target of <0.5 PSU change from ambient conditions.					
Lowest toxic concentration reported in the SDS.					

The most stringent dilution target is **46-fold** for salinity. Therefore, achieving a 46-fold dilution of the wastewater plume will ensure adequate dilution of all other parameters to meet the WQOs for the above analytes. Note though the wastewater salinity is approximately a third of seawater, it is a buoyant plume that rises to the surface when discharged into the marine waters through the outlet.

Whole-effluent Toxicity (WET) testing is not considered necessary for monitoring of the KSIA wastewater discharge due to the highly dispersive nature of the receiving marine environment (based on the predictions made in the modelling results – refer to section 3.3) and the relatively benign nature of the analytes (refer to Table 3-1). WET testing is used to determine the actual acute and chronic toxicity of wastewater discharges.

For water quality monitoring, a suite of laboratory analyses are recommended for the testing of analytes in Table 3-1 (refer to section 5.4.2).

### 3.3 Modelling Results

The outputs of the near-field and far-field dispersion modelling were used to define the characteristics of the mixing zone in the receiving coastal waters. A range of flow rates ranging from 5 to 72 L sec<sup>-1</sup> were modelled to take into account the future potential flow rates from the KSIA outfall.

<sup>6</sup> Ambient concentration assumed to be 50% of the ANZECC & ARMCANZ (2000) default guideline trigger value for physical and chemical stressors (not toxicants) in inshore marine waters of south-west Australia.

<sup>7</sup> Outlet concentration below mixing zone criterion – no dilution required.

<sup>8</sup> Salinity (PSU, or ppt) is calculated from the TDS concentration.

<sup>9</sup> Mixing zone salinity target of 34.5 PSU represents a salinity change of 0.5 PSU from ambient (ambient assumed to be 35 PSU, which is standard for marine water in south-west Australia).

<sup>10</sup> Outlet concentration estimated as 7.7 x the RO feedwater concentration as described in Section 3.2, bullet-point two.

The near field modelling results indicated that the buoyant plume is predicted to reach the sea surface at a horizontal distance of 6-9 m west of the outlet. This distance defines the edge of the near-field zone. Average plume dilutions (average dilution across the plume width) at the edge of the near-field were predicted to reach 350-fold for the referred Proposal moderate flow rate ( $5 \text{ L sec}^{-1}$ ), 146-fold for the referred Proposal peak flow rate ( $15 \text{ L sec}^{-1}$ ) and 58-fold for the infrastructure capacity peak flow rate ( $72 \text{ L sec}^{-1}$ ), while plume centreline dilutions (lowest dilution in plume centre where a lower degree of ambient mixing occurs) were 104-fold, 50-fold and 28-fold, respectively. The referred Proposal flow rates assessed are predicted to achieve the target dilution of 46-fold in close proximity to the outlet (within the near-field zone and within a distance of 5 m). Average plume dilutions for the infrastructure capacity peak flow case ( $72 \text{ L sec}^{-1}$ ) achieved the dilution target, however the central portion of the plume was predicted to require additional far-field dilution in order to achieve the water quality standards.

To inform the far-field dilution, far-field modelling with MIKE3 FM was also undertaken, which indicated that the 46-fold dilution target (i.e. achievement of the WQOs) for the infrastructure capacity flow of  $72 \text{ L sec}^{-1}$  will be achieved within a maximum distance of ~40 m from the outlet for both summer conditions and winter conditions (Figure 3-1).

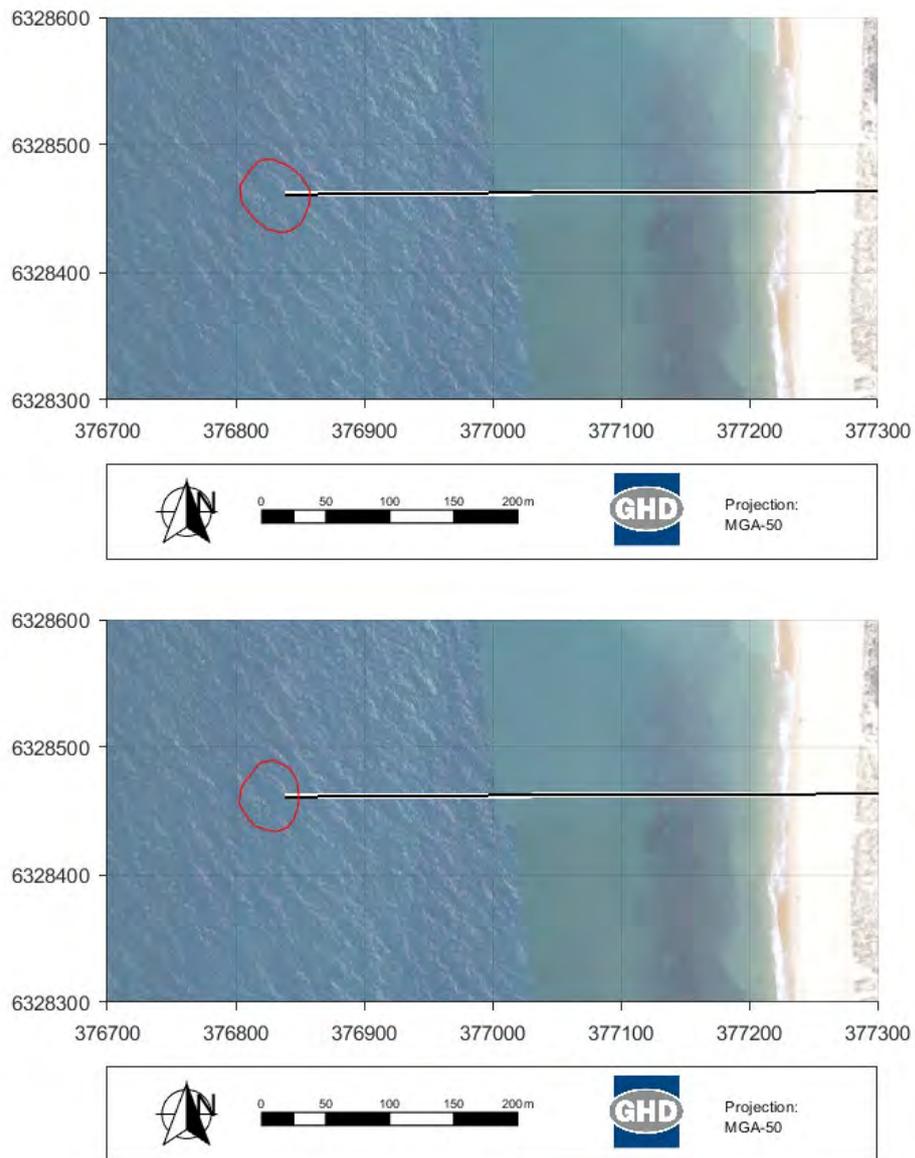


Figure 3-1 Maximum predicted extent to achieve a dilution of 46-fold or greater for the summer simulation (left) and winter simulation (right) (GHD, 2020a)

The far-field modelling predictions which indicate the WQOs will be achieved at a maximum distance of 40 m from the outlet for the infrastructure capacity peak flow ( $72 \text{ L s}^{-1}$ ). A **100 m radius around the outlet** is recommended to be established as the regulatory mixing zone (ecological protection zone) for compliance monitoring purposes. The 100 m radius allows additional distance beyond that predicted by the modelling to account for any uncertainties inherent with a modelled approach and to demonstrate adequate sampling of the surrounding area. It also allows for consistent sampling in the event that the peak flow rate is increased in the future.

The salinity dispersion modelling has shown that near ambient levels of salinity, temperature, pH and treatment chemicals concentration are likely to be achieved close to the outfall as defined by the predicted boundary of the mixing zone. The model output and the above regulatory mixing zone has been used to inform the design of the monitoring programme.

# 4. Environmental Effects

The purpose of this section is to give a high-level summary of the potential for environmental impacts in the vicinity of the proposed KSIA outfall, used to inform the design of the monitoring programme. This is focused on two areas: benthic habitats and water quality.

## 4.1 Benthic Habitats

### 4.1.1 Introduction

A benthic habitat survey took place on 15<sup>th</sup> November 2019 by GHD (GHD, 2021b). A towed underwater video system was used to conduct a visual assessment of seabed conditions to assess habitat type or dominant species in the vicinity of the proposed pipeline construction and outfall location. The purpose of the benthic habitat survey was to identify any potential sensitive habitats or species that could be impacted by the proposal. Figure 4-1 shows the target video transect survey lines.

Further information on the benthic habitat survey conducted by GHD is provided in the benthic habitat survey report (GHD, 2021b).

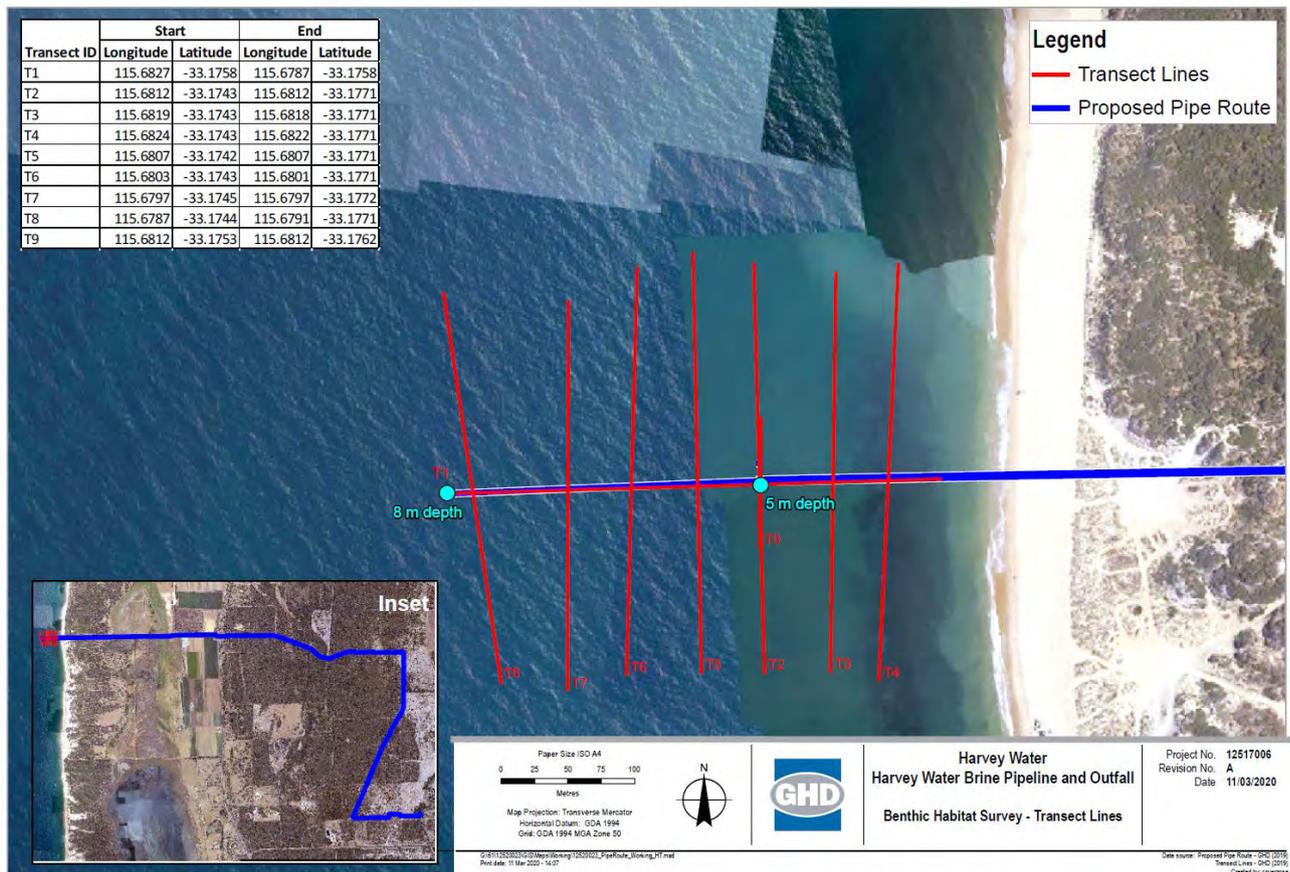


Figure 4-1 KSIA outfall benthic habitat underwater video survey location and target transect lines (GHD, 2020b)

### 4.1.2 Survey Results

The following sections presents the survey findings as collected and documented by GHD .

#### 4.1.2.1 Benthic Substrate

Based on towed imagery analysis, two substrate types were clearly distinguishable; unconsolidated (sand) and consolidated (reef/hard rock/boulders). Consolidated substrate was predominantly colonised, forming reefs. Reef types identified included low relief (<1 m) dominated by algae, and low/moderate relief (1-3 m) with mixed algal and epifauna assemblages (Figure 4-2) (GHD, 2020b).

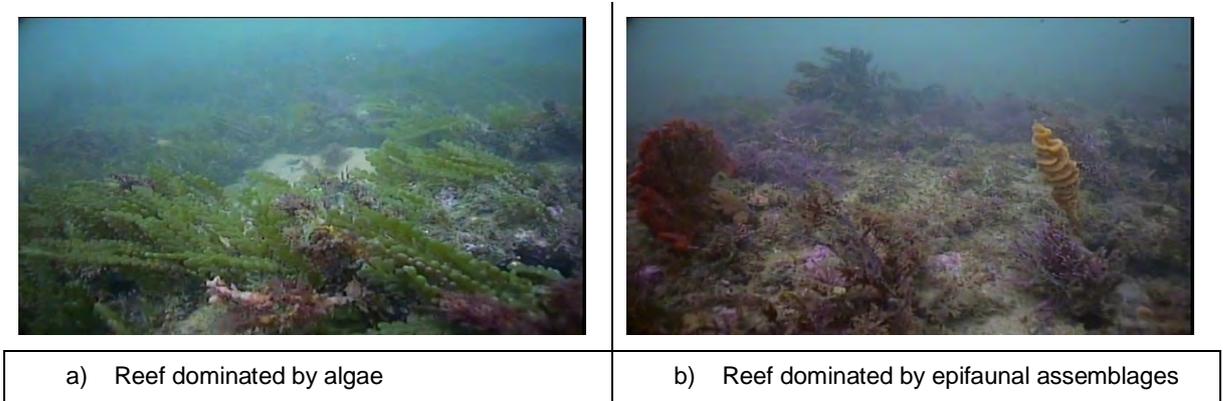


Figure 4-2 Reef types encountered during the underwater video survey (GHD, 2021b)

#### 4.1.2.2 Biota Profile

A summary of the benthic organisms encountered on the underwater video survey is provided by GHD in Table 4-1. Many of the observed biota could not be identified to species level.

Table 4-1 Summary of the biota encountered during the underwater video survey (GHD, 2021b)

Seagrasses	Algae	Invertebrates	Fish
<i>Amphibolis spp.</i>	<i>Caulerpa spp.</i>	Ascidians	Globe fish ( <i>Diodon nictemerus</i> )
	<i>Sargassum spp.</i>	Corals	Shaw's Cowfish (female) ( <i>Aracana aurita</i> )
	<i>Ecklonia spp.</i>	Sponges	
	<i>Cystophora spp.</i>	Echinoderms	
	Unidentified algae	Western rock lobster ( <i>Panulirus Cygnus</i> )	
		Other invertebrates	

Seagrass identified in the area was *Amphibolis spp.* (Figure 4-3). More seagrass was observed in near-shore waters, combined with macroalgae, but not observed in the furthest offshore transects of T5 - T8. Seagrass was not observed at the proposed outfall location i.e. transects T8 (Figure 4-4) (GHD, 2021b).

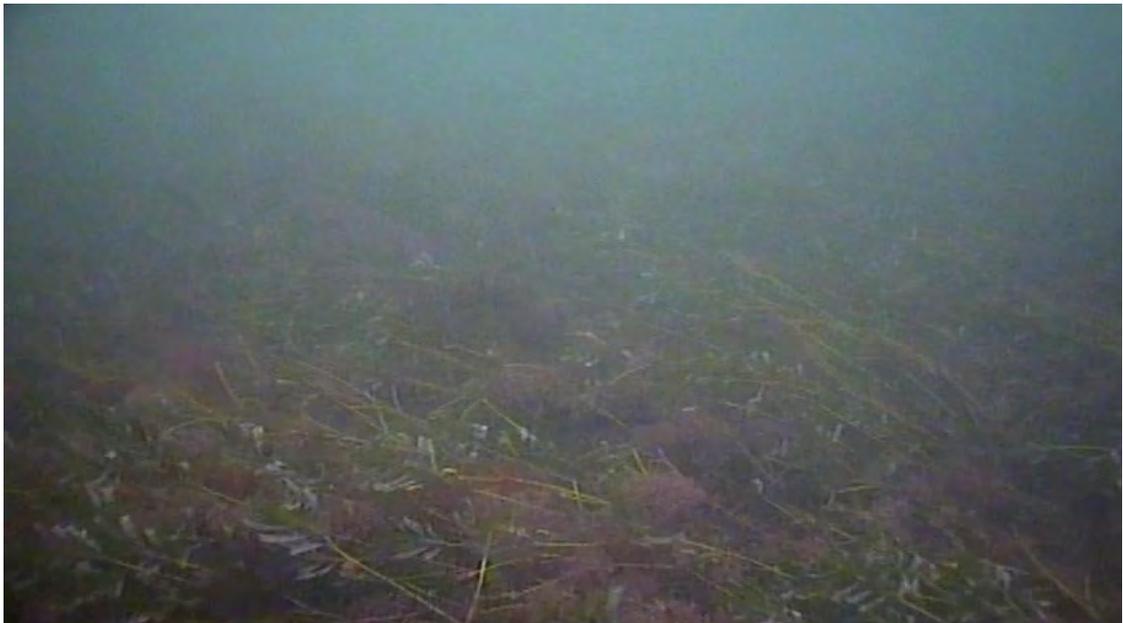


Figure 4-3 Seagrass patch (*Amphibolis spp.*) in nearshore waters (GHD, 2020b)

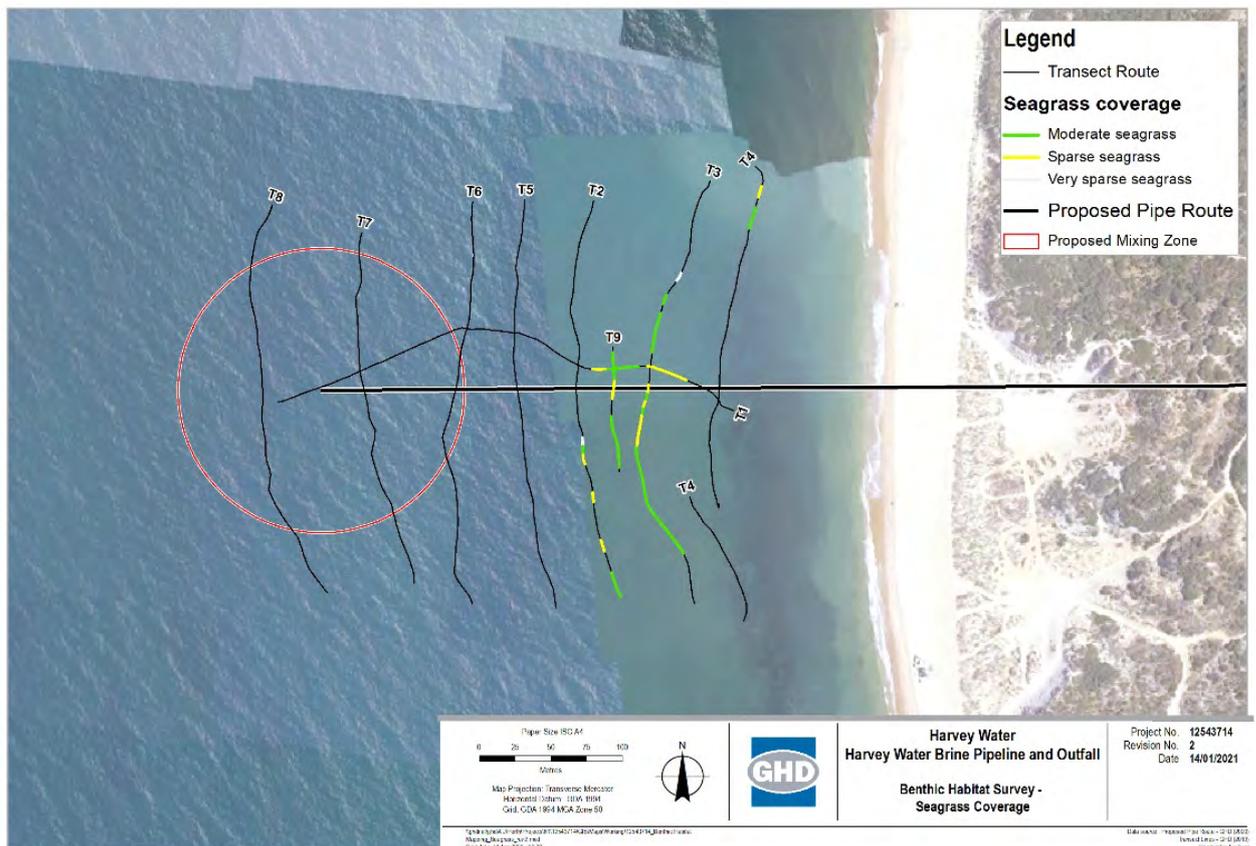


Figure 4-4 Seagrass distribution along the underwater video survey transect lines (actual) (GHD, 2020b)

Few species of macroalgae could be identified to species level (Table 4-1), however there appeared to be high diversity and abundance throughout all transects ranging from filamentous to large canopy forming, with moderate to dense coverage across the survey area (Figure 4-5). Large macroalgae (e.g. *Ecklonia spp.*) dominated the near-shore waters and macroalgae reduced in size with distance offshore (GHD, 2021b).

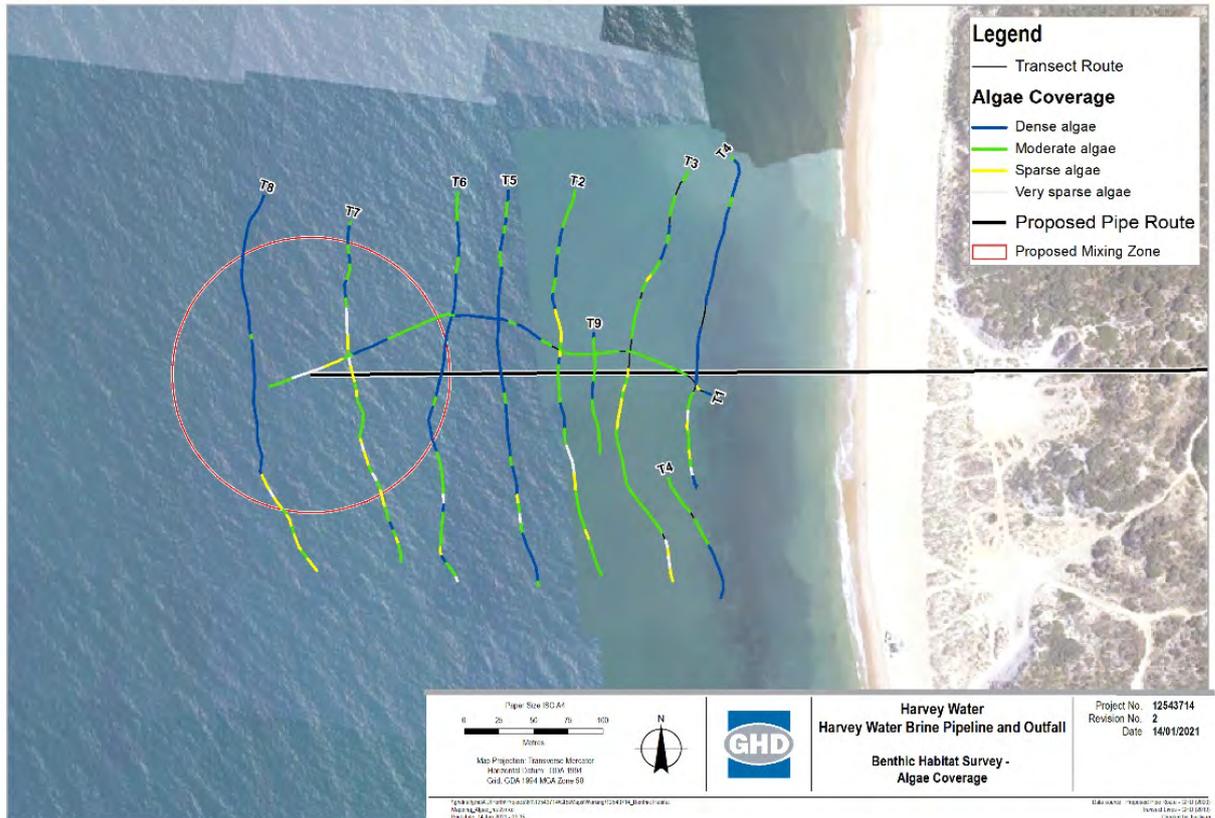


Figure 4-5 Macroalgae distribution along the underwater video survey transect lines (actual) (GHD, 2020b)

Epifauna were observed on most consolidated substrate; however, given the density of macroalgae, coverage was rarely estimated to be >30%. Sponges were the dominant benthic macro-organism and appeared relatively diverse, ranging in colour from encrusting to erect forms. The sea tulip (*Pyura spp.*), a sessile ascidian, was also observed regularly. There were only a small number of other invertebrates that could be discerned due to poor visibility (GHD, 2021b).

There was one observation of a western rock lobster (*Panulirus Cygnus*) and there were several fishing pots just south of transect T4. The Western Rock Lobster is listed as a Key Ecological Feature identified in the South-west Marine Bioregional Plan, with one of the pressures assessed as of potential concern being physical habitat modification (Clifton *et al.*, 2007, in: DAWE, 2020).

Four fish (two species) were observed during the survey; three observations of female Shaw's cowfish (*Aracana aurita*), and one observation of Globe fish (*Diodon nicthemerus*). Both species are endemic to Australia and are not listed as threatened or vulnerable (noting that Globe fish has not been evaluated by the IUCN (IUCN, 2020).

#### 4.1.3 Summary

The most notable biota observed during the survey was seagrasses, which were observed in the inshore areas but not out to the approximate location of the outfall.. Reefs were the dominant habitat type, containing relatively diverse assemblages of macroalgae and invertebrates, namely sponges. Reef structure and assemblages changed with distance from shore, where sandy patches became more frequent (GHD, 2021b).

The seagrass identified during the underwater video transects were not at a density and coverage considered to constitute a seagrass meadow. However, further underwater video

monitoring of benthic communities and habitats is proposed as part of the monitoring programme (refer to section 5.6).

## 4.2 Water Quality

This section provides a high-level summary of the potential impacts of wastewater discharges on marine water quality in order to inform the monitoring programme design.

Wastewater discharge can potentially give rise to environmental impacts due to localised changes in water quality, characterised by changes in salinity, temperature and the use of chemicals in the RO process (such as coagulants and coagulant aids, anti-foam agents, cleaners and biocides). These chemicals are used primarily to avoid fouling of the RO screens.

At a high level, the main potential impacts specifically from wastewater discharge into marine water include potential impacts on plankton, fish, and benthic habitats such as coral reefs and seagrasses.

Due to the relatively small spatial extent of the predicted change in salinity to the marine waters expected from the proposed wastewater discharge ( $\Delta$  0.5 PSU and primarily in the surface waters) the environmental impacts from this discharge are expected to be negligible.

In addition, the near-field dispersion modelling indicates that the wastewater discharge will rise because of its lower salinity (and hence density) rather than sink (with little to no seabed impact); consequently the wastewater discharge during operation is expected to cause a negligible impact to the surrounding reef habitat or to other benthic habitats (e.g. seagrass) and their associated fauna (GHD, 2020a).

In summary, negligible impacts on water quality are anticipated as a result of the proposed KSIA wastewater discharge. However, this DMMP commits to monitoring of water quality in the vicinity of the KSIA outfall to establish a monitoring regime for future uses

# 5. Monitoring Programme

## 5.1 Mixing Zone

It is common practice to define a mixing zone, which is a defined area around a marine outfall, where reduced water quality due to the discharge can be reasonably expected to occur (ANZECC & ARMCANZ, 2000).

Discharged water from the KSIA outfall may temporarily alter water salinity and quality from background levels, and may potentially temporarily alter other parameters, such as temperature, hydrogen ion concentration (pH) and dissolved oxygen content, in the immediate vicinity of the outfall.

regulatory mixing zone (ecological protection zone) for compliance monitoring purposes

The regulatory mixing zone (ecological protection zone) for compliance monitoring purposes for the KSIA outfall has been set within this DMMP at 100 m (north-south) x 100 m (east-west), centred on the discharge location. Within this area, the WQOs defined in Table 3-1 are predicted to be achieved, based on a target dilution factor of 46 (GHD, 2020a) (refer to section 3.3).

The monitoring programme adequately samples the area of higher potential impact as defined by the mixing zone boundary predicted in the far-field modelling (Figure 3-1).

## 5.2 Baseline Water Quality Monitoring

No baseline water quality monitoring has been undertaken to date within the proposed outfall area. Harvey Water is currently investigating whether baseline reference data may be available from outfalls in the wider area from other operators.

Reference water monitoring and sampling is recommended, which will be undertaken during the monitoring programme (refer to section 5.5).

## 5.3 Monitoring Transects and Target Locations

The ocean outfall monitoring programme area will be a circle, with diameter 100 m, centred on the discharge location.

The proposed monitoring programme is based on a combination of field measurements (of salinity, pH and water temperature) and laboratory analysis of surface water samples.

## 5.4 Field Monitoring Frequency

It is proposed that the field monitoring be conducted on a biannual basis (i.e. one fieldwork monitoring excursion event every six months). Harvey water commits to this monitoring for an initial period of two years. Following this initial period, the monitoring requirement/ frequency will be re-evaluated based on the field results. If quality targets are consistently met, the monitoring programme will cease. The need for re-establishing field monitoring will be evaluated based on operational condition changes (i.e. future increased discharge flow rate).

The monitoring events will be targeted (where practicable) for anticipated worst-case mixing conditions i.e. a slack tide, with low wind and low swell conditions. Tidal predictions will be used to inform slack tide timings, whilst meteorological/ metocean forecasts will be used to inform anticipated wind and swell conditions.

#### 5.4.1 Field Measurements

The field monitoring programme will involve the measurement of vertical profiles of salinity, pH and water temperature with a multi-parameter sonde (e.g. Hanna HI98194 or equivalent (*Hanna Instruments, 2020*)).

The field measurements will be conducted along two proposed transects, each measuring 300 m in length, centred on the outfall location (Table 5-1 and Figure 5-1). Vertical profiles of salinity, pH and temperature measurements will be made along each transect at 25 metre intervals; a total of 13 sampling points along each transect.

Table 5-1 Proposed KSIA outfall monitoring transect location details

Sample point ID	Remarks	Target location (GDA94 MGA Zone 50)		Vertical Profiles			Primary Sample	QA/QC Split or Replicate Sample
				1	2	3		
<b>Transect 1 (300 m north-south, centred on discharge location)</b>								
T1.01	150 m north of outfall	115.679017	-33.174316	Salinity (PSU)	pH	Temp. (°C)		
T1.02	125 m north of outfall	115.679013	-33.174541	Salinity (PSU)	pH	Temp. (°C)		
T1.03	100 m north of outfall	115.679011	-33.174767	Salinity (PSU)	pH	Temp. (°C)	Yes	Possible
T1.04	75 m north of outfall	115.679007	-33.174992	Salinity (PSU)	pH	Temp. (°C)		
T1.05	50 m north of outfall	115.679004	-33.175218	Salinity (PSU)	pH	Temp. (°C)		
T1.06	25 m north of outfall	115.678997	-33.175443	Salinity (PSU)	pH	Temp. (°C)		
T1.07	Outfall location (transect centre)	115.678997	-33.175668	Salinity (PSU)	pH	Temp. (°C)	Yes	Possible
T1.08	25 m south of outfall	115.678994	-33.175893	Salinity (PSU)	pH	Temp. (°C)		
T1.09	50 m south of outfall	115.678991	-33.176118	Salinity (PSU)	pH	Temp. (°C)		
T1.10	75 m south of outfall	115.678988	-33.176343	Salinity (PSU)	pH	Temp. (°C)		
T1.11	100 m south of outfall	115.678982	-33.176569	Salinity (PSU)	pH	Temp. (°C)	Yes	Possible
T1.12	125 m south of outfall	115.678981	-33.176794	Salinity (PSU)	pH	Temp. (°C)		
T1.13	150 m south of outfall	115.678978	-33.17702	Salinity (PSU)	pH	Temp. (°C)		
<b>Transect 2 (300 m east-west, centred on discharge location)</b>								
T2.01	150 m west of outfall	115.67739	-33.17565	Salinity (PSU)	pH	Temp. (°C)		
T2.02	125 m west of outfall	115.677658	-33.175654	Salinity (PSU)	pH	Temp. (°C)		
T2.03	100 m west of outfall	115.677926	-33.175656	Salinity (PSU)	pH	Temp. (°C)	Yes	Possible
T2.04	75 m west of outfall	115.678193	-33.175659	Salinity (PSU)	pH	Temp. (°C)		
T2.05	50 m west of outfall	115.678462	-33.175663	Salinity (PSU)	pH	Temp. (°C)		
T2.06	25 m west of outfall	115.678729	-33.175665	Salinity (PSU)	pH	Temp. (°C)		
T2.07	Outfall location (transect centre)	115.678997	-33.175668	Salinity (PSU)	pH	Temp. (°C)		
T2.08	25 m east of outfall	115.679265	-33.175671	Salinity (PSU)	pH	Temp. (°C)		
T2.09	50 m east of outfall	115.679532	-33.175672	Salinity (PSU)	pH	Temp. (°C)		
T2.10	75 m east of outfall	115.6798	-33.175675	Salinity (PSU)	pH	Temp. (°C)		
T2.11	100 m east of outfall	115.680069	-33.175679	Salinity (PSU)	pH	Temp. (°C)	Yes	Possible
T2.12	125 m east of outfall	115.680337	-33.175681	Salinity (PSU)	pH	Temp. (°C)		
T2.13	150 m east of outfall	115.680605	-33.175683	Salinity (PSU)	pH	Temp. (°C)		
<b>Reference Location</b>								
R1	250 m west of outfall	115.676318	-33.175636	Salinity (PSU)	pH	Temp. (°C)	Yes	Possible
<b>Wastewater Stream Location</b>								
W1	Wastewater Access Point	TBD	TBD	Salinity (PSU)	pH	Temp. (°C)	Yes	Possible

The transect lengths are greater than the predicted 100 metre mixing zone to assess that the target dilution factor is being achieved within the boundaries of the 100 m mixing zone.

Target locations have been specified in Table 5-1 to aid in navigation to the proposed sampling points. The location of each sample point will be recorded with a GPS device, used in tandem to record the vertical profiles with the multi-parameter sonde at each location.

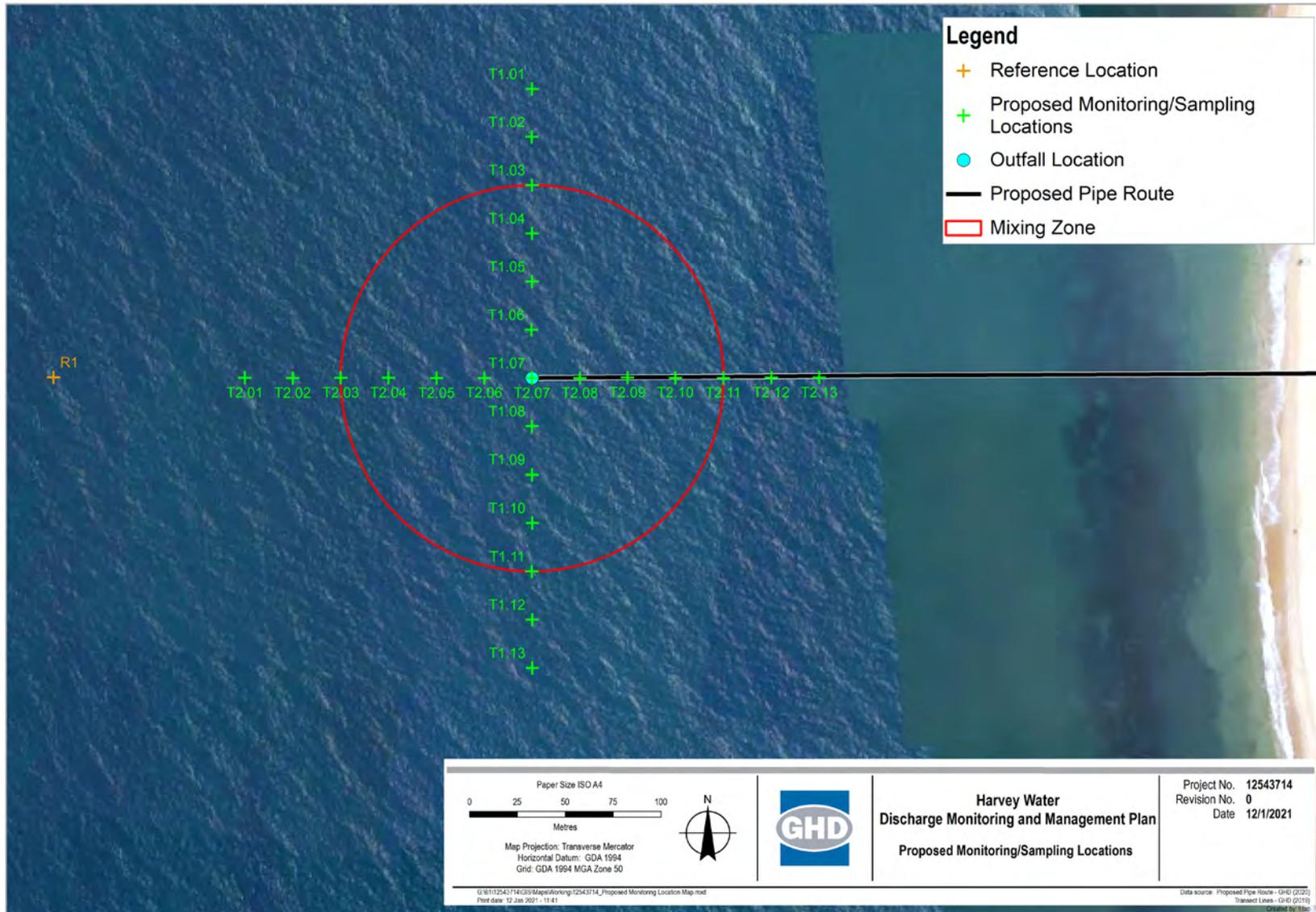


Figure 5-1 Proposed transect locations

#### 5.4.2 Water Sampling and Testing

A primary sample will be collected of the surface (~0.25 m depth) waters at the outfall location, each 100-metre point on each transect and the reference site, and from the KSIA wastewater stream (at a suitable location prior to release to the sea) a primary sample will be collected (Table 5-1). Sampling will be in accordance with the Department of Water Field Sampling Guidelines (*Government of Western Australia, 2009*).

Water samples will be sent to a NATA certified laboratory for analysis of the analytes shown in Table 3-1. The suitable laboratory analytical methods used for these analyses will be confirmed in consultation with the selected laboratory but are likely to include those listed in Table 5-2.

Results will be compared against the WQO criteria specified in Table 3-1. For analytes where no criteria are available, a 'baseline 80<sup>th</sup> percentile' approach can be adopted. At the current time, no baseline water quality information is available, therefore these criteria can be developed from the reference samples once a suitable number of sample replicates have been obtained.

Table 5-2 Water sample analytes and proposed laboratory methods (note: will be refined in consultation with the selected laboratory)

Analyte	Lab. method code
Total Dissolved Solids (TDS)	EA016: Solids – Total dissolved (TDS)
Total Suspended Solids (TSS)	TM022: Total Suspended Solids (TSS)
pH	EA005/EA070: pH – Saturation value
Temperature	NA - Field measurement
Hardness as CaCO <sub>3</sub>	EA065: Hardness (Total)
Calcium	USEPA 3005: Analysis for elements; saline waters
Magnesium	USEPA 3005: Analysis for elements; saline waters
Sodium	ED093F: Dissolved Major Cations
Potassium	ED093F: Dissolved Major Cations
Barium	USEPA 3005: Analysis for elements; saline waters
Alkalinity	ED037P: Alkalinity (Total as CaCO <sub>3</sub> )
Sulphate	ED040N: Sulfate - Calcium phosphate extractable
Chloride	ED045G: Chloride by discrete analyser
Flouride	EK040: Fluoride; Saline waters
Nitrate	EK058G: Nitrate as N by Discrete Analyser
Phosphate	EK067G: Phosphorus - Total
Silica	USEPA 3005: Analysis for elements; saline waters
Boron	USEPA 3005: Analysis for elements; saline waters

Analyte	Lab. method code
Salinity	EA020: Salinity
<b>Water treatment chemicals</b>	
Sodium Molybdate	<i>Recommended water treatment chemicals analysis methods to be confirmed in consultation with the selected laboratory.</i>
THPS (Biocide)	
Phosphonates (PBTC)	
Phosphonates (HEDP)	
Polyacrylate	
Azole	
Molybdate	

## 5.5 Reference Sampling

As no baseline water sampling information is available for the area, reference water sampling is proposed. A reference sampling site is proposed, 250 m west of the proposed outfall location (refer to Table 5-1). This location is at a distance outside of the mixing zone and away from the influence of nearshore water effects (e.g. wave shoaling).

At the reference location, vertical profiles with the multi-parameter sonde (as per section 5.4.1) and surface water sampling (as per section 5.4.2) will take place.

## 5.6 Underwater Video Monitoring

Underwater video will be collected to monitor the benthic habitat conditions in the vicinity of the KSIA outfall location. It is proposed that this monitoring take place on an annual basis, with the first underwater video monitoring to take place immediately after the installation of the KSIA pipeline and at yearly intervals thereafter.

The purpose of the underwater video monitoring will be to assess the benthic conditions in the vicinity of the KSIA outfall to assess:

- Areas of benthic habitat that have been disturbed due to the installation of the outfall relative to the baseline survey (November 2019);
- Recovery of benthic habitats and associated species in areas that are potentially disturbed during the installation; and
- Condition of the benthic habitats to ascertain any deterioration of the existing habitats and species.

The monitoring will utilise a drop-down camera system (or similar). The underwater video monitoring will aim to sub-sample the habitats identified during the November 2019 baseline survey (Table 4-1), with a particular focus on the areas of seagrass identified in close proximity to the outfall (Figure 4-4). The design of the target locations for the underwater video monitoring will take into account the locations of the transects in the baseline survey, and the location of the as-built outfall pipeline once this has been constructed.

## 5.7 Data Collection and Recording

### 5.7.1 Field Measurements

During field measurement data collection vertical profiles will be collected with the multi-parameter sonde at each location. The probe will be lowered over ~0.5 m intervals and held to allow the readings to stabilise, after which measurements will be logged/recorded. The field measurements will be recorded within the device memory, with the operative periodically checking that measurements have been recorded successfully.

At the end of the field monitoring activities, the field measurement data will be downloaded from the device onto a laptop. The data logs will be downloaded and saved securely on the laptop, and server.

### 5.7.2 Water Samples

Surface water samples will be collected from nine sample points (Table 5-3) in the manner described in Section 5.4.2 and dispensed into laboratory provided bottles.

At two different locations one field split (one Niskin bottle sample split into two samples) and one field replicate (two samples from two Niskin bottle collections) will be collected for QA/QC purposes. The field split involves splitting one sample into two subsamples and submitted as separate samples. The field split samples reveal the magnitude of errors (such as contamination, random and systematic errors) occurring between sampling and sample analysis. The field replicate is obtained when two or more samples are taken from the same site at the same time, using exactly the same method. The replicate samples are representative of the same environmental condition. Replicate samples are used to detect both natural variations in the environment and variations caused by the field sampling methods (*Government of Western Australia, 2009*).

Samples will be carefully packaged in the field in a chilled thermal box (e.g. Esky or similar) to minimise transient temperature effects during transit.

Chain of custody (COC) documentation shall be completed for all samples as per the Department of Water Field Sampling Guidelines (*Government of Western Australia, 2009*).

Water samples shall be given the identifiers in Table 5-3.

Table 5-3 Water sample identifiers

Sample	Identifier
Water sample directly from the KSIA wastewater waste stream. Accessed at pigging outlet location 1.2 km up pipe from outfall )	KSIA_OF01
Surface water sample 100 m north of outfall at sample point T1.03	KSIA_T1.03
Surface water sample at outfall location at sample point T1.07 / 2.07	KSIA_T1.07
Surface water sample 100 m south of outfall at sample point T1.11	KSIA_T1.11
Surface water sample 100 m west of outfall at sample point T2.03	KSIA_T2.03
Surface water sample 100 m east of outfall at sample point T2.11	KSIA_T2.11
Reference surface water sample 250 m west of outfall at sample point R1	KSIA_R1
Blind Field Split (location to be selected on the day)	KSIA_FS

Sample	Identifier
Blind Replicate (location to be selected on the day)	KSIA_BR

## 5.8 Record Keeping, Data Sharing and QA/QC

Following the field measurements, the raw data will be transferred into a standardised spreadsheet to enable analysis and reporting as per section 7.

Data and records will be kept from the monitoring programme in accordance with the Harvey Water data management procedure, with no plans for the periodic deletion or destruction of data. All data and records shall be kept on secure systems that are subject to regular back-up to minimise the risk of data loss.

Data shall only be shared externally once all analyses are completed in full to satisfactory QA/QC and once periodic reporting has been finalised (as per section 7). QA/QC of water samples will be based on acceptable relative percentage differences (RPDs) of the field split (nominally RPD <35%) and field replicate (nominally RPD <50%) samples.

## 5.9 Limitations

It is important to recognise the limitations of any proposed monitoring programme. The two key limitations of the KSIA ocean outfall monitoring programme are the observer effect and the limit of reporting.

### 5.9.1 Observer Effect

The observer effect is the possibility that the act of observation may affect the properties of what is being observed. For the field monitoring, an observer effect is expected due to the measurement instruments used, and also to the use of a vessel for sampling.

The field measurement instruments will be calibrated as per the manufacturer's recommended procedure and shall pass the calibration before field measurements begin.

The vessel wake will disturb the surface water and hence the measurements recorded by the salinity sonde. In order to minimise this effect as far as reasonably practicable, the vessel should move at a 'dead-slow' speed to minimise disturbance to the surface of the sea water, where permitted by navigational safety.

### 5.9.2 Limit of Reporting

For laboratory analysis of the water samples it is important to recognise the limit of reporting (LOR), which is defined as the smallest concentration (or amount) of analyte that can be reported by the laboratory. The laboratory will report the LOR achieved for each analyte for each quarterly water sampling event and will also include laboratory QA/QC reports to enable assessment of the quality of the laboratory results.

# 6. Safety, Roles and Responsibilities

## 6.1 Quarterly Field Monitoring

In order to conduct the quarterly field monitoring works, the use of a small vessel is required (e.g. rigid inflatable boat (RIB)). It is proposed that the monitoring vessel shall have a minimum of two crew as follows, with the roles and responsibilities of each defined in sections 6.1.1 to 6.1.3 below:

- 1 x vessel master/skipper;
- 1 x fieldwork operative.

The addition of a third crew member (fieldwork assistant) may be needed for the annual underwater video survey. All persons involved in the field monitoring works shall have the appropriate training and qualifications to perform their duties as defined in sections 6.1.1 to 6.1.3 below.

All crew members shall have suitable PPE, including as a minimum:

- Appropriate clothing and footwear;
- High-visibility vest or jacket;
- Lifejacket fitted with EPIRB;
- Hat, to mitigate against sun exposure;
- Sunglasses, to mitigate against sun glare induced eye fatigue;
- Sunblock, to mitigate against sunburn;
- Waterproof jacket in cold conditions.

The vessel will have at least 1 x marine band radio on board. All persons on board are responsible for ensuring that adequate water and food are taken along for each fieldwork excursion. Equipment and bags carried on board the vessel must be safely stowed and secured prior to transit and during the fieldwork.

Prior to the fieldwork excursions, an approved Job Hazard Analysis (JHA) will be in place, and all persons involved in the fieldwork shall familiarise themselves with the JHA and follow any practices/mitigations defined in the JHA to safely perform and complete the fieldwork programme.

### 6.1.1 Vessel master

The vessel master shall have the following roles and responsibilities:

- Ensuring appropriate consumables are on board prior to departure (fuel, oil, water, etc.);
- Performing pre-mobilisation vessel safety checks;
- Familiarisation with the area and its navigation requirements, including consulting the relevant marine chart(s);
- Skippering of the vessel;
- Safety of the vessel and its crew;
- Communication with other vessels and sea users as necessary;

- Safe navigation and watchkeeping;
- Safe navigation to the target sample points and holding of position at sample points to enable sampling;
- Safe navigation to/from the vessel home Port;
- Safe launch and recovery (if necessary);
- Assisting with the field collection.

The vessel master will at minimum have a coxswain ticket and have the competence and experience necessary to carry out the tasks required for the fieldwork programme.

It should be noted that the monitoring programme is based on sampling of surface waters, therefore the vessel master is to avoid creating an unnecessary wash with the vessels propellers when moving in the vicinity of the mixing zone, as this will disturb the mixing zone waters and monitoring results.

#### 6.1.2 Fieldwork operative

The fieldwork operative shall have the following roles and responsibilities:

- Overall responsibility for the collection of data according to the fieldwork programme specified within this DMMP;
- Assist the vessel master in navigating to the sample points;
- Safe taking and recording of field measurements;
- Safe taking and storage of water samples;
- Completion of COC documents for water samples;
- Overall responsibility for the fieldwork assistant, including delegation and management of tasks;
- Overall responsibility for the recording and reporting of field monitoring results in accordance with this DMMP.
- Contributing towards a safe navigation lookout at all times, including reporting of observed and perceived risks to the vessel master.

The fieldwork operative shall have the necessary experience and competence to perform the above tasks to the specification of the fieldwork monitoring programme. As a minimum, the fieldwork operative shall be a qualified environmental scientist with marine sampling experience.

#### 6.1.3 Fieldwork assistant

If a fieldwork assistant is needed, then they shall have the following roles and responsibilities:

- Carrying out of tasks delegated by the fieldwork operative.
- Contributing towards a safe navigation lookout at all times, including reporting of observed and perceived risks to the vessel master.

## 6.2 Yearly Underwater Video Monitoring

The yearly drop-down underwater camera survey will require a vessel with a stable platform and adequate deck space for the camera deployment and recovery equipment. This may be larger

than the small vessel used for the field measurements, which may therefore need to be contracted for the yearly drop-down camera work. The underwater video survey will be accompanied by a suitable marine benthic environmental scientist that is familiar with the project to supervise/ QA/QC the underwater drop-down camera monitoring work.

## 7. Reporting

Following each monitoring event, reporting will take place. The ultimate aim of the reporting is to ensure that the WQO's have been met within the limits of the ecological monitoring zone and to report on the condition of the benthic habitats in the vicinity of the KSIA outfall. Regular reporting forms part of Harvey Water's internal Environmental Management Plan requirements.

### 7.1 Biannual Field Monitoring and Water Sample Analysis

Following each field monitoring event and on receipt of laboratory results, a report will be developed. The report will be organised as follows:

- **Introduction:** An outline of the field monitoring that has taken place, including dates, times, measurements and water samples taken, and a description of the fieldwork excursion, including any problems that were encountered. The section will also include sample target location performance and general field excursion HSE performance.
- **Assessment Criteria:** A description of the WQOs used for assessment of the results from field measurements and laboratory analyses and how the results are compared to these to demonstrate achievement of the WQO's.
- **Field Measurements Assessment:** This section will present the results of the field measurements. The section will include:
  - General presentation of results including trends identification;
  - Comparison of results to WQOs and reference field measurements;
  - Field instrument QA/QC and calibration.
- **Water Sampling Assessment:** This section will present the results of the water sampling and laboratory analyses. The section will include:
  - General presentation of laboratory results including trends identification;
  - Analysis of water treatment chemical usage during the time of sampling (provided by Harvey Water);
  - Comparison of results to WQOs and reference water samples;
  - Laboratory QA/QC performance (field replicates and splits, RPDs, lab QA/QC).
- **Recommendations:** Recommendations for future field monitoring and trends identification/analysis.
- **Conclusion:** Overall conclusions, including a statement on whether the WQOs have been met in accordance with this DMMP.

### 7.2 Annual Benthic Underwater Video Monitoring

Following each annual benthic underwater video survey, a report will be developed. The report will be organised as follows:

- **Introduction:** An outline of the underwater video monitoring that has taken place, including dates, times, target and actual locations, and a general description of the fieldwork excursion, including any problems that were encountered. The section will also include sample target location performance and general field excursion HSE performance.

- **Analysis:** Analysis of the underwater video, including identification of benthic habitat type, coverage and identification of epifaunal species encountered.
- **Comparison to baseline:** Commentary on the condition of the benthic habitat encountered in comparison to the November 2019 baseline survey, including specific commentary on recovery of any disturbed areas from installation and on the condition of seagrass.
- **Conclusion and Recommendations:** Overall conclusion of the underwater video survey, including any recommendations for future monitoring.

### 7.3 Management Response

In the event that the WQOs have not been met within the regulatory mixing zone, a management response will be triggered. Depending on the nature and severity of the exceedance, management response actions may include:

- Confirmation of the exceedance:
  - Confirming field measurement equipment calibration and function;
  - Re-sampling of surface waters and/or the KSIA wastewater discharge;
  -
- Investigation of exceedance causes:
  - Assessment of changes to KSIA outfall operating conditions;
  - Confirmation of correct operation and maintenance of plant;
  - Assessment of changes to water treatment chemical use;
- Corrective actions:
  - Amendment to chemicals and/or dosing concentrations;
  - Changes to operational protocols/procedures;
  - Changes to operations and maintenance activities;
  - Training and competence assessment of key operational staff.

## 8. References

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GHD

Level 10

999 Hay Street

T: OfficeTelephone F: OfficeFax E: OfficeEmail

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