ENVIRONMENTAL ASSESSMENT OF THE KINGDOM OF BAHRAIN DESALINATION PLANTS DISCHARGES

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Content

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- Assessment methods.
- The Bahrain legislation for industrial effluents.
- Bahrain Desalination Plants Environmental Assessment.
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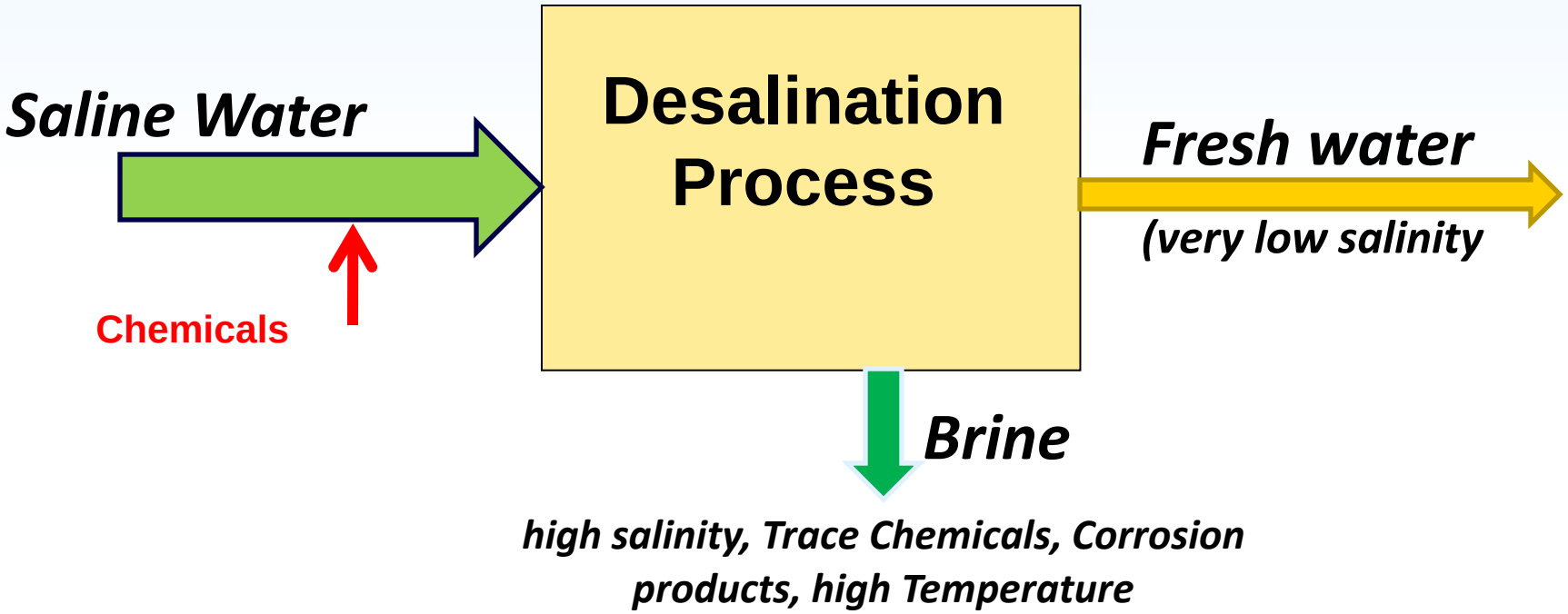
Environmental Concern; the cause and potential effects



Environmental Concern; the cause and the potential effects

Parameter	Potential Impact
High salinity	•affects Species growth. •affects survival of Larva. •affects Population density of organisms. •May cause Fish migration
Residual Chlorine	
Corrosion products e.g. Cu	
Trace chemicals	
High Temperature	

Assessment Methods

Bahrain Standard for Industrial Effluent (Issued in 1999)

Physiochemical

e.g. pH, temp, turbidity

Biochemical

e.g. BOD, COD, TOC

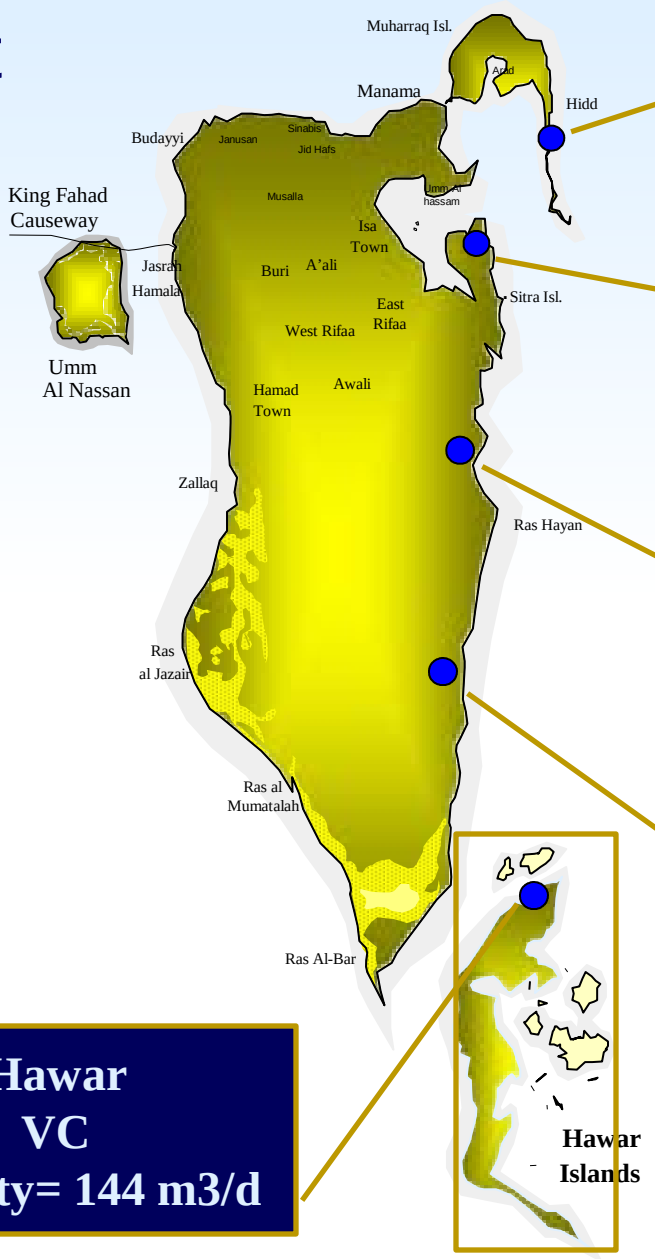
Chemical

e.g. residual chlorine, Fe, Cu, nitrates, nitrites, phosphates

Biological

total coliform

Bahrain Desalination Plants Environmental Assessment



Hidd Power Company
MSF/MED
capacity=409,090 m3/d

Sitra Power & Water Station
MSF
capacity=113,636 m3/d

Ras Abu Jarjur Plant
R.O
capacity=75,000 m3/d
70% recovery

Addur SWRO Plant
R.O
capacity=45,454 m3/d
30% recovery

Hawar
VC
Capacity= 144 m3/d

Bahrain Desalination Plants Environmental Assessment

- Point source assessment.
- The assessment work covers the period from 2008 to 2010.

HPC/ outfall

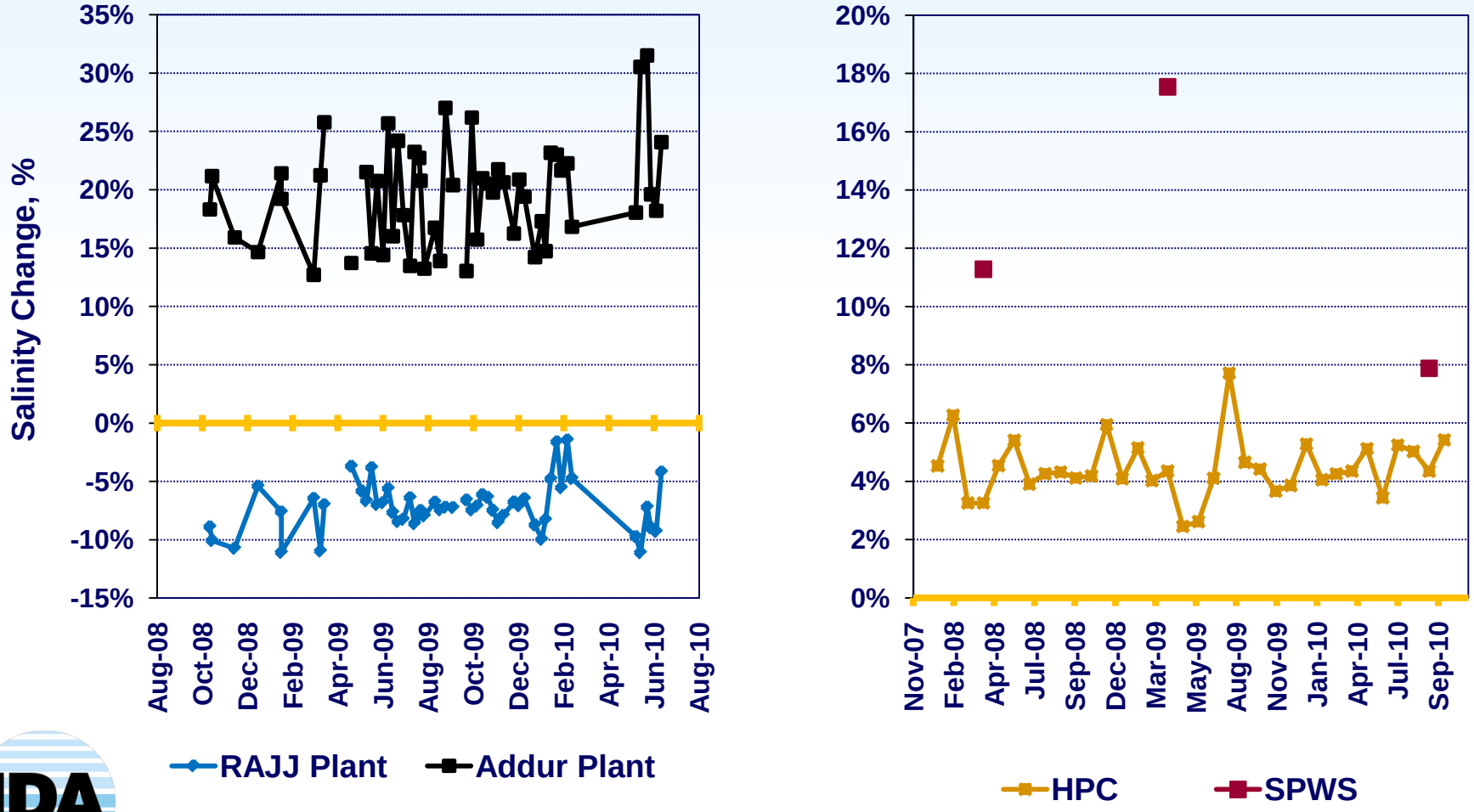
SPWS/ phase I&III outfalls

Addur outfall

RAJJ outfall

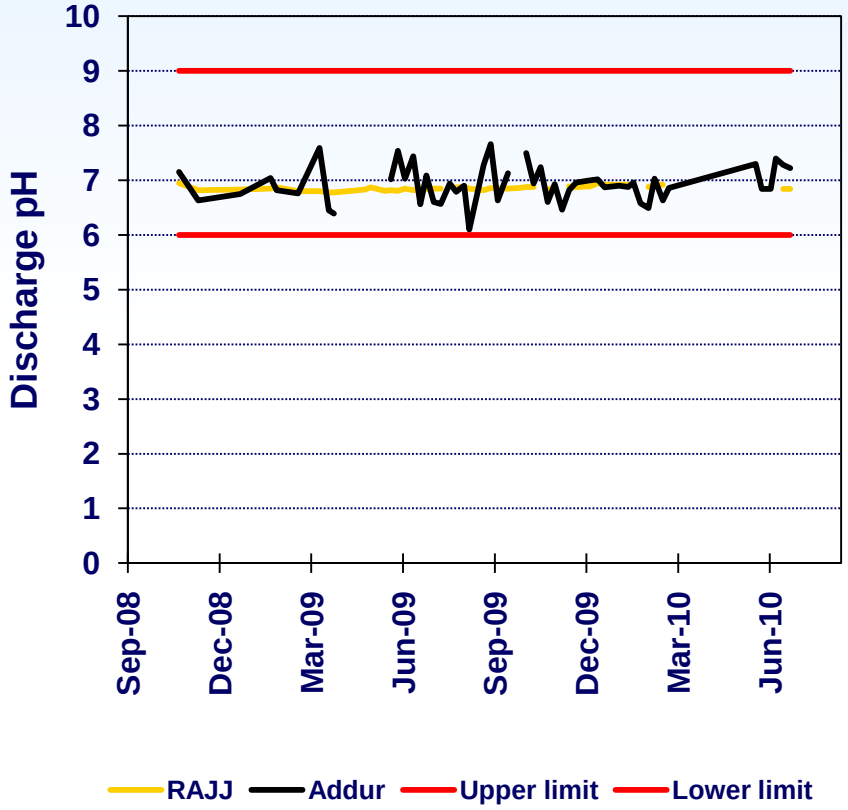
Results: Physiochemical Parameters

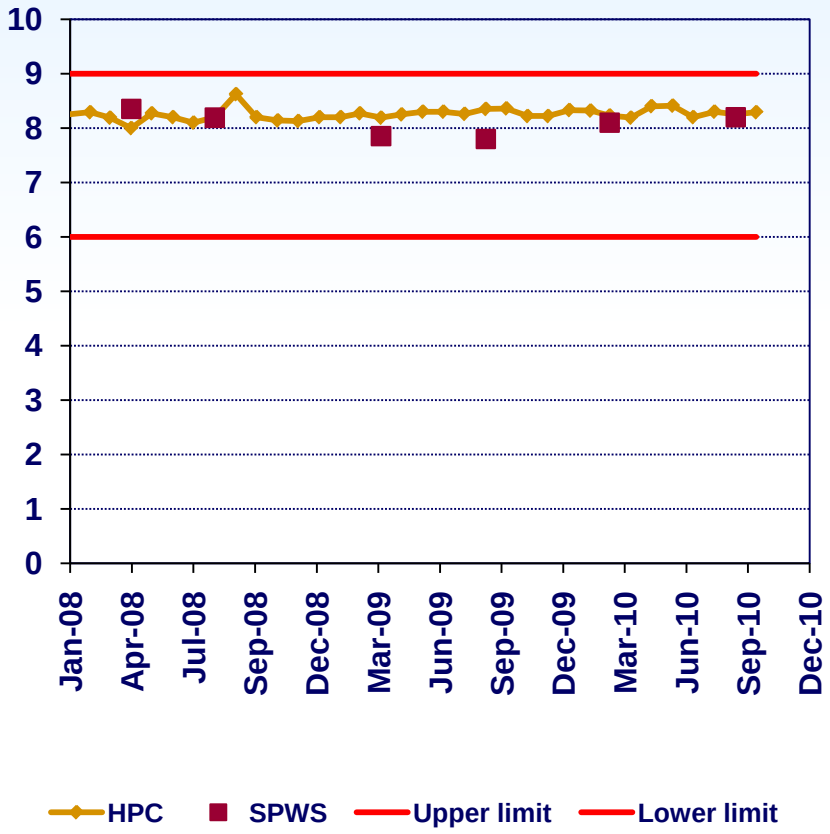
Fig. 1 Salinity Change, %



Results: Physiochemical Parameters

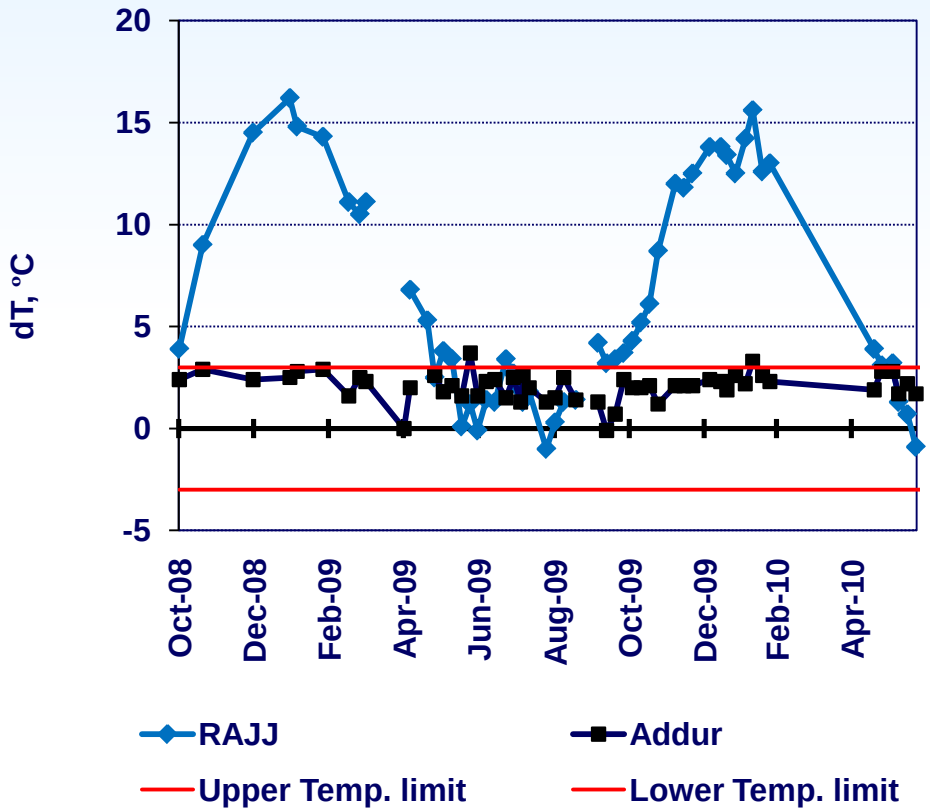
Fig. 2 Discharge pH

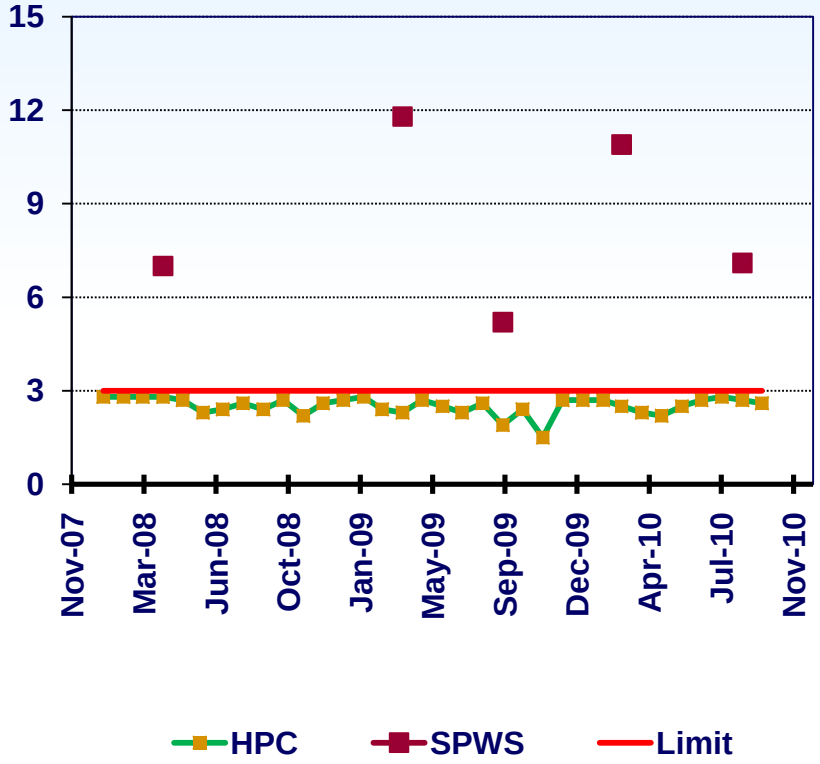




Results: Physiochemical Parameters

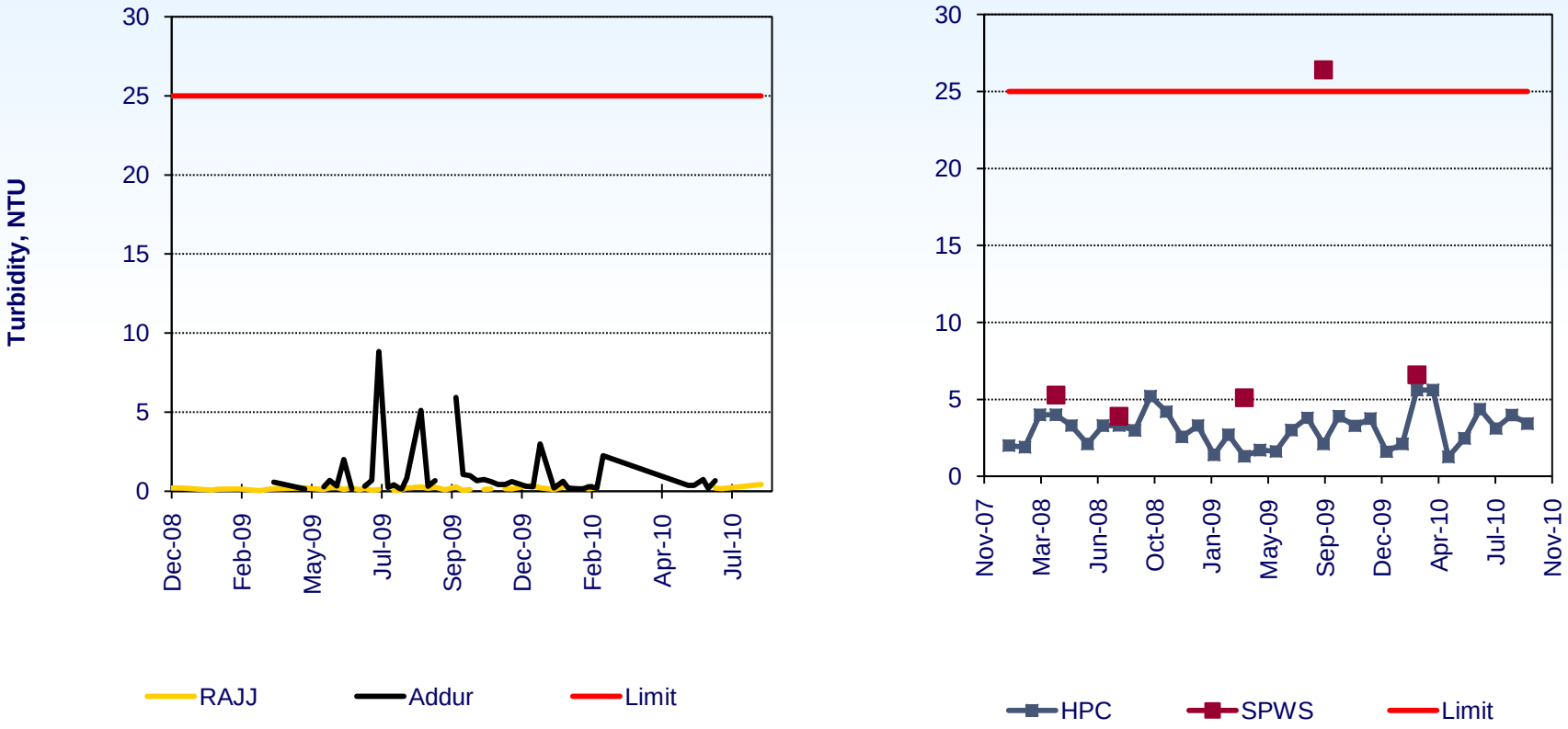
Fig. 3 Difference between discharge and Seawater Temperatures





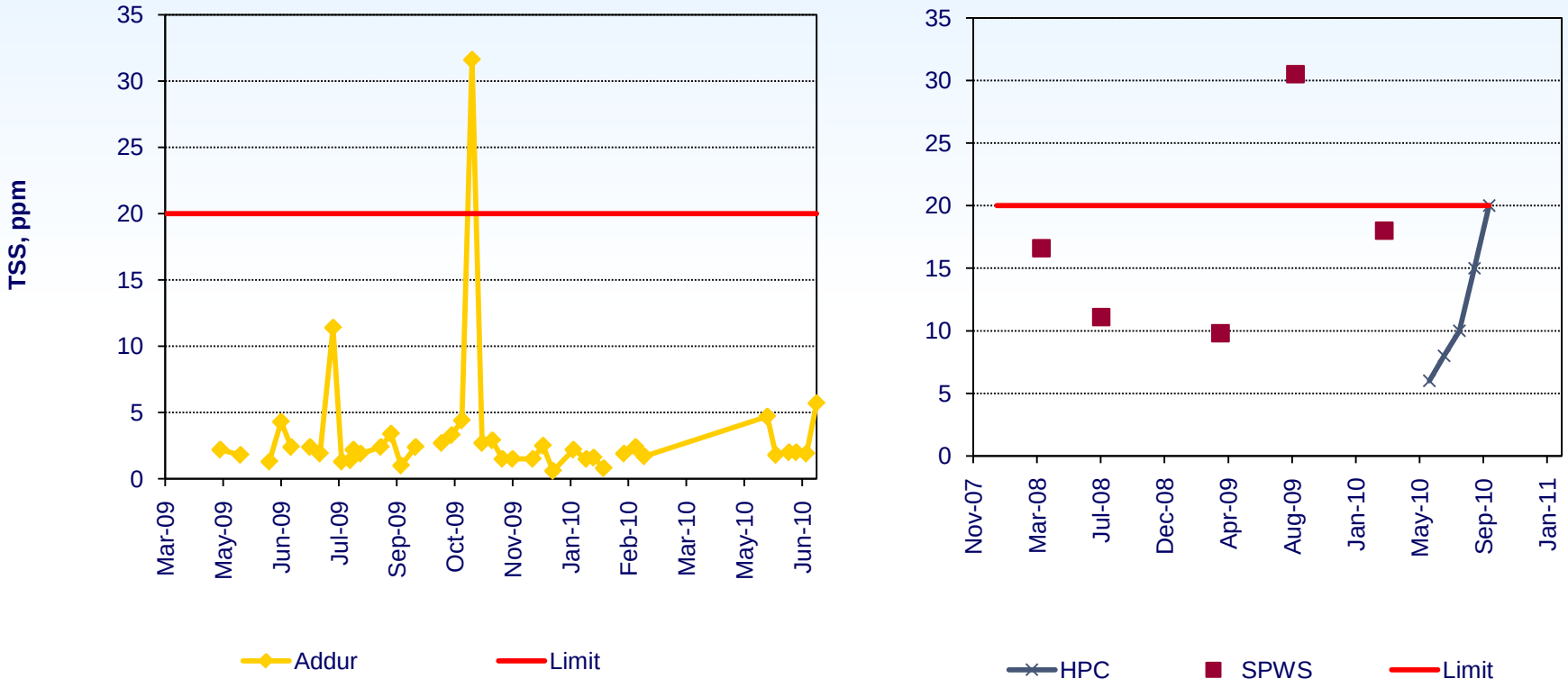
Results: Physiochemical Parameters

Fig. 4 Discharge Turbidity



Results: Physiochemical Parameters

Fig. 5 Discharge TSS

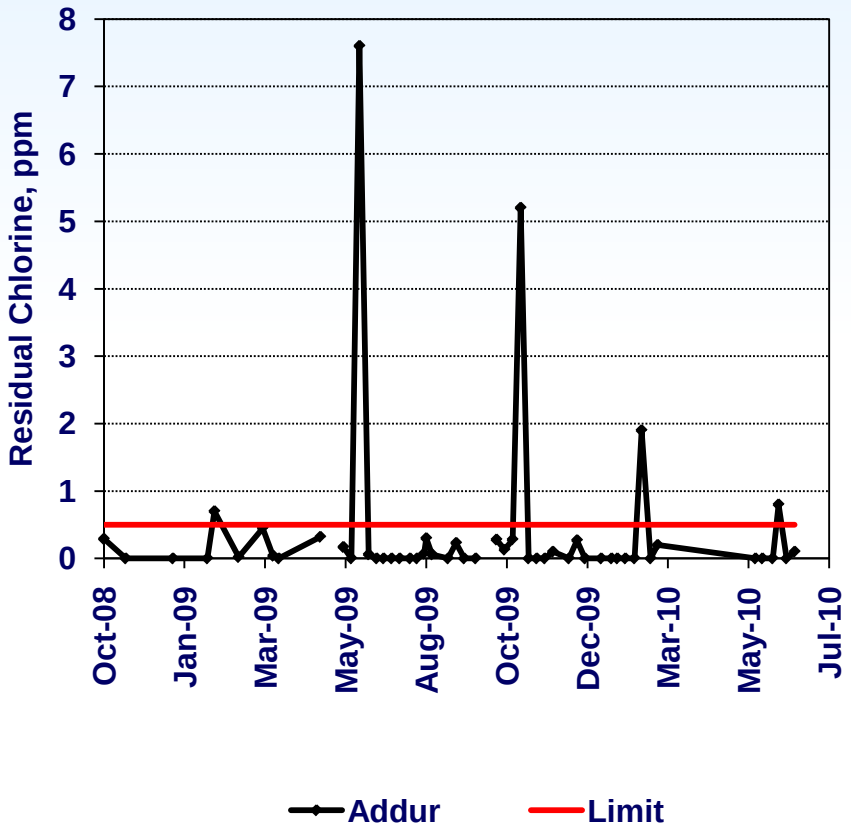


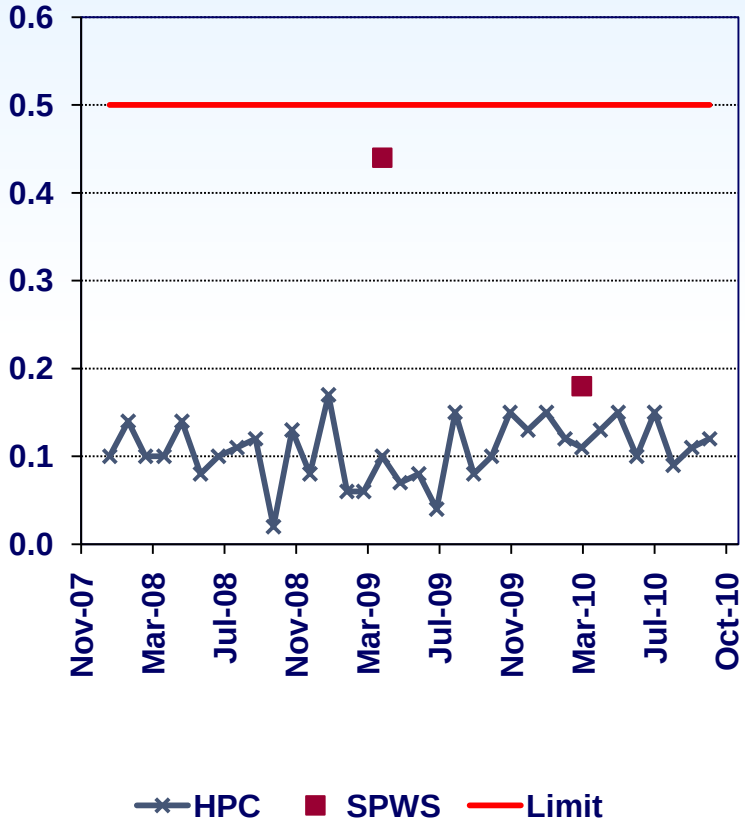
Results: Biochemical Parameters

	BOD, mg/l			COD, mg/l			TKN, mg/l			TOC, mg/l		
Limit	**monthly avg=25**			**monthly avg=150**			**monthly avg=5**			**monthly avg. = 50**		
Month	**RAJ**	**Addur**	**SPWS**	**RAJ**	**Addur**	**SPWS**	**RAJ**	**Addur**	**SPWS**	**RAJ**	**Addur**	**SPWS**
Jun-08	#	#	#		#	#	#	#	#	#	#	#
Oct-08		#	#		#	#		#	#	#	#	#
Apr-09		#	#		#	#		#	#	#	#	#
May-09	#		#	#	_____	#	#		#	#		#
Aug-09	#		#	#		#	#	**<0.1**	#	#		#
Feb-10	#	#	#	#	#	#	#	#	#	#	#	#
Mar-10	#	#		#	#		#	#		#	#	**<0.5**
Sep-10		#			#			#		#	#	**NDLT 0.5**
Oct-10	#	#	#	#	#	#	#	#	#	#	#	#
Nov-10		#	#		#	#		#	#	**<1**	#	#
Dec-10	#	#	#	#	#	#	#	#	#	#	#	#

Results: Chemical Parameters

Fig 6. Residual Chlorine





Results: Chemical Parameters

Fig. 7 RAJ Brine Sulphide

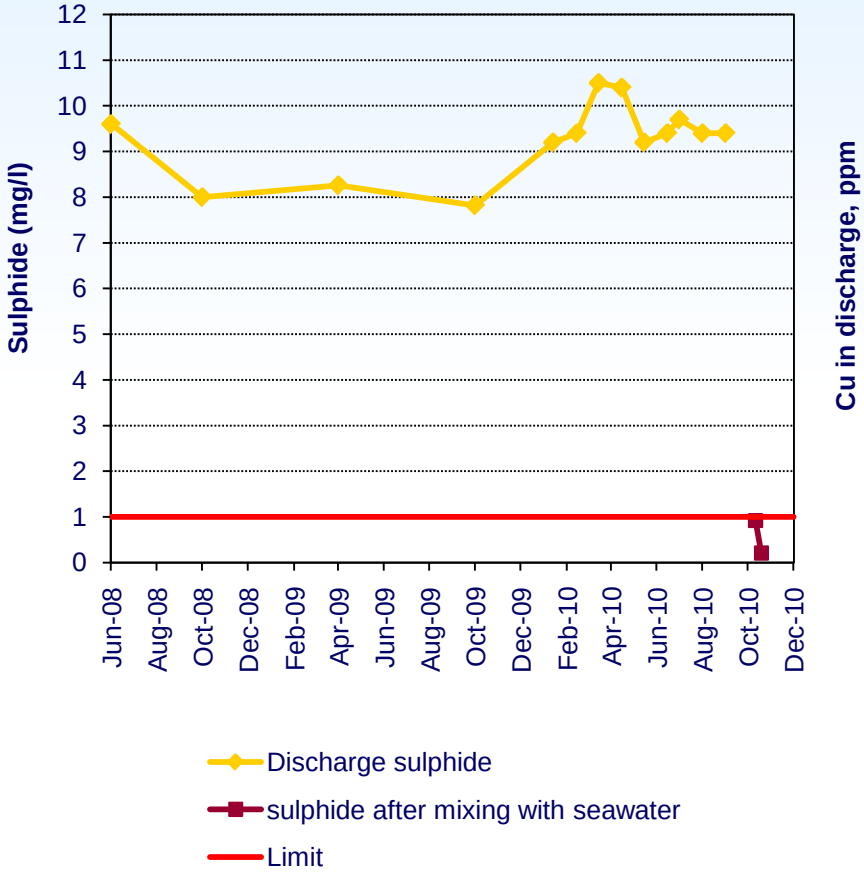
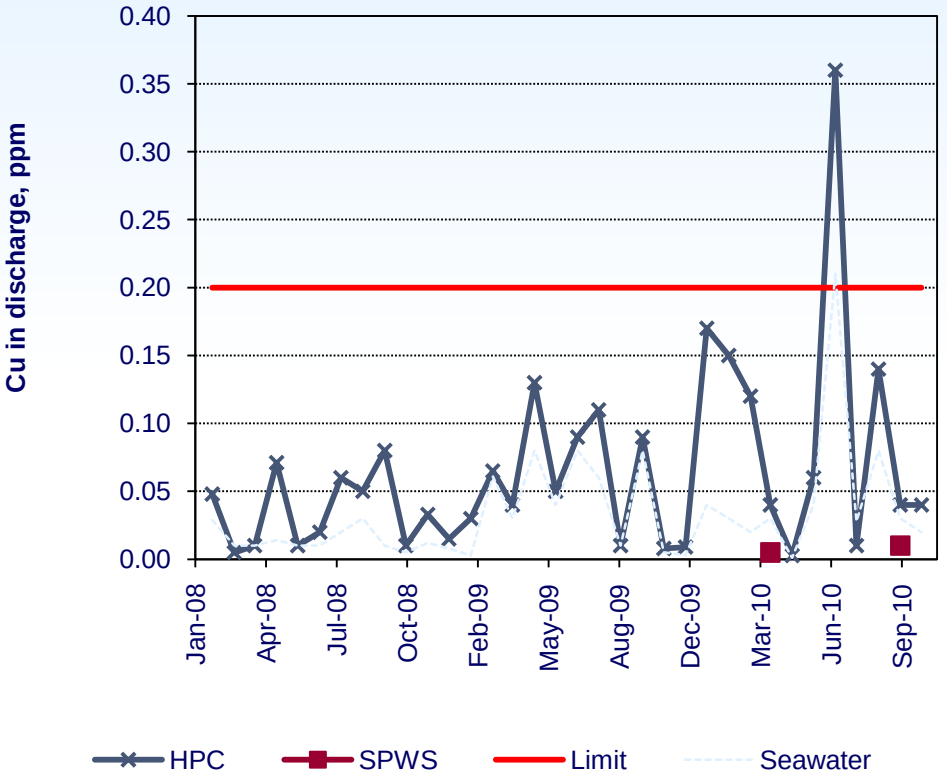


Fig. 8 Copper in HPC & SPWS Discharges



Results: Chemical Parameters

Date	Plant	Aluminium as Al, mg/l	Lead as Pb, mg/l	Iron, mg/l	Copper as Cu, mg/l	Nickel as Ni, mg/l	Zinc as Zn, mg/l
	Limit	*15 mg/l*	*0.2 mg/l*	*5 mg/l*	*0.2 mg/l*	*0.2 mgl*	*2 mg/l*
	Addur	0.02	< 0.001	0.06	#	#	#
	Addur	#	< 0.15	#	0.08	0.07	0.08
	RAJJ	0.05	0.01	0.08	0.002	0.011	0.097
	RAJJ	0.03	< 0.1	0.24		0.02	0.09
	SPWS	< 0.05	< 0.05	0.01	0.005	< 0.02	< 0.05
	SPWS	0.038	NDLT 0.01	#	0.01	0.006	0.02

Results: Chemical Parameters

Date	Plant	Ammoniacal Nitrogen, mg/l	Nitrate, mg/l	Nitrite, mg/l	Total Phosphate, mg/l
	Limit	*3 mg/l*	*10 mg/l*	*1 mg/l*	*2 mg/l*
	Addur	< 0.1	3.2	0.01	< 0.1
	RAJJ	0.55	0.1	0.01	#
	SPWS	0.27	0.6	< 0.01	< 0.01
	SPWS	0.11	0.7	NDLT 0.01	0.07
	HPC	0.08		0.04	0.2
	HPC	0.39	#	0.021	0.06
	HPC	0.41	#	0.016	0.1

CONCLUSION AND RECOMMENDATIONS

- Most parameters found in compliance with the Bahrain's legislation.
- Few parameters , in each Plant, still need close monitoring in the near and far fields e.g. discharge temperature (SPWS and RAJJ) and Sulphide in case of RAJJ Plant.
- All Organic parameters will be subjected to thorough analysis with more specialized laboratory in this field.
- EIA to be carried out in the vicinity of all Plants to assess the conditions

Thank you

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