



Northern  
Territory  
Government

## WASTE DISCHARGE LICENCE

(Pursuant to section 74 of the *Water Act*)

### Licence Details

Licence Number: **WDL150-5**  
Commencement Date: 1 November 2016  
Expiry Date: 31 October 2018

### Licensee Details

Legal Entity Name: Power and Water Corporation  
ABN: 15 947 352 360  
Registered Business Address: Level 2 Mitchell Centre  
Postal Address: Darwin NT 0800  
PO Box 37471  
Winnellie N.T 0821  
Contact Person: Water Services Executive Group  
Contact Details:  
b/h: 08 8985 7123  
mobile: 0401 117 644  
email: [waterservicesexecutive@powerwater.com.au](mailto:waterservicesexecutive@powerwater.com.au)  
fax: 08 8924 5121

### Location of Premises

Name: Ludmilla Wastewater Treatment Plant  
Address: 21 Dick Ward Drive  
Ludmilla N.T 0820  
Telephone Numbers:  
b/h: 08 8941 7218  
fax: 08 8924 5121

### 24 hour emergency response

Contact Person: Power and Water Corporation Emergency Response Line  
Telephone Number(s): 1800 245 090

### Licensed Activity

Discharge of wastewater from Ludmilla Wastewater Treatment Plant (WWTP) to Darwin Harbour subject to the Licence Conditions.

**WASTE DISCHARGE LICENCE (WDL 150-5)**

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## WASTE DISCHARGE LICENCE (WDL 150-5)

### INFORMATION ABOUT THIS LICENCE

#### Definitions of Terms

- A section on the definition of terms used in this Licence can be found at the end of this Licence.
- Terms used in the waste discharge licence which are defined in the *Water Act* (the Act) have the meaning given in that Act unless specifically indicated otherwise.

#### Responsibilities of Licensee

- It is an offence under the *Water Act*, if the holder of a waste discharge licence contravenes or fails to comply with the conditions of a waste discharge licence.
- In addition to the conditions set out in this Licence, general responsibilities of Licensees are set out in the *Waste Management and Pollution Control Act* (WMPCA) and associated Regulations and the *Water Act*.
- Licensees must comply at all times with the requirements of these Acts and all other applicable laws.
- Except as expressly provided for in this Licence, the Licensee must not:
  - cause environmental harm either directly or indirectly;
  - cause waste to come into contact with water; or
  - cause water to be polluted.
- Without limiting the conditions of this Licence, in conducting the Activity, the Licensee must do all things reasonable and practicable to:
  - prevent or minimise the likelihood of pollution occurring as a result of, or in connection with, the Activity;
  - prevent or minimise the likelihood of environmental harm occurring as a result of, or in connection with, the Activity;
  - effectively respond to pollution and the risk of pollution occurring as a result of, or in connection with, the Activity;
  - effectively respond to environmental harm and the risk of environmental harm occurring as a result of or in connection with the Activity; and
  - as far as practicable:
    - avoid and reduce waste produced as a result of, or in connection with the Activity;
    - increase the re-use and recycling of waste;
    - effectively manage waste disposal; and
- apply the principles of ecologically sustainable development.

#### Duration of Licence

This Licence will remain in force until its expiry date, unless it is surrendered by the Licensee or until it is suspended or revoked by the Controller.

#### Amendment, Modification or Revocation of Licence (section 93 of the Water Act.)

The Controller of Water Resources may, by notice:

- amend or modify the terms and conditions of a licence;
- revoke a licence; or
- suspend a licence.

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### Public Register

A copy of this Licence will be placed on a register in accordance with section 95 of the *Water Act*. The register is publicly available for viewing on the Northern Territory Government website. A copy of the Annual Audit and Compliance Report will also be placed on the register.

### Supporting Guidelines and Documents

This Licence has been developed based on the information in the following documentation:

- Application for Waste Discharge Licence, Power and Water Corporation. Dated 30 September 2016.
- Application for Waste Discharge Licence, Power and Water Corporation. Dated 27 August 2014;
- Application for Waste Discharge Licence, Power and Water Corporation. Dated 8 October 2012;
- Assessment Report 72 East Point Effluent Rising Main Duplication Project Power and Water corporation Environmental Assessment Report and Recommendation, December 2012
- Power and Water Corporation –Public Environmental Report, Draft Further Information Dated 27 June 2012/6/2012. Reference No: 42213959/M&C/A;
- Waste Discharge Licence WDL 150-01;
- Waste Discharge Licence WDL 150-02;
- Waste Discharge Licence WDL 150-03; and
- Waste Discharge Licence WDL 150-04.

### Environment Protection Objectives (Part 4 of the WMPCA) and Beneficial Use Declaration (section 73 of the Water Act)

An Environment Protection Objective (EPO) is a statutory instrument to establish principles on which:

- a) environmental quality is to be maintained, enhanced, managed or protected;
- b) pollution, or environmental harm resulting from pollution, is to be assessed, prevented, reduced, controlled, rectified or cleaned up; and
- c) effective water management is to be implemented or evaluated.

In accordance with section 18 of the WMPCA a beneficial use, quality standard, criteria or objective declared under section 73 of the *Water Act* and in force is an environment protection objective for the purposes of the WMPCA.

Beneficial Use Declaration (BUD) is a legislated process that reduces the effects of water pollution and assists in the protection and management of water. The community decides how a particular water body should be used by choosing on one or more Beneficial Use categories.

The following EPO and BUD are relevant to this Licence:

- Declaration of Beneficial Uses and Objectives, Darwin Harbour Region, Northern Territory Government Gazette No. G27, 7 July 2010. Aquatic Ecosystem Protection and Recreational Water Quality and Aesthetics.

### Environmental Interests

This section highlights sensitivity of the surrounding land use and environment associated with the location of the approved activity that represents an interest to the Northern Territory Government and the community.

Sites of Conservation Significance: Darwin Harbour, SOCS Number 6 (NT Parks and Conservation

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Masterplan Map Number 12).

### LICENCE CONDITIONS

#### ADMINISTRATIVE

- 1 The Licensee must notify the Administering Agency within 24 hours if there are changes to the details of the 24-hour emergency contact as provided on page one of this Licence.
- 2 The Licensee must notify the Administering Agency within 14 days if there are changes to the Licensee details shown on page one of this Licence.
- 3 The Licensee must notify the Administering Agency within 14 days after ceasing to conduct the activity to which this Licence relates.
- 4 The Licensee must notify the Administering Agency prior to making any operational change that will cause, or is likely to cause, an increase in the potential for environmental harm, environmental nuisance, material environmental harm or serious environmental harm.
- 5 The Licensee must cause a copy of this Licence to be available at all times:
  - 5.1 on the Licensee's Australian website; and
  - 5.2 at the Location.
- 6 Where this Licence requires the provision of any notice, document or other correspondence to the Administering Agency, the relevant contact is:

Environment Division  
Department of Environment and Natural Resources  
Physical Address:  
Level 1 Arnhemica House  
16 Parap Road Parap NT 0820  
Postal Address: GPO Box 3675, Darwin, NT 0801  
Email: [waste@nt.gov.au](mailto:waste@nt.gov.au)
- 7 The licensee must maintain and implement the documents listed in Table 1.

**Table 1 Documents Relevant to Licenced Activity**

Document ID	Document Title
1	Waste Discharge Licence 150, Ludmilla Wastewater Treatment Plant PID Desktop Environmental Assessment
2	PWC Waste Discharge Licences - Communication Strategy
3	Waste Discharge Licence 150 Ludmilla Wastewater Treatment Plant Management Goals: Ludmilla WwTP discharge

- 8 Within 10 business days of any amendment being made to a document listed in Table 1 the licensee must provide the amended document to the Administering Agency, along with:
  - 8.1. a tabulated summary of the amendment(s) with document references;
  - 8.2. reasons for the amendment(s); and
  - 8.3. an assessment of environmental risk associated with the amendment(s).

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### OPERATIONAL

- 9 The Licensee must, without limiting any other condition of this Licence in conducting the Activity do all things reasonable and practicable to ensure the Activity does not adversely affect the Declared Beneficial Uses and objectives as declared from time to time, including those applying to:
- 9.1. the Darwin Harbour Region.
- 10 The Licensee must maintain a log of each complaint, made in relation to the Activity, to any persons involved in the Activity. The log must include details of the following:
- 10.1. the date and time of the complaint;
- 10.2. the contact details of the complainant if known, or where no details are provided a note to that effect;
- 10.3. the nature of the complaint;
- 10.4. the nature of events giving rise to the complaint;
- 10.5. prevailing weather conditions at the time of the event;
- 10.6. the action taken in relation to the complaint, including any follow-up contact with the complainant; and
- 10.7. if no action was taken, why no action was taken.

### DISCHARGES AND EMISSIONS

- 11 This licence authorises wastewater to be discharged from the Authorised Discharge Point (s) identified in Table 2 and shown in Appendix 4.

Authorised Discharge Point	Description	Location (MGA94, Zone 52)
SLUEPO1	East Point Outfall, Darwin Harbour	Longitude: 130.8223° Latitude: -12.4015°
SLULCDP	Overflow weir discharge to Ludmilla Creek via concrete drain.	Longitude: 130.8450° Latitude: -12.42051°

- 12 Discharges from Authorised Discharge point SLULCDP must only occur when inflows to the WWTP exceed:
- 12.1. 300L/second until such time that the East Point rising main duplication is commissioned; and
- 12.2. 1000L/second at any time after commissioning of the East Point rising main duplication.

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- 13 Waste water discharged from the Authorised Discharge Points in Table 2 must not:
- 13.1. contain any visible matter;
  - 13.2. cause or generate odours which would adversely affect the use of surrounding waters;
  - 13.3. cause algal blooms;
  - 13.4. cause visible change in the behaviour of fish or other aquatic organisms;
  - 13.5. cause mortality of fish or other aquatic organisms; or
  - 13.6. cause adverse impacts on plants

### **MONITORING**

- 14 The licensee must for all (terrestrial) sampling points required by this Licence:
- 14.1. install, maintain and provide appropriate identification signage so that they are easily identifiable at all times; and
  - 14.2. maintain safe access and egress, as is reasonably practicable.
- 15 For each sample required to be collected by this Licence the following information must be recorded and retained:
- 15.1. the date(s) on which the sample was taken;
  - 15.2. the time(s) at which the sample was collected;
  - 15.3. the point(s) at which the sample was taken;
  - 15.4. the name of the person who collected the sample;
  - 15.5. the chain of custody forms relating to the sample(s);
  - 15.6. the field measurements and/or analytical results for the sample; and
  - 15.7. laboratory QA/QC documentation.
- 16 Surface water monitoring must be conducted in accordance with Appendix 1.
- 17 Sediment monitoring must be conducted in accordance with Appendix 2.
- 18 Biological monitoring must be conducted in accordance with Appendix 3.

### **RECORDING AND REPORTING**

- 19 All records required to be kept by this Licence must be in a legible format.
- 20 The Licensee must keep records of all non-compliances with this Licence.
- 21 The Licensee must notify the Administering Agency of non-compliance(s) with this Licence as soon as practicable and in any case within 5 business days after becoming aware of the non-compliance(s).
- 22 The licensee must include in the non-compliance notification the following information:
- 22.1. the date and time of the non-compliance;
  - 22.2. the actual and potential causes and contributing factors to the non-compliance;
  - 22.3. the risk of environmental harm arising from the non-compliance;

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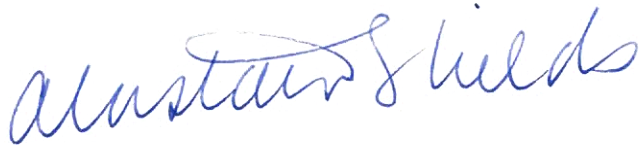
- 22.4. the action(s) that have or will be undertaken to mitigate any environmental harm arising from the non-compliance;
- 22.5. corrective actions that have or will be undertaken to ensure the non-compliance does not reoccur; and
- 22.6. if no action was taken, why no action was taken.
- 23 The Licensee must as soon as practicable report to the Administering Agency any exceedances of reporting limits, as specified in Appendices 1 or 3.
- 24 The Licensee must provide to the Administering Agency annual monitoring reports prepared in accordance with the Environment Protection and Biodiversity Conservation Act Referral 2009/5113.
- 25 The Licensee must immediately and in any case within 24 hours notify the Administering Agency of any potential or actual environmental harm or pollution by contacting the Pollution Hotline on telephone number 1800 064 567 and emailing [pollution@nt.gov.au](mailto:pollution@nt.gov.au).
- 26 The Licensee must complete an Annual Audit and Compliance Report (AACR) in the approved form, and provide to the Administering Agency a minimum of 20 Business Days prior to the anniversary of the commencement date of this Licence, for each year of this Licence.
- 27 The Licensee must provide a licence report to the Administering Agency a minimum of 20 Business Days prior to the anniversary of the commencement date of this Licence, for each year of this Licence
- 28 The Licence Report must include a:
- 28.1. Monitoring Report including trend analysis and interpretation of all surface water, sediment and biota monitoring data required as a condition of this licence; and
- 28.2. Report on progress to implement the improvement plan referred to in condition 32.
- 29 The Administering Agency may request that the Licensee must provide to the Administering Agency, within 10 working days of a request, a copy of any document, monitoring data or other information in relation to the activity, in the format requested by the Administering Agency.
- 30 The Licensee must update the Desktop Environmental Assessment a minimum of 60 Business Days prior to end date for this licence.
- 31 The Administering Agency may require the licensee to revise or amend and resubmit any amended document.
- IMPROVEMENT**
- 32 The Licensee must submit an improvement plan detailing reasonable and practicable measures the licensee will undertake to improve the discharge water quality and/or discharge location in order to achieve the water quality objectives for Darwin Harbour, insofar as background water quality (i.e. water quality that would prevail in the absence of any discharge from the Ludmilla Wastewater Treatment) allows.
- 32.1 The Licensee must submit the improvement plan 30 November 2017.
- 33 The Licensee must update *Waste Discharge Licence 150 Ludmilla Wastewater Treatment Plant Management Goals: Ludmilla WwTP discharge (July 2015)* to reflect the conditions of this Licence.
- 33.1 The Licensee must submit the updated management goals by 30 June 2017.



## WASTE DISCHARGE LICENCE (WDL 150-5)

### END OF LICENCE CONDITIONS

This Licence is not valid unless signed below:



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**Alastair Shields**

Controller of Water Resources

Dated the 28/10/2016

### END NOTES

13 August 2006 – WDL 150 issued to Power and Water Corporation (ABN 159 473 523 60)

28 October 2011 – WDL 150-01 issued to Power and Water Corporation (ABN 159 473 523 60)

31 October 2012 – WDL 150-02 issued to Power and Water Corporation (ABN 159 473 523 60)

02 August 2013 – WDL 150-03 issued to Power and Water Corporation (ABN 159 473 523 60)

This licence supersedes WDL150-04 which was issued (ABN 159 473 523 60) to Power and Water Corporation on 1 November 2014.

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### DEFINITIONS

All terms in the Licence which are defined in the *Water Act* have the meaning given in that Act unless otherwise or further defined in this section.

'Act'	means the Northern Territory of Australia <i>Water Act</i> .
'Activity'	means the activity licensed under this Licence described as Licensed activity on page 1 of this Licence.  The definition does not in any way limit the meaning of the term given in the Act.
'Business Day'	means a day not Saturday, Sunday or a public holiday in Darwin, Northern Territory.
'Beneficial Use'	means the uses of water specified in subsection (3) of the <i>Water Act</i> .
'Controller of Water Resources'	has the meaning described in section 4 of the Act.
'the Controller'	
'Delegate'	is a person who has been delegated powers by the Minister or Controller of Water by an instrument in writing.
'emergency response plan'	means a plan to deal with emergencies that may, or have the potential to adversely impact or the environment including but not limited to fire, spills, and accidents.
'Environmental Harm'	has the meaning described in the <i>Water Act</i> .
'Environmental nuisance'	has the meaning described in the <i>Waste Management and Pollution Control Act</i> .
'Executive Director'	Is the delegate for the Controller of Water of the Administering Agency pursuant to section 19 of the Act.
'Incident'	has the meaning described in section 14 of the <i>Waste Management and Pollution Control Act</i> .
'Licence'	means a licence granted and in force under the Act.
'Location'	is the Location of Premises as described on page 1 of this Licence.
'Material environmental harm'	has the meaning described in the <i>Water Act</i> .
'Records'	any written information as requested as a condition of this Licence. Any logs, registers or other documents.
'Serious environmental harm'	has the meaning described in the <i>Water Act</i> .
'Sites of Conservation Significance'	means any site listed at: <a href="http://lrm.nt.gov.au/conservation/data_resources">http://lrm.nt.gov.au/conservation/data_resources</a>
'WMPC Regulations'	means the <i>Waste Management and Pollution Control (Administration) Regulations</i> of the Northern Territory
'WMPCA'	means the <i>Waste Management and Pollution Control Act</i> of the Northern Territory.

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### APPENDIX 1 – SURFACE WATER MONITORING SCHEDULE

Table 1: Sampling locations; parameters and frequency

Sample locations*		LWwTP	East Point Outfall	Ludmilla Creek	Darwin Harbour		Ludmilla Creek	
Site Code		SLu080/ SLuLCDP	SLuEP01	SLuLC03	SLuEP02	SLuEP03	SLuLC01	SLuLC04
Site location		Locations as per Appendix 4 and described in Discharge Licence Application attachment F(iv)						
Indicator	Units							
<b>Physico-chemical parameters</b>								
Flow	kL/day	D						
pH	pH units	M						
Electrical conductivity	$\mu\text{Scm}^{-1}$							
Dissolved oxygen	%saturation							
Temperature	$^{\circ}\text{C}$							
Turbidity	NTU							
Total Suspended Solids	$\text{mgL}^{-1}$							
<b>Biotic parameters</b>								
Biological oxygen demand	$\text{mgL}^{-1}$	M						
Chlorophyll-a	$\mu\text{gL}^{-1}$							
EDCs 4-t-octylphenol; Nonylphenol; Bisphenol A; Andosterone; Etiocholanolone	$\text{ngL}^{-1}$	S		NR				
<b>Nutrient parameters</b>								
Ammonia (s total N)	$\mu\text{gL}^{-1}$	M						
Total Nitrogen	$\mu\text{gL}^{-1}$							
Oxides of Nitrogen (NOx as N)	$\mu\text{gL}^{-1}$							
Total Phosphorus	$\mu\text{gL}^{-1}$							
Filterable Reactive Phosphorus	$\mu\text{gL}^{-1}$							
<b>Metals parameters</b>								
Copper (filtered)	$\mu\text{gL}^{-1}$	M						
Zinc (filtered)	$\mu\text{gL}^{-1}$							
<b>Pathogen Indicators</b>								
Escherichia coli	Cfu /100 mL or MPN / 100 mL	M						
Enterococci								

Key: D= daily; M= monthly; S= seasonal 1 wet and 1 dry season sample; NR= not required \* as identified in F (iv) sample site location map

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Appendix 1 Table 2: Surface Water Quality Assessment and Reporting Criteria

	Sample Locations <sup>A</sup>								
		LWwTP effluent	East Point Outfall	Ludmilla Creek	Darwin Harbour		Ludmilla Creek		
	Site Code	SLu080/ SLuLCDP	SLuEP01	SLuLC03	SLuEP02	SLuEP03	SLuLC01 <sup>B</sup>	SLuLC04	
Indicator	Units	Reporting Limits						Reporting Trigger	
<b>Physico-chemical parameters</b>									
Flow	kL/day	kL/day			NR			Annual reporting only	
pH	pH units	7.0-8.5 <sup>1</sup>	7.0-8.5 <sup>2</sup>		7.0-8.5 <sup>3</sup>			Report all exceedance of SSTVs Annual trends compared to SSTVs 20th and 95 <sup>th</sup> percentiles	
Electrical conductivity	µS/cm	Annual reporting – interpretive trend only							
Dissolved oxygen	% saturation	Annual trend <sup>1</sup>	50-110 <sup>2</sup>		80 - 110 <sup>3</sup>			Report < 30% sat <sup>n</sup> (toxic threshold) Report all exceedance of SSTV Annual trends compare to SSTV	
Temperature	°C	Annual reporting - interpretive trend only							
Total Suspended Solids	mg/L	Annual trend	10	15	6	10		Report individual exceedances of SSTV and annual compare Annual trend compare median to SSTV	
<b>Biotic parameters</b>									
Biological oxygen demand	mg/L	Annual load <sup>1</sup>	>5+ annual load			>5			Individual exceedances and annual report compare 95th%ile to SSTV
Chlorophyll-a <sup>4</sup>	µg/L	Annual trend <sup>1</sup>	2	4	2	4		Report all exceedances of SSTVs Annual report compare trend to SSTV Reporting statistic median	
EDCs 4-t-octylphenol; Nonylphenol; Bisphenol A; Andosterone; Etiocholanolone	ng/L	Annual Report No SSTV			NR			Annual reporting of maximum values	

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Nutrient parameters						
Ammonia (as total N) <sup>4</sup>	toxicant	µg/L	Annual load <sup>1</sup>	Annual trend based on 90 <sup>th</sup> %ile pH corrected SSTV	ANZECC pH corrected toxicant marine values	All exceedances of pH corrected SSTV in the SMD zone Reporting statistic 95 <sup>th</sup> percentile
	nutrient					
Total Nitrogen <sup>4</sup>		µg/L	Annual load <sup>1</sup>	Annual load based on median	< 20 <sup>5</sup>	Only a reportable exceedances of SSTV in SMD if primary indicator also exceeds SSTV Reporting statistic median
Oxides of Nitrogen (NOx as N) <sup>4</sup>		µg/L	Annual load <sup>1</sup>		< 300 <sup>5</sup>	
Total Phosphorus <sup>4</sup>		µg/L	Annual load <sup>1</sup>		< 20 <sup>5</sup>	
Filterable Reactive Phosphorus <sup>4</sup>		µg/L	Annual load <sup>1</sup>		≤ 30 <sup>5</sup>	
					< 10 <sup>5</sup>	
Metals parameters						
Copper (filtered)		µg/L	Annual load <sup>1</sup>	90% species protection SSTV ≤ 3 µg/L	95% species protection ≤ 1.3 µg/L	Report individual exceedance of SSTV using percentile of most recent 24 monthly samples
Zinc (filtered)		µg/L	Annual load <sup>1</sup>	95 <sup>th</sup> species protection SSTV ≤ 15 µg/L	95 <sup>th</sup> ile ≤ 15 µg/L	Report individual exceedance of SSTV using percentile of most recent 24 monthly samples
Pathogen Indicators						
<i>Escherichia coli</i>	Cfu org/100mL or		>50 <sup>1</sup>		Median ≤ 14 <sup>5</sup> 90 <sup>th</sup> percentile ≥ 43 <sup>5</sup>	Exceedance of SSTV reporting limits, except with following rainfall in preceding 10 days
Enterococci	mpn org/100 mL		>500 <sup>1,6</sup>	≤ 200 <sup>6</sup>	≤ 200 <sup>6</sup> 95 <sup>th</sup> percentile ≤ 40 <sup>6</sup>	Annual reporting against SSTV

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### Reporting Triggers

- NR Parameter is not relevant for the site.
- A Site locations as described in Appendix 4 and Licence Application document F (iv)
- B Upstream Ludmilla Creek sites only considered as exceedance of SSTVs if effluent discharges to Ludmilla Creek via SLULCDP in the preceding 10 days
- 1 Treatment train within Ludmilla WwTP at point of transfer to discharge points SLuEP01 or SLuLCDP  
Annual reporting and source identification only for this site.  
Annual report annual discharge flow (ML/year) from discharge points;  
Annual trends for all measured parameters; and  
Annual loads discharged for all relevant measured parameters
- 2 Annual reporting of trends and discharge loads
- 3 Report all results outside SSTV range
- 4 Chlorophyll-a is the primary indicator of impacts associated with nutrient enrichment, nutrients outside the SSTV range are only considered as an exceedance of the primary indicator also exceeds the SSTV.
- 5 Darwin Harbour Water Quality Objectives
- 6 National Health and Medical Research Council, Guidelines for Managing Risks in Recreational Water

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### APPENDIX 2 – SEDIMENT MONITORING SCHEDULE

Appendix 2 Table 1: Sediment Monitoring Program and Assessment and Reporting Schedule

Indicator	Water Quality Management Zone			Zone of impact		Zone 1		Zone 2		Ludmilla Creek		
	Sampling Site Code			SLuEP01	SLuLC03	SLuEP02	SLuEP02	SLuEP03	SLuEP04	SLuLC01	SLuLC04	
			Easting	As per attachment Appendix 4								
	Sample medium		Northing									
Units	Sediment	Pore waters	Monitoring Frequency							Assessment Protocol		
<b>Interpretative indicators</b>												
Total Organic Carbon	%	✓	✗		Annual – Dry Season					Calculate C:N ratios		
Aluminium	mg/kg	✓	✗		Annual – Dry Season					Al normalisation of metals in sediments		
pH	pH units	✗	✓		Annual – Dry Season					Calculation of pH adjusted ammonia criteria		
<b>Biological indicators</b>												
Chlorophyll a	mg/kg	✓	✗		Annual – Dry Season					1. Calculate 2x 80 <sup>th</sup> percentile of reference data 2. Calculate ratio to phaeophytin-a		
<b>Nutrient indicators</b>												
Total P	mg/kg	✓	✗		Annual – Dry Season					Annual trend assessment in comparison to loads.		
Filterable reactive phosphorus	µg/L	✗	✓		Annual – Dry Season					1. Compare to 80th percentile of reference site data		
Total N	mg/kg	✓	✗		Annual – Dry Season					Annual trend assessment in comparison to loads and for determining C:N ratios		
Ammonia-Total as N)	µg/L	✗	✓		Annual – Dry Season					1. Compare to pH adjusted SMD SSTV 2. Compare to 2x80th percentile of reference sites		
<b>Metals indicators</b>												
Copper	mg/kg and µg/L pore water	✓	✓		Annual – Dry Season					1. Compare total in sediments to ISQG low c and then if exceeds compare B in sediments to ISQG low 2. Compare F in pore water to SMD SSTV (1.3 µg/L Cu and 15 µg/L Zn) 3. Compare T and B in sediment and F in pore water to 2x 80th percentile of reference data 4. Compare Al normalised T in sediment to 2x80th percentile of reference data in that season and assess for significant difference		
Zinc		✓	✓		Annual – Dry Season							

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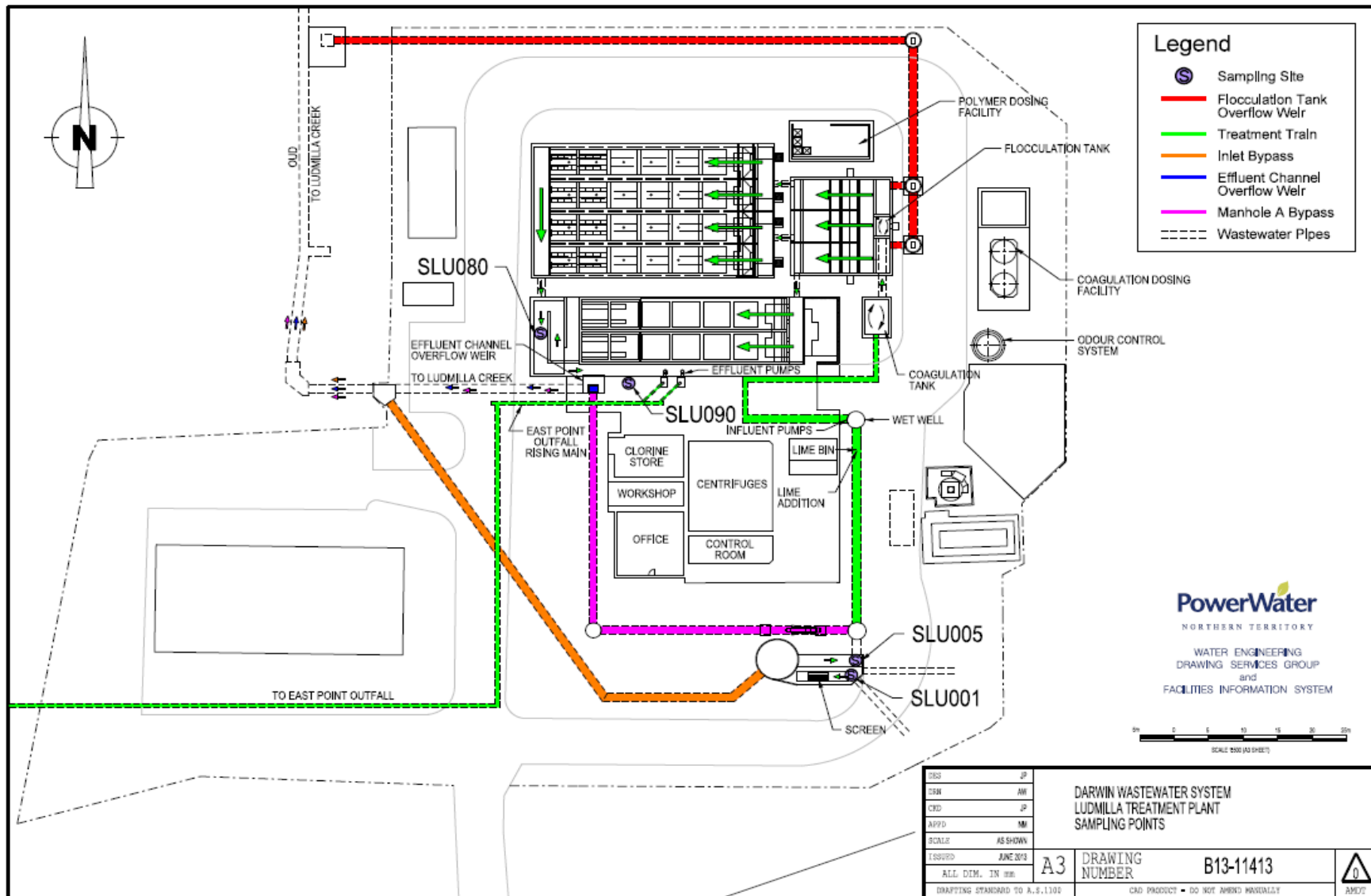
### APPENDIX 3- BIOLOGICAL MONITORING SCHEDULE

		East Point and Ludmilla Creek Sampling locations and monitoring and assessment criteria										
		Impact Zone				Outside impact zone				Protocols		
Sampling site code	SLu080 SLuLCDP	SLUEP01	SLUEP02	SLULC03	SLuEP03	SLuEP04	SLuLC01	SLuLC04	Guideline	Assessment and Reporting		
Eastings	As per Appendix 4 WDL Monitoring Locations											
Northings												
Rationale	Sampling period	Dry										
Ecotoxicological assessment												
Effluent toxicity Implement Monitoring Plan Developed by Independent Technical Expert and Approved by the Environmental approvals to directly assesses risks to relevant species from exposure to the effluent	Dry season inflow rate. 24 hour integrated sample	✓	X	X	X	X	X	X	X	ANZECC (2000) (as amended from time to time)	Annual report during the period in which assessment is conducted.	
Benthic Infauna monitoring and Management Plan												
A Benthic Infauna Monitoring and Management Plan was approved by the Commonwealth Minister in July 2016. The plan aims to identify changes in the impact of the discharge on benthic infauna in the vicinity of the Ludmilla WwTP discharge. The BIMMP has been previously provided to NT EPA and it is designed to provide early warning of changes in infauna which may have impacts on sensitive species present in Darwin Harbour. The BIMMP includes reporting and action triggers and includes detailed monitoring in a zone to at least 1000 metres from the outfall. The BIMMP also includes the requirement to conduct seasonal surveys of seagrass communities in the vicinity of the outfall.	1 wet season and 1 dry season program per year	X	✓	✓	X	✓	✓	X	X	The BIMMP specifies monitoring sites for a comprehensive program however specific sites corresponding to the water quality and sediment quality sites are included in the BIMMP to provide a comprehensive monitoring program at these sites.	Annual report and compliance reporting included in the approved BIMMP	




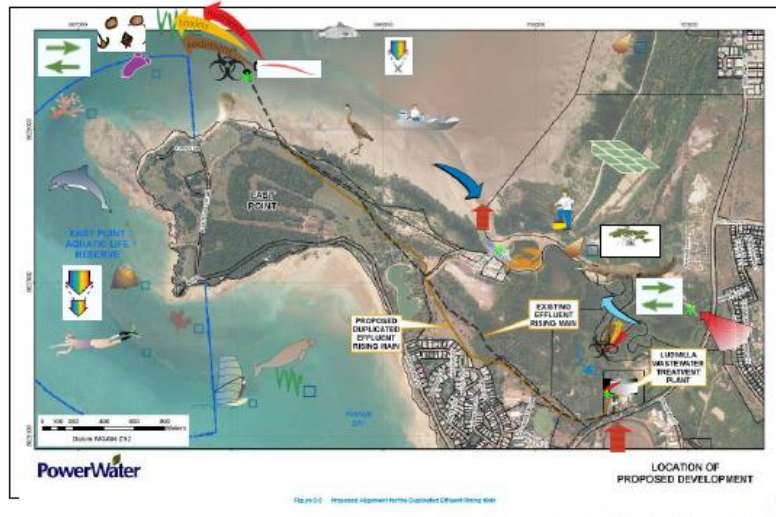
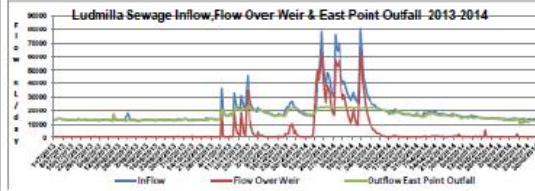



# WASTE DISCHARGE LICENCE (WDL 150-5)




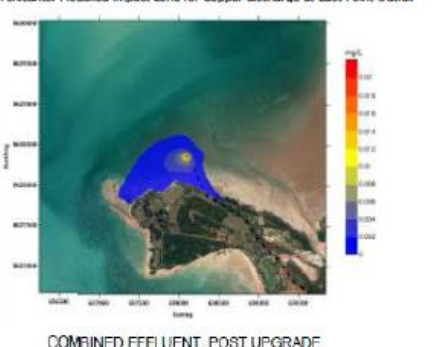
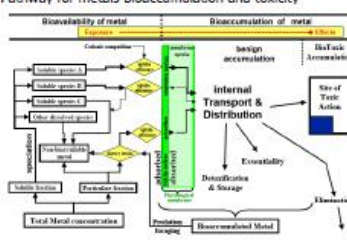
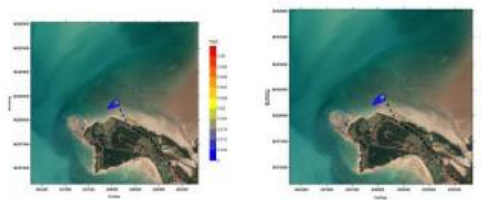
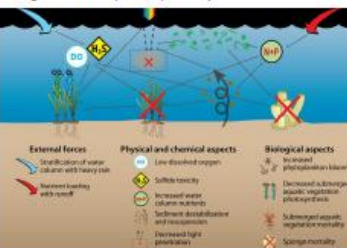

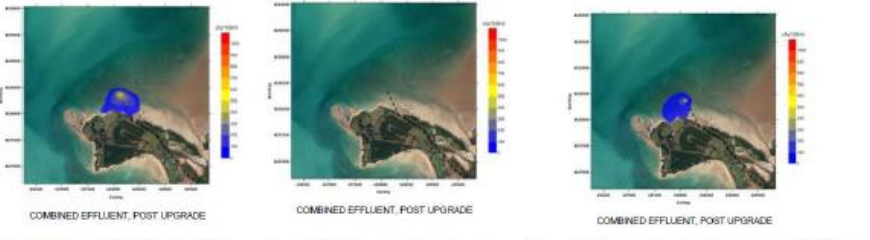
# WASTE DISCHARGE LICENCE (WDL 150-5)

## APPENDIX 5- CONCEPTUAL SITE MODEL

<p><b>WDL 150-03:</b> <b>Condition 28 Conceptual Site Model</b> Ludmilla Wastewater Treatment Plant (LWwTP): Discharges to the environment are permitted at the intertidal East Point Outfall and via a drain to Ludmilla Creek.</p>	<p><b>Ludmilla Creek and East Point Outfall</b> Catchment: 1588 ha (579 ha urban; 599 ha infrastructure (roads, race course, Ludmilla WwTP; parks and ovals); 410 ha (riparian zone))<sup>1</sup> Ludmilla Creek Flow: (not gauged) Dry season: Tidal inlet tidal flow 2 to 2.5 m<sup>3</sup>/s Little to no catchment inflow as rainfall dependent Wet Season: Dependent on rainfall and tidal flushing rates Tidal Range: Macro tidal range to &gt;7 m Flushing Period: Less than 14 days<sup>2</sup> East Point Outfall and Ludmilla Creek- Located within the Darwin Harbour Outer Estuary Zone<sup>2</sup></p>	<p><b>Beneficial Uses: Darwin Harbour Ground Water</b><sup>3</sup>: There are no declared beneficial uses for groundwater in the area. <b>Darwin Harbour Surface Waters</b><sup>3</sup>: Darwin Harbour: Saline waters south of an imaginary line between Gunn and Charles Point bounded by the upper limits of the high tide mark of tidal waterways including all named and unnamed inlets and creeks: <b>East Point</b><sup>3</sup> <b>Environment:</b> • Mangroves, seagrass and phytoplankton • Aquatic organisms including fish, corals, sponges, benthic infauna, dolphins, dugongs, wading birds. <b>Aquaculture</b> • No marine aquaculture in location. <b>Cultural</b> • Food collection (fish, molluscs e.g. oysters and long bums • Secondary contact recreation (wading, fishing and boating) • Some diving, snorkelling and swimming to the south and east of East Point. • Aesthetic views and intact environment. <b>Ludmilla Creek</b><sup>3</sup> <b>Environment</b> • Coastal mangroves and mudflats • Fishing and aquatic organisms in water, sediment and flood plains • Bird life including wading and migratory birds. <b>Aquaculture</b> • Disused mud crab farm adjacent to Ludmilla Creek. <b>Cultural</b> • Food collection: e.g. mud crabs, fish, long bums, and plants; • Secondary contact recreation (boating, wading and fishing) • Aesthetic views and intact environment.</p>																																																																																																																															
<p><b>Ludmilla Sewerage Catchment</b> Ludmilla WwTP is the second largest plant in the Darwin region. It treats the wastewater from an equivalent population of approximately 32 000. Ludmilla WwTP receives wastewater from the suburbs of Nightcliff, Winnellie, Ludmilla, Coconut Grove, Fannie Bay, Parap, Stuart Park and most of Darwin's inner city area<sup>3</sup>.</p> 	 <p>Fig 2.0 Proposed alignment for the Duplicated Effluent Receipt Basin</p>	<p><b>East Point</b><sup>3</sup> <b>Environment:</b> • Mangroves, seagrass and phytoplankton • Aquatic organisms including fish, corals, sponges, benthic infauna, dolphins, dugongs, wading birds. <b>Aquaculture</b> • No marine aquaculture in location. <b>Cultural</b> • Food collection (fish, molluscs e.g. oysters and long bums • Secondary contact recreation (wading, fishing and boating) • Some diving, snorkelling and swimming to the south and east of East Point. • Aesthetic views and intact environment. <b>Ludmilla Creek</b><sup>3</sup> <b>Environment</b> • Coastal mangroves and mudflats • Fishing and aquatic organisms in water, sediment and flood plains • Bird life including wading and migratory birds. <b>Aquaculture</b> • Disused mud crab farm adjacent to Ludmilla Creek. <b>Cultural</b> • Food collection: e.g. mud crabs, fish, long bums, and plants; • Secondary contact recreation (boating, wading and fishing) • Aesthetic views and intact environment.</p>																																																																																																																															
<p><b>Inflow LWwTP 30 Oct 2012-30 June 2014</b></p> <table border="1"> <tr><td>Volume ML</td><td>11,379</td></tr> <tr><td>Influent Load</td><td>Tonne /yr</td></tr> <tr><td>BOD</td><td>955</td></tr> <tr><td>TSS</td><td>1068</td></tr> <tr><td>TP</td><td>38</td></tr> <tr><td>FRP</td><td>27</td></tr> <tr><td>TN</td><td>284</td></tr> <tr><td>NH3 (free)</td><td>218</td></tr> <tr><td>Metals</td><td>kg/yr</td></tr> <tr><td>Metals</td><td>kg/yr</td></tr> <tr><td>Hg</td><td>0.3</td></tr> <tr><td>Cu</td><td>1180</td></tr> <tr><td>Ni</td><td>17</td></tr> <tr><td>Zn</td><td>650</td></tr> </table>	Volume ML	11,379	Influent Load	Tonne /yr	BOD	955	TSS	1068	TP	38	FRP	27	TN	284	NH3 (free)	218	Metals	kg/yr	Metals	kg/yr	Hg	0.3	Cu	1180	Ni	17	Zn	650	<p><b>Inputs to Darwin Harbour</b></p> <table border="1"> <thead> <tr> <th>Quantity 2012-13</th> <th>East Point Outfall<sup>4</sup></th> <th>Ludmilla Creek discharge<sup>4</sup></th> <th>Ludmilla Creek catchment<sup>5</sup></th> <th>Ocean<sup>6</sup></th> </tr> </thead> <tbody> <tr><td>Vol ML</td><td>5 398</td><td>469</td><td>unknown</td><td>-</td></tr> <tr><td colspan="5"><b>Input to Darwin Harbour T/yr</b></td></tr> <tr><td>TP</td><td>21</td><td>0.8</td><td>0.9</td><td>1087</td></tr> <tr><td>FRP</td><td>12</td><td>0.5</td><td>-</td><td>-</td></tr> <tr><td>TN</td><td>190</td><td>9.0</td><td>9.2</td><td>15 015</td></tr> <tr><td>NH<sub>3</sub>-N (free)</td><td>150</td><td>8.0</td><td>1</td><td>-</td></tr> <tr><td>NH<sub>3</sub>-N org</td><td>41</td><td>2.0</td><td>-</td><td>-</td></tr> <tr><td>TSS<sup>7</sup></td><td>55</td><td>28</td><td>700</td><td>-</td></tr> <tr><td colspan="5"><b>Inputs to Darwin Harbour kg/yr</b></td></tr> <tr><td>Hg</td><td>0.54</td><td>0.05</td><td>unknown</td><td>-</td></tr> <tr><td>Cu</td><td>700</td><td>60</td><td>210</td><td>-</td></tr> <tr><td>Ni</td><td>13</td><td>1.2</td><td>12</td><td>-</td></tr> <tr><td>Zn</td><td>61</td><td>5.3</td><td>690</td><td>-</td></tr> <tr><td>As</td><td>4.9</td><td>0.42</td><td>9.3</td><td>-</td></tr> <tr><td colspan="5">Polycyclic aromatic hydrocarbons, petroleum hydrocarbons, pesticides below detection</td></tr> <tr><td colspan="5"><b>Input and Discharge organisms per year (based on median concentrations)</b></td></tr> <tr> <th></th> <th>Inflow to LWwTP</th> <th>East Point Outfall<sup>4</sup></th> <th>Ludmilla Creek discharge<sup>4</sup></th> <th>Ludmilla Creek catchment<sup>5</sup></th> </tr> <tr><td><i>E. coli</i></td><td>5.1x10<sup>12</sup></td><td>5.4x10<sup>12</sup></td><td>1.2x 10<sup>11</sup></td><td>unknown</td></tr> <tr><td>Enterococci</td><td>2.7x10<sup>10</sup></td><td>6.2 x 10<sup>11</sup></td><td>1.3 x 10<sup>11</sup></td><td>unknown</td></tr> </tbody> </table> <p>The graph below indicates inflow and outflow for the Ludmilla WwTP in 2013-14. Inflow is shown in blue, outflow to East Point Outfall in green and outflow to Ludmilla Creek in red. Discharges to Ludmilla creek (flow over weir) are primarily between October and April<sup>8</sup>. During the period of the licence 97.7% of flows to Ludmilla Creek were between November and April (the wet season). Of the total LWwTP discharge, 0.4% was via Ludmilla Creek in the dry season and 81.5% of the total discharge was via the East Point Outfall.</p> 	Quantity 2012-13	East Point Outfall <sup>4</sup>	Ludmilla Creek discharge <sup>4</sup>	Ludmilla Creek catchment <sup>5</sup>	Ocean <sup>6</sup>	Vol ML	5 398	469	unknown	-	<b>Input to Darwin Harbour T/yr</b>					TP	21	0.8	0.9	1087	FRP	12	0.5	-	-	TN	190	9.0	9.2	15 015	NH <sub>3</sub> -N (free)	150	8.0	1	-	NH <sub>3</sub> -N org	41	2.0	-	-	TSS <sup>7</sup>	55	28	700	-	<b>Inputs to Darwin Harbour kg/yr</b>					Hg	0.54	0.05	unknown	-	Cu	700	60	210	-	Ni	13	1.2	12	-	Zn	61	5.3	690	-	As	4.9	0.42	9.3	-	Polycyclic aromatic hydrocarbons, petroleum hydrocarbons, pesticides below detection					<b>Input and Discharge organisms per year (based on median concentrations)</b>						Inflow to LWwTP	East Point Outfall <sup>4</sup>	Ludmilla Creek discharge <sup>4</sup>	Ludmilla Creek catchment <sup>5</sup>	<i>E. coli</i>	5.1x10 <sup>12</sup>	5.4x10 <sup>12</sup>	1.2x 10 <sup>11</sup>	unknown	Enterococci	2.7x10 <sup>10</sup>	6.2 x 10 <sup>11</sup>	1.3 x 10 <sup>11</sup>	unknown
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<p><b>LWwTP site plan</b></p>  <p>The plant provides solids screening, grit removal, chlorination and chemically assisted sedimentation through the addition of lime (pH adjustment); ferric sulphate (to assist agglomeration) and polymer (long chain formation), followed by sedimentation and sludge removal<sup>3</sup>.</p>	<p>Power and Water Corporation Ludmilla WwTP/East Point Conceptual Site Model of Sources, Inputs and Receptors</p> <table border="1"> <tr> <td>A3</td> <td>D2013/576711</td> <td>Version 2.0</td> </tr> </table>	A3	D2013/576711	Version 2.0																																																																																																																													
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# WASTE DISCHARGE LICENCE (WDL 150-5)

## Conceptual Site Model- Page 2

Exposure factor	Impact zone creek discharge	East Point Outfall discharge	Impact pathways <sup>12</sup>
<p><b>Toxicants.</b> Toxicity may have acute or chronic impacts depending on the nature of the discharge. Acute toxicity has not been identified in the LWwTP discharge. Copper is the most common persistent toxicant identified in the discharge and as it is not transformed in the environment it is used as a conservative tracer. Other identified toxicants include ammonia. Other potential toxicants include H<sub>2</sub>S and chloramines.</p>	<p>Toxicants: Modelled Impact Zone for Copper discharge Ludmilla Creek</p>  <p><b>Figure T1: Atypical (95<sup>th</sup> percentile) bypass discharge of partially treated effluent to Ludmilla Creek<sup>8</sup></b></p>	<p>Toxicants: Modelled Impact zone for Copper discharge at East Point Outfall</p>  <p>COMBINED EFFLUENT, POST UPGRADE</p> <p><b>Figure T2: Atypical (95<sup>th</sup> percentile) discharge via East Point Outfall<sup>11</sup></b></p>	<p>Pathway for metals bioaccumulation and toxicity<sup>13</sup></p>  <p><b>Figure T3: Metals exposure pathway</b> Metals are the most common and highest concentration toxicant detected in the LWwTP discharge, other toxicants have similar pathways. The potential impacts of toxicants in the discharge include lethal impacts for acute toxicants and sub lethal impacts including changes in population indices, behavioural changes and bioconcentration of chronic toxicants into local flora and fauna.</p>
<p><b>Nutrients</b> Mangroves act as a sink for nutrients 12 750 T N / yr and 1380 T P /yr retained in long term sequestration<sup>9</sup>.  Seagrass excess nutrients and sediments can result in loss due to shading and excessive epiphytic algal growth<sup>10</sup>.</p>	<p>No modelling of the zone of influence nutrients in the overflow discharges to Ludmilla Creek has been undertaken.</p>	<p>East Point Outfall Nutrients Impact Zone</p>  <p>COMBINED EFFLUENT, POST UPGRADE</p> <p><b>Figure N1: Impact zone Total P 95<sup>th</sup> percentile (atypical conditions) <sup>8</sup></b></p> <p><b>Figure N2: Impact zone Total N 95<sup>th</sup> percentile (atypical conditions) <sup>8</sup></b></p>	<p>Nitrogen and Phosphorus pathway<sup>10</sup></p>  <p><b>Figure N3: Phytoplankton response to nutrient loading. Darwin Harbour 56000 T N /yr and 3300 T P /yr <sup>8</sup></b></p>
<p><b>Pathogens<sup>20</sup></b> The beneficial use of 'cultural', is declared for the waters of Ludmilla Creek and East Point, this includes recreational use and collection of food. Primary contact recreation is not a recognised use of the waters of Ludmilla Creek or in the vicinity of the East Point Outfall<sup>14</sup>.  Figures P1 to P3 show the modelled 90<sup>th</sup> percentile impact areas for <i>E. coli</i> and enterococci in the East Point Outfall discharge (figure P2a, P2b, P3).</p>	<p>Modelled Impact Zone for <i>E. coli</i> in discharges to Ludmilla Creek</p>  <p><b>Figure P1: Preliminary model of atypical (90<sup>th</sup> percentile) conditions impact zone bypass conditions (yellow median &gt;14 org/100 mL, red 90<sup>th</sup> percentile of &gt;43 organisms /100 mL) for an 8 day bypass wet season discharge of untreated wastewater to Ludmilla Creek<sup>9</sup></b></p>	<p>East Point Outfall atypical discharges impacts</p>  <p>COMBINED EFFLUENT, POST UPGRADE</p> <p><b>Figure P2a: <i>E. coli</i> impact zone (Red &gt;1000 org/100 mL to blue &lt;100 org/100 mL) for an East Point discharge<sup>10</sup></b></p> <p><b>Figure P2b: Enterococci impact zone (red &gt;1000 org/100 mL to blue &lt;100 org/100 mL) for an East Point discharge<sup>10</sup></b></p> <p><b>Figure P3: Food collection impact zone for filter feeding animals (red &gt;1000 org/100 mL to blue, 100 org/100 mL) for an East Point discharge<sup>10</sup></b></p>	

# WASTE DISCHARGE LICENCE (WDL 150-5)

## Conceptual Site Model- Page 3

Legend for Conceptual Site Diagram Symbols <sup>12</sup>							
Symbols for Beneficial Uses – Darwin Harbour – Saline Waters <sup>7</sup>				Symbols Features and Processes			
<b>Aquaculture: water for commercial production of aquatic animals including related research</b>					Natural nutrient movement into and out of Darwin Harbour		Ludmilla WwTP
	Kulaluk mud crab aquaculture lease currently not active				Natural nutrient sources		Point source nutrient/ toxicant/ sediment from human activities
<b>Environment(Aquatic ecosystem protection): water to maintain the health of aquatic ecosystems</b>					Tidal Flushing - Marine water input		Sediment bound nutrients settles on the sea and creek bed
<b>Flora</b>					Freshwater Input: seasonal input (no flow gauge)		Micro-organisms/ pathogen indicators
<b>Fauna</b>					Catchment inputs of nutrients		Groundwater infiltration and movement
					Unknown Input from • Spot on Marine and • Fannie Bay Race course		Waste discharge licence monitoring sites
					High light availability		
					Low light availability		
<b>Cultural: (Recreational water quality and aesthetics): water to meet aesthetic, recreational and cultural needs</b>							
<b>Indigenous and non-indigenous uses eg food collection</b>							
<b>Primary contact</b>							
<b>Secondary contact</b>							

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  - 4a D2013/575240 six monthly data report 2013.
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