



**WorleyParsons®**

resources & energy



**ALKIMOS WATER ALLIANCE**

**ALKIMOS WASTEWATER TREATMENT SCHEME  
MANAGEMENT PLAN FOR CONSTRUCTION  
AND ONGOING PRESENCE OF THE  
OCEAN OUTLET PIPELINE**



301/0120006/4

30 July 2008

Level 7, QV1 Building  
250 St Georges Terrace  
Perth WA 6000 Australia  
Tel: +61 8 9278 8111  
Fax: +61 8 9278 8110  
[www.worleyparsons.com](http://www.worleyparsons.com)  
WorleyParsons Services Pty Ltd  
ABN 61 001 279 812

© Copyright 2008 WorleyParsons Services Pty Ltd



**MULTIPLY**





## ALKIMOS WASTEWATER TREATMENT SCHEME

### MANAGEMENT PLAN FOR THE CONSTRUCTION AND ONGOING PRESENCE OF THE OCEAN OUTLET PIPELINE

#### Disclaimer

*This report has been prepared on behalf of and for the exclusive use of the Water Corporation and is subject to and issued in accordance with the agreement between the Water Corporation and WorleyParsons Services Pty Ltd (as part of the Alkimos Water Alliance). WorleyParsons Services Pty Ltd accepts no liability or responsibility whatsoever for it in respect of any use of or reliance upon this report by any third party.*

*Copying this report without the permission of the Water Corporation or the Alkimos Water Alliance is not permitted.*

REV	DESCRIPTION	ORIG	REVIEW	WORLEYPARSONS APPROVAL	DATE	CLIENT APPROVAL	DATE
A	Issued for internal review	N. Cowlishaw	A. Costen	N/A	12 June 08	N/A	
B	Issued for client review	D. Collins	R. Scoones	A. Costen	14 July 08		
0	Released to client		R. Scoones	A. Costen	30 July 08		



## ALKIMOS WASTEWATER TREATMENT SCHEME

### MANAGEMENT PLAN FOR THE CONSTRUCTION AND ONGOING PRESENCE OF THE OCEAN OUTLET PIPELINE

#### CONTENTS

<b>1.</b>	<b>INTRODUCTION</b> .....	<b>1</b>
1.1	Objectives.....	4
1.2	Ocean Outfall Environmental Assessment Process.....	4
1.3	Environmental Aspects.....	5
1.4	Legal and other Requirements.....	5
1.4.1	Legislation, regulations, policies and standards.....	5
1.4.2	Commonwealth and international legislation, policies and standards.....	6
1.5	Proponent Contact Details.....	6
<b>2.</b>	<b>SCOPE AND FRAMEWORK</b> .....	<b>8</b>
2.1	EIAMMP Process.....	8
<b>3.</b>	<b>DATA ACQUISITION (STAGE 1)</b> .....	<b>11</b>
3.1	Climate and Meteorology.....	11
3.1.1	Wind.....	11
3.2	Hydrodynamics.....	11
3.2.1	Currents.....	11
3.2.2	Waves.....	12
3.2.3	Tides.....	13
3.2.4	Sediment Transport.....	14
3.3	Water Quality.....	14
3.3.1	Physicochemical.....	14
3.3.2	Chemical.....	15
3.4	Marine Ecology.....	16
3.4.1	Marine Benthic Communities.....	16
3.4.2	Marine Fauna.....	18
3.5	Geotechnical Information.....	19
3.5.1	Geology and Geomorphology.....	19
3.5.2	Sediment Composition.....	20
3.6	Engineering.....	20
3.6.1	Route Design.....	21
3.6.2	Blasting and Excavation.....	21
3.6.3	Pipeline Fabrication and Launch Site.....	23
3.6.4	Groyne and Cofferdam.....	26
3.6.5	Pipeline Installation.....	27
3.6.6	Backfilling.....	31
3.6.7	Ocean Outfall Construction Schedule.....	31
<b>4.</b>	<b>IMPACT PREDICTION (STAGE 2)</b> .....	<b>34</b>
4.1	Model Type.....	34
4.2	Model Inputs.....	34
4.3	Predicted Impacts (Construction).....	35



**ALKIMOS WASTEWATER TREATMENT SCHEME**

**MANAGEMENT PLAN FOR THE CONSTRUCTION AND ONGOING PRESENCE OF THE OCEAN  
OUTLET PIPELINE**

---

4.3.1	Water Quality .....	38
4.3.2	Benthic Primary Producer Habitat.....	39
4.3.3	Seabed (subtidal, intertidal and beaches) .....	43
4.3.4	Benthic Fauna .....	43
4.3.5	Noise Effects on Megafauna and Fish .....	44
4.3.6	Blasting Effects on Fish and Megafauna .....	46
4.3.7	Heritage.....	49
4.3.8	Air Quality.....	49
<b>4.4</b>	<b>Predicted Impacts (Pipeline Presence) .....</b>	<b>49</b>
4.4.1	Water Quality .....	50
4.4.2	Benthic Primary Producer Habitat.....	50
4.4.3	Seabed (subtidal, intertidal and beaches) .....	50
4.4.4	Heritage.....	50
4.4.5	Air Quality.....	50
<b>4.5</b>	<b>Impact Risk Assessment .....</b>	<b>51</b>
<b>5.</b>	<b>IMPACT VALIDATION (CONSTRUCTION) STAGE 3.....</b>	<b>57</b>
<b>5.1</b>	<b>Element 1: Water Quality .....</b>	<b>58</b>
5.1.1	Summary of Predicted Impacts.....	58
5.1.2	Procedures.....	58
<b>5.2</b>	<b>Element 2: Benthic Primary Producer Habitat.....</b>	<b>64</b>
5.2.1	Summary of Predicted Impacts.....	64
5.2.2	Procedures.....	64
<b>5.3</b>	<b>Element 3: Seabed (subtidal, intertidal and beaches) .....</b>	<b>68</b>
5.3.1	Summary of Predicted Impacts.....	68
5.3.2	Procedures.....	68
<b>5.4</b>	<b>Element 4: Marine Fauna .....</b>	<b>70</b>
5.4.1	Summary of Predicted Impacts.....	70
5.4.2	Procedures.....	71
<b>5.5</b>	<b>Element 5: Heritage .....</b>	<b>73</b>
5.5.1	Summary of Predicted Impacts.....	73
5.5.2	Procedures.....	74
<b>5.6</b>	<b>Element 6: Air Quality .....</b>	<b>74</b>
5.6.1	Summary of Predicted Impacts.....	74
5.6.2	Procedures.....	75
<b>6.</b>	<b>IMPACT VALIDATION (OPERATION) STAGE 4 .....</b>	<b>76</b>
<b>6.1</b>	<b>Element 1: Water Quality .....</b>	<b>76</b>
6.1.1	Summary of Predicted Impacts.....	76
6.1.2	Procedures.....	76
<b>6.2</b>	<b>Element 2 Benthic Primary Producer Habitat .....</b>	<b>77</b>
6.2.1	Summary of Predicted Impacts.....	77



**ALKIMOS WASTEWATER TREATMENT SCHEME**

**MANAGEMENT PLAN FOR THE CONSTRUCTION AND ONGOING PRESENCE OF THE OCEAN OUTLET PIPELINE**

6.2.2	Procedures.....	78
<b>6.3</b>	<b>Element 3: Seabed (subtidal, intertidal and beaches) .....</b>	<b>79</b>
6.3.1	Summary of Predicted Impacts.....	79
6.3.2	Procedures.....	79
<b>6.4</b>	<b>Element 4: Marine Fauna .....</b>	<b>80</b>
6.4.1	Summary of Predicted Impacts.....	80
6.4.2	Procedures.....	81
<b>6.5</b>	<b>Element 5: Heritage .....</b>	<b>82</b>
6.5.1	Summary of Predicted Impacts.....	82
6.5.2	Procedures.....	83
<b>6.6</b>	<b>Element 6: Air Quality .....</b>	<b>83</b>
6.6.1	Summary of Predicted Impacts.....	83
6.6.2	Procedures.....	84
<b>7.</b>	<b>REPORTING AND AUDITING.....</b>	<b>85</b>
<b>7.1</b>	<b>Compliance Auditing.....</b>	<b>85</b>
<b>7.2</b>	<b>Internal Reporting.....</b>	<b>85</b>
<b>7.3</b>	<b>External Compliance Reporting .....</b>	<b>86</b>
7.3.1	Monthly Environmental Update Report.....	86
7.3.2	Annual Environmental Compliance Report.....	86
7.3.3	Performance Review Report.....	87
<b>8.</b>	<b>ROLES AND RESPONSIBILITIES.....</b>	<b>88</b>
<b>9.</b>	<b>REFERENCES .....</b>	<b>89</b>

**TABLES**

Table 1-1:	Contact details for the proponent .....	7
Table 3-1:	Summary of habitats identified in the vicinity of the ocean outlet route .....	17
Table 4-1:	Comparison between PER and final design of total BPPH loss.....	40
Table 4-2:	Recovery potential of seagrass species in the vicinity of the ocean outfall.....	43
Table 4-3:	Acoustic intensity and frequency of marine mammals and noise sources.....	46
Table 4-4:	Estimated blast effect zones for marine mammals in 10 m water depth.....	47
Table 4-5:	Estimated blast effect zones for 10 kg marine fish species in 10 m water depth.....	49
Table 4-6:	Rating of risk likelihood.....	51
Table 4-7:	Rating of risk consequence .....	51
Table 4-8:	Risk ranking matrix .....	52
Table 4-9:	Risk ranking matrix key.....	52
Table 4-10:	Environmental aspect/impact table used in Scoping Document .....	53



**ALKIMOS WASTEWATER TREATMENT SCHEME**

**MANAGEMENT PLAN FOR THE CONSTRUCTION AND ONGOING PRESENCE OF THE OCEAN  
OUTLET PIPELINE**

**FIGURES**

Figure 1-1: Project location ..... 3

Figure 2-1: EIAMMP framework process ..... 10

Figure 3-1: Typical spring tidal cycle predicted for Two Rocks Marina located 15 km  
north-north-west of the proposed development site ..... 13

Figure 3-2: Typical neap tidal cycle predicted for Two Rocks Marina located 15 km  
north-north-west of the proposed development site ..... 14

Figure 3-3: BPPH identified within the proposed pipeline route area ..... 18

Figure 3-4: Horizontal and vertical alignment of the ocean outlet pipeline ..... 22

Figure 3-5: Locations of drilling and blasting ..... 24

Figure 3-6: Typical backhoe dredge (Atteris 2006)..... 25

Figure 3-7: Typical diver-operated drill rig ..... 25

Figure 3-8: A typical pipe sting launch site (Atteris 2006)..... 26

Figure 3-9: Design and location of the groyne and cofferdam..... 27

Figure 3-10: Proposed locations of pipeline installation barge mooring anchors ..... 29

Figure 3-11: Trench excavation/dredging process..... 30

Figure 3-12: Construction schedule ..... 33

Figure 4-1: Domain and resolution of the Mike 3 model, used to predict and spatially define  
environmental impacts of the Alkimos ocean outlet construction..... 35

Figure 4-2: Close up of the outlet pipeline trench in the Mike 3 model, used to predict and  
spatially define environmental impacts of the Alkimos ocean outlet construction..... 36

Figure 4-3: 2008 Alkimos wind and current data inputs into the hydrodynamic model ..... 37

Figure 4-4: General impacts associated with construction of the ocean outlet ..... 38

Figure 4-5: Two consecutive days of model output showing dissipation of each day’s plume  
before the beginning of the third day’s dredging under south-east wind conditions .... 40

Figure 4-6: Two and a half days after dredging, the SSC has returned to background levels ..... 42

Figure 5-1: The management and monitoring program to be implemented for key environmental  
elements ..... 57

Figure 5-2: Conceptual model for the proposed integrated routine water quality, reactive benthic  
habitat and routine benthic habitat monitoring and management ..... 63



## APPENDICIES

- APPENDIX A -** MINISTERIAL STATEMENT NO. 755
- APPENDIX B -** WATER CORPORATION'S INTERPRETATION OF CONDITIONS UNDER MINISTERIAL STATEMENT NO. 755 AND RELEVANT SECTION OF MPCOOP
- APPENDIX C -** WATER CORPORATION ENVIRONMENT POLICY
- APPENDIX D -** WATER CORPORATION SUSTAINABILITY PRINCIPLES
- APPENDIX E -** ALKIMOS MARINE STUDIES PROGRAMME INTERIM WATER QUALITY CHARACTERISATION DATA REPORT
- APPENDIX F -** ALKIMOS MARINE STUDIES PROGRAMME BENTHIC HABITAT MAPPING AND INFAUNA SURVEY
- APPENDIX G -** ALKIMOS MARINE STUDIES PROGRAMME SEDIMENT SURVEY
- APPENDIX H -** ALKIMOS OUTFALL DREDGE MANAGEMENT PLAN  
HYDRODYNAMIC AND SEDIMENT TRANSPORT MODELLING OF DREDGE PLUME
- APPENDIX I -** AUSTRALIAN NATIONAL GUIDELINES FOR WHALE AND DOLPHIN WATCHING 2005
- APPENDIX J -** ROLES AND RESPONSIBILITIES
- APPENDIX K -** TRIGGER EVALUATION METHODOLOGY
- APPENDIX L -** REVIEWERS' REPORTS AND EXPLANATION OF AMENDMENTS IN RESPONSE  
PROFESSOR ERIC PALING  
MR IAN LEPROVOST  
WORLEYPARSONS AMENDMENTS IN RESPONSE TO REVIEWERS' COMMENTS