



Process No. EHS-E-P013		King Abdullah University of Science and Technology (KAUST)		 جامعة الملك عبد الله للعلوم والتقنية King Abdullah University of Science and Technology
Issue Date: March 2019	Revision: 02	Subject: Wastewater Management Procedure		
Approval: Robert Kilford	Page No. 1 of 15	Issuing Dept.: Health, Safety & Environment		

DOCUMENT HISTORY & REVISION STATUS


02	Mar 2019	Sufyan Khan, Shahzad Ghauri	Scheduled review
01	Jan 2014	Mohamed S Omar Sufyan Khan	For approval
00	Dec 2013	Mohamed S Omar Sufyan Khan	Draft for comments
REV.	DATE	PREPARED BY	DESCRIPTION

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Appendix A: Effluent Discharge Standard
 Appendix B: Marine Outfall Inventory

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DEFINITIONS

Brine water discharges	Concentrated brine water rejected from the Reverse Osmosis plant Includes, but is not limited to, any spilling, leaking, pumping, pouring, emitting, emptying, or dumping of effluents.
Wastewater	Any contaminated water resulting from industrial or agricultural operations or any other activities which are of equivalent environmental impact, including sanitary wastewater.
GAMEP	Refers to the General Authority for Meteorology and Environmental Protection (GAMEP), which is designated as the responsible authority for the protection of the environment and the development of environmental protection standards in the Kingdom of Saudi Arabia.
Storm water	Precipitation that runs off land or structures on land.
Mixing zone	Defined area of water directly adjacent to an area for discharging wastewater where the receiving water quality may be exceeded.

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1.0 Introduction

Wastewater management encompasses a broad range of efforts that promote effective and responsible wastewater treatment, and disposal that is protective of King Abdullah University of Science and Technology's (KAUST) environment and beyond.

2.0 Scope

This program applies to all wastewater generated from KAUST operations and activities. Discharges include any liquid effluents or process water which is not classified as clean or unpolluted surface runoff. This may include but is not restricted to:

- treated sewage effluent from wastewater treatment plant
- storm water
- rejected brine water
- groundwater resulting from dewatering activities
- boat sewage
- concrete truck washout water
- fire or potable network chemical flushing water
- roof/gutter leak testing of structures/buildings
- fat, oil and grease (F.O.G)
- untreated wastewater
- laboratory wastewater

3.0 Related Policies and Procedures

- a) Spill Prevention Control and Counter Measures
- b) Waste Management Procedure

4.0 Objectives


- To ensure legal compliance for wastewater discharges
- Monitoring and management of wastewater discharges associated with KAUST operations and activities
- Protection of the marine and land environment around KAUST and beyond.

5.0 Regulations and Standards

Environmental protection standard of General Authority for Meteorology and Environmental Protection (GAMEP) shall be the governing regulatory standard. Appendix A contains GAMEP discharge limits for effluents prior to discharge into water bodies. Massachusetts (U.S.) Water Resources Authority Toxic Reduction and Control (TRAC) regulations where applicable for laboratory wastewater discharge shall be used as a guide. Effluent irrigation water quality standards have been adopted from the Royal Commission Environmental Regulations.

6.0 Roles and Responsibility

Designation	Responsibility
Health, Safety & Environment Department	<ul style="list-style-type: none"> • Perform regular review and update of this procedure and communicating the requirements of this procedure. In addition, provision of advice and guidance on matters related to this procedure. • Ensure adequate training and communication of this procedure to staff. • Ensure correct implementation of this procedure through periodic surveillance activities and incident close out. • Maintain records related to this procedure and keep at site for a minimum of three years, making records available to KAUST Internal Audit upon request.
Relevant Departments	<ul style="list-style-type: none"> • Comply with the requirements of this procedure.

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Designation	Responsibility
	<ul style="list-style-type: none"> • Ensure adequate training and communication of this procedure to staff, facility operators and contractors. • Put in-place local work instructions and management practices to ensure compliance with this procedure's requirements. • Provide assistance to HSE Department, including incidents and non-compliance investigations. • Report any non-compliance with this procedure, as well as incidents and associated corrective actions to HSE in a timely manner. • Maintain records related to this procedure and keep at site for a minimum of three years, making records available to HSE upon request.

7.0 Operation Control

7.1 Marine Outfall Management

- Prior to the installation of marine outfall and/or modification, removal or relocation of an existing marine outfall, project proponent must seek approval from HSE.
- Department Managers shall establish and maintain an inventory of marine outfall structures, reviewing on a minimum annual basis, and share it with HSE. Appendix B contains the template for marine outfall inventory.

7.2 Direct Discharge

Direct discharge of untreated/partially treated wastewater (except for storm water) to the following locations is prohibited without authorization from HSE.

- Marine and canals
- Unlined evaporation ponds
- Open ground
- Below ground surface

Surface runoff being generated from routine external area cleaning activities carried out by housekeeping services is exempted from this requirement.

Due to potential adverse environmental impact on our marine environment, services that use detergents must be able to demonstrate that low-phosphate detergents have been rigorously considered.

7.3 Washing/flushing/testing discharges

Activities involving discharge of wastewater that is used for cleaning, flushing, or testing purposes also require management in accordance with this procedure. Examples of such discharges include, but are not limited to, firefighting network chemical flushing, potable water line disinfection flushing, concrete truck washout water, and hydrotesting of structures and buildings.

7.4 Dewatering


Dewatering activities are common at KAUST due to high groundwater table. For ground excavation activities that may require dewatering, project proponent must receive approval from HSE for the release of wastewater resulting from dewatering prior to starting the ground excavation.

7.5 Marine Vehicle Sewage

Release of untreated boat sewage from marine vessels into the marine environment is strictly prohibited. Sewage from the marine vessels shall be managed through sewage pump out station and disposed in an approved municipality facility. The operator of marine facilities shall maintain a boat sewage disposal log sheet.

7.6 Wastewater Reuse

KAUST operates a tertiary wastewater treatment facility that treats wastewater generated throughout the KAUST. HSE encourages using treated sewage effluent from the wastewater treatment plant for landscape irrigation and

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other suitable purposes (wherever the quality of treated sewage effluent meets the re-use requirements) as an alternate to potable water.

The operator of wastewater treatment facility shall maintain data related to wastewater influent and effluent i.e. wastewater received, treated, discharge to sea, and reused. Also the operator of the plant shall ensure that a wastewater quality testing program is in place that complies with potential contaminants as detailed in Appendix A, as well as details related to quantity and frequency of discharges.

7.7 Septic Tank and F.O.G

- a) Facilities within KAUST that are not connected to the sewer network or temporary facilities such as security stations, and construction site toilets can collect wastewater into septic tanks.
- b) The KAUST proponent of the facility or construction site shall ensure that wastewater septic tank is designed and maintained properly to avoid any leakage of wastewater into the ground and offensive odor from the system.
- c) Wastewater from the septic tank and grease interceptors shall be collected at intervals that avoid overflowing of septic tank/grease interceptor and shall be disposed at municipality registered wastewater treatment plants. The KAUST facility proponent shall ensure that records related to wastewater disposal are maintained and made available upon request.

7.8 Water Quality Monitoring Requirements

- a) Water quality at the marine outfall for wastewater treatment plant shall meet the effluent water quality standards "Red Sea- Marine", and effluent irrigation water shall meet the irrigation water quality standards, as outlined in Appendix A. HSE shall be notified by KAUST proponent of marine outfall for any incident of non-compliance with effluent water quality standard.
- b) For rejected brine water from the desalination plant shall meet GAMEP standards at the edge of mixing zone and compared with background. Calculation of mixing zone is presented in appendix C.
- c) For flushing, washout, hydrotesting discharges, water quality must be tested to ensure compliance with discharge requirements and records of HSE approval and water quality retained on file.
- d) Records related to water quality analysis shall be maintained by the KAUST proponent of marine outfall and made available upon HSE inspection.
- e) KAUST environmental team shall periodically monitor ambient marine water quality at the edge of mixing zone.

8.0 Communication

Environmental Protection Manager is responsible for communicating this procedure to all KAUST Departments. Department manager is responsible for communicating the requirements of this procedure to his/her staff and contractors.

9.0 Monitoring


The Department Manager shall ensure that service providers and contractors related to his/her department shall comply with the requirements of this procedure. Any non-compliance shall be reported to HSE, based on the nature of non-compliance HSE will recommend further action.

HSE Department or its representative may also request reports related to wastewater discharges if deemed necessary.

10.0 Complaint and Incident Investigation

10.1 Incident Reporting

Any wastewater related incident (e.g. unauthorized disposal or exceedance of discharge criteria) shall be reported to HSE as an incident through ReportIt. (<http://reportit.kaust.edu.sa>) within 24 hours of occurrence.

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10.2 Incident and Complaint Investigation

KAUST encourages its staff and service providers to raise any concern with respect to wastewater management in their workplace. Employees are advised to inform these concerns to their Department Managers; community can raise these concerns through online reporting form available at KAUST HSE website-ReportIt (<http://apps.kaust.edu.sa/sites/reportit/Pages/InitialForm.aspx>). All incidents and complaint shall be investigated by HSE and findings shared with the individual who reported the incident/complaint.

11.0 Record Keeping and Document Control

Wastewater generator or its service provider is required to record and keep onsite for a minimum period of five years the following information, and made available to HSE upon request:

1. Water quality reports including laboratory tests
2. Offsite wastewater disposal records
3. HSE authorization of wastewater discharges.

12.0 Review

This procedure shall be reviewed as per KAUST University Policy Office requirements.

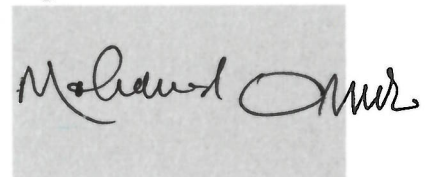
APPROVAL

Recommended By:

Dr Mohamed Omar

Manager Environmental Protection
Health, Safety & Environment

Signature:

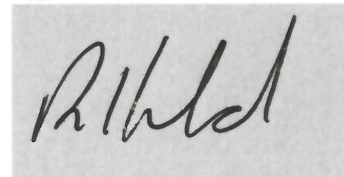



Approved By:

Robert Kilford

Director
Health, Safety & Environment

Signature:



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APPENDIX A – EFFLUENT DISCHARGE STANDARD

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Table B1 – Discharge limits for effluents prior to discharge into water bodies (and municipal collection systems)

Parameter	Unit	Municipal collecting systems	Red Sea			Gulf			Surface water
			Marine	Eco-sensitive	Industrial	Marine	Eco-sensitive	Industrial	
Important note*									
Physical chemistry									
Coarse material			Absent	Absent	Absent	Absent	Absent	Absent	Absent
Temperature	Δ °C (from ambient)	45	7	5	7	7	5	7	5
pH	pH units	5-10	6-9.5	7.5-9	6-10	6-9.5	7.5-9	6-10	6.5-8.5
TDS	mg/l	3000*							
Turbidity	NTU		50	5	75	50	5	75	5
TSS	mg/l	600	15	10	15	15	10	15	10
Indicators									
BOD ₅	mg/l	500	25	10	25	25	10	25	10
COD	mg/l	1000	150	50	150	150	50	150	50
Total Oil & Grease ¹	mg/l	100	5	2	7	5	2	7	5
TKN (organic N)	mg/l	120	5	5	10	5	5	10	5
TOC	mg/l	1000	50	40	50	50	40	50	100
Phosphorus (total)	mg/l	50	2	1	5	3	1	5	5
Phosphate (PO ₄) ³⁻	mg/l	n/a	0.8	0.5	1	1	0.5	1	1
Ammonia (as NH ₃)	mg/l	40	1	1	3	1	1	3	0.5
Chloride (as Cl)	mg/l								1500
Total inorganic nitrogen (as NO ₂ and NO ₃)	mg/l	n/a							15
Sodium	mg/l	1000	800	800	1500	800	800	1500	800
Sulfate	mg/l	500	600	600	1000	600	600	1000	600
Sulfide	mg/l	10	0.2	0.2	1.0	0.2	0.2	1.0	0.2
Heavy metals									
Aluminium	mg/l	30	10	5	15	10	5	15	5
Arsenic	mg/l	1	0.3	0.05	0.5	0.3	0.05	0.5	0.1
Barium	mg/l	2	2	1	2	2	1	2	1
Cadmium	mg/l	1.0	0.02	0.005	0.05	0.02	0.005	0.05	0.001
Chromium (total)	mg/l	1	0.5	0.01	0.5	0.5	0.01	0.5	.01
Chromium (Hexavalent)	mg/l	0.5	0.1	0.05	0.1	0.1	0.05	0.1	0.05
Cobalt	mg/l	2	0.2	0.05	0.2	0.2	0.05	0.2	0.05
Copper	mg/l	1	0.2	0.2	0.5	0.2	0.2	0.5	0.2
Iron	mg/l	30	5	5	10	5	5	10	2
Lead	mg/l	1	0.1	0.1	0.5	0.1	0.1	0.5	0.1
Manganese	mg/l	2	0.5	0.2	1	0.5	0.2	1	0.2
Mercury	mg/l	0.5	0.005	0.001	0.1	0.005	0.001	0.1	0.001
Nickel	mg/l	1.5	0.5	0.2	1	0.5	0.2	1	0.2
Silver	mg/l	1	0.3	0.3	0.5	0.3	0.3	0.5	0.3
Zinc	mg/l	10	3	2	5	3	2	5	2
Organics and inorganics									
Benzene	mg/l	1	0.05	0.05	0.1	0.05	0.05	0.1	0.05
Carbon Tetrachloride	mg/l	1	0.02	0.02	0.04	0.02	0.02	0.04	0.02
Chlorine (residual)	mg/l	1.0	0.2	0.1	0.3	0.2	0.1	0.2	0.3

¹ No sheen should be visible within the mixing zone.

* Consideration should be given to areas of natural high TDS

Chlorinated Hydrocarbons (total)	mg/l	0.5	0.5	0.1	0.5	0.5	0.1	0.5	0.1
Chlorobenzene(s) – total or individual concentrations									
Chloroform	mg/l	1							
Cyanide (free)	mg/l	1	0.05	0.05	0.1	0.05	0.05	0.1	0.05
Fluoride	mg/l	15	25	15	25	25	15	25	15
Furans ²	mg/l	0.005	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Hexachlorobenzene	mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Lindane	mg/l	0.1	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Mirex	mg/l		0.01	0.01	0.01	0.01	0.01	0.01	0.01
MTBE	mg/l		0.01	0.01	0.01	0.01	0.01	0.01	0.01
PAH	mg/l	0.002	0.01	0.01	0.05	0.01	0.01	0.05	0.01
PCBs	mg/l	0.002	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Pentachlorophenol	mg/l	5							
Pesticides and insecticides (total)	mg/l	5	0.05	0.05	0.05	0.05	0.05	0.05	0.05
- Aldrin	mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
- Chlordane		0.06	0.01	0.01	0.01	0.01	0.01	0.01	0.01
- DDT (and metabolites)	mg/l	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01
- Dieldrin	mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
- Endrin	mg/l	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
- Heptachlor	mg/l	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01
- Toxaphene	mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Phenols	mg/l	150	0.1	0.1	1	0.1	0.1	1	0.1
Dioxins ³	mg/l	0.005	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Toluene	mg/l	2							
TPH	mg/l	15	5	5	10	5	5	10	5
Vinyl chloride	mg/l	0.1	0.02	0.02	0.1	0.02	0.02	0.1	0.02
Xylenes	mg/l	2	0.05	0.05	1	0.05	0.05	1	0.05
Microbiological									
Total Coliform	count/100ml	n/a	2500	2000	3000	3000	2000	5000	2000

* Any substance other than those mentioned in the above table may not be discharged at a concentration greater than 0.001mg/l unless agreed in advance with the Competent Agency or receiving treatment works.

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**TABLE 3D
IRRIGATION WATER QUALITY STANDARDS
AT THE POINT OF DISCHARGE TO IRRIGATION SYSTEM**

PARAMETER ⁽¹⁾	UNITS	Maximum Allowable	Monthly Average
PHYSICAL			
Floating Particles	mg/m ²	Nil	-
Total Suspended Solids	mg/l	10 / 40 ⁽⁸⁾	10
Total Dissolved Solids	mg/l	2000	1750
Turbidity ⁽²⁾	N.T.U.	5	2
CHEMICAL			
Aluminum	mg/l	5	-
Ammonia, Total as N	mg/l	5	-
Arsenic	mg/l	0.1	-
Barium	mg/l	1	-
Beryllium	mg/l	0.1	-
BOD ₅	mg/l	10 / 40 ⁽⁸⁾	-
Boron	mg/l	0.075	-
Cadmium	mg/l	0.01	-
COD	mg/l	50	-
Chloride	mg/l	1000	500
Chlorine Residual ⁽³⁾	mg/l	0.5 (min)	-
Chromium	mg/l	0.01	-
Cobalt	mg/l	0.05	-
Copper	mg/l	0.2	-
Cyanide	mg/l	0.05	-
Dissolved Oxygen ⁽⁴⁾	mg/l	2.0 (min.)	-
Fluoride ⁽⁵⁾	mg/l	15	5
Iron	mg/l	5	-
Lead	mg/l	0.5	0.1
Lithium	mg/l	2.5	-
Manganese	mg/l	0.2	0.02
Mercury	mg/l	0.001	-
Molybdenum	mg/l	0.01	-
Nickel	mg/l	0.02	-
Nitrate	mg/l	10	-
Oil and Grease	mg/l	Nil	-
pH	pH units	6 - 8.4	-
Phenols	mg/l	0.002	-
Phosphorus, total as P	mg/l	30	20
Selenium	mg/l	0.02	-
Silver	mg/l	0.5	-
Sodium	mg/l	1000	500
Sodium Adsorption Ratio (SAR)	SAR units	20	10
Sulfate	mg/l	600	-
Sulfide	mg/l	0.1	0.05
Total Kjeldahl Nitrogen	mg/l	60	35
Total Organic Carbon	mg/l	40	-
Vanadium	mg/l	0.1	-
Zinc	mg/l	2	-

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Appendix D – Calculation of mixing zones

D1 – Red Sea and Gulf mixing zones

Basic screening model for defining the maximum horizontal extent of a mixing zone:

$$SD_{ave} = \text{Horizontal extent of mixing zone}$$

Where:

D_{ave} = average water depth at outfall location^{4 5}


S = refer to table D1.

Table D1 – Red Sea S values

S	Example of habitat/area type
2	High-value area
5	Marine classified area
8	Industrially classified area

Table D3 – A look up table showing the radius of a mixing zone for given values of S and D_{ave} for the Red Sea and Gulf of Arabia

Red Sea Depth (m)	2	5	8	Arabian Gulf Depth (m)	4	10	16
	Mixing zone radius				Mixing zone radius		
5 or less	10	25	40	5 or less	20	50	80
6	12	30	48	6	24	55	96
7	14	35	56	7	28	60	100
8	16	40	64	8	32	65	
9	18	45	72	9	36	70	
10	20	50	80	10	40	75	
11	22	55	88	11	44	80	
12	24	60	96	12	48	85	
13	26	65	100	13	52	90	
14	28	70		14	56	95	
15	30	75		15	60	100	
16	32	80		16	64		
17	34	85		17	68		
18	36	90		18	72		
19	38	95		19	76		
20	40	100		20	80		
21	42			21	84		
22	44			22	88		
23	46			23	92		
24	48			24	96		
25	50			25	100		
26	52			26			
27	54			27			
28	56			28			
29	58			29			
30	60			30			
31	62			31			
32	64			32			
33	66			33			
34	68			34			
35	70			35			
36	72			36			
37	74			37			
38	76			38			
39	78			39			
40	80			40			
41	82			41			
42	84			42			
43	86			43			
44	88			44			
45	90			45			
46	92			46			
47	94			47			
48	96			48			
49	98			49			
50	100			50			

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APPENDIX B – MARINE OUTFALL INVENTORY

MARINE OUTFALL INVENTORY



Document No.

EHS-E-P013-F01

Sr.	Outfall ID	Date(s) of Operation (provide install date and decommission date if applicable)	Outfall Location (description and GPS coordinates)	Owner (Name and Position Title)	Discharge Source	Status	Flow Type	Monitoring Frequency	Parameter(s) Analyzed	Revision Date

Description	Key Words
Outfall ID	Format: Owner-Discharge source-XXX e.g. CP-ST-01 (campus-storm water-01) Owner Campus=CP, Community = CT, Utilities =UT Research = RS Discharge source TSE: Tertiary Sewage Effluent ST: Storm water Other: provide detail as best understood
Discharge Source	Treated wastewater from WWTP Storm water Other: provide detail as best understood
Status	Active Discontinued
Flow Type	Continuous Seasonal Intermittent

Department Manager			
Signature:		Date	