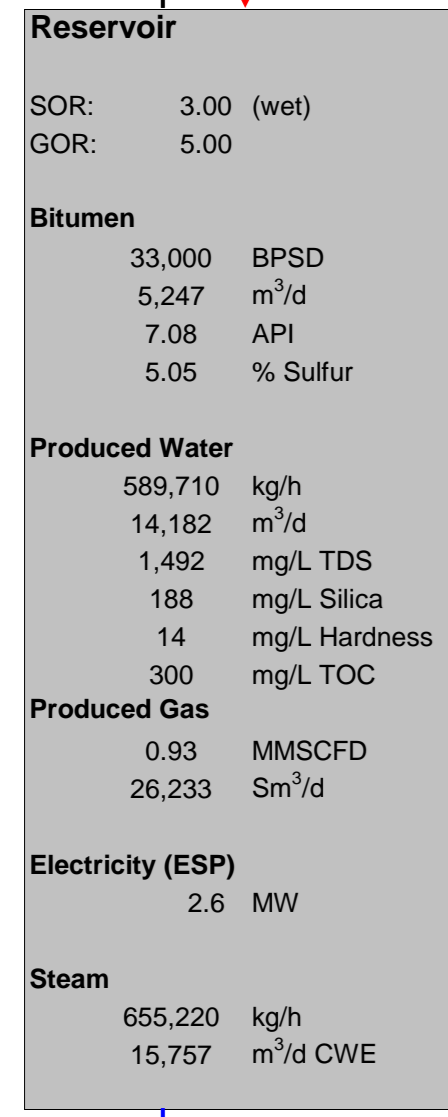
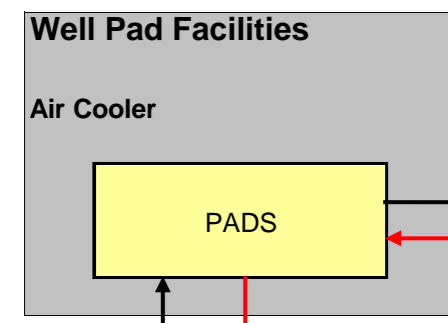


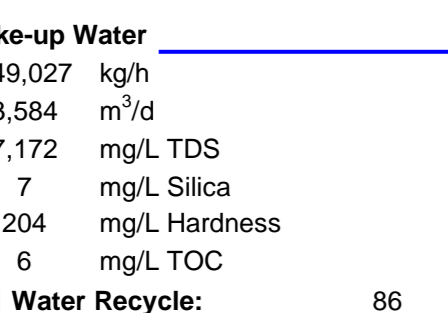
# COSIA SAGD TEMPLATE

**Base Case**  
 Mechanical Lift - 2200 kPa  
 Warm Lime Softening - OTSG



**Water Losses to Reservoir:**

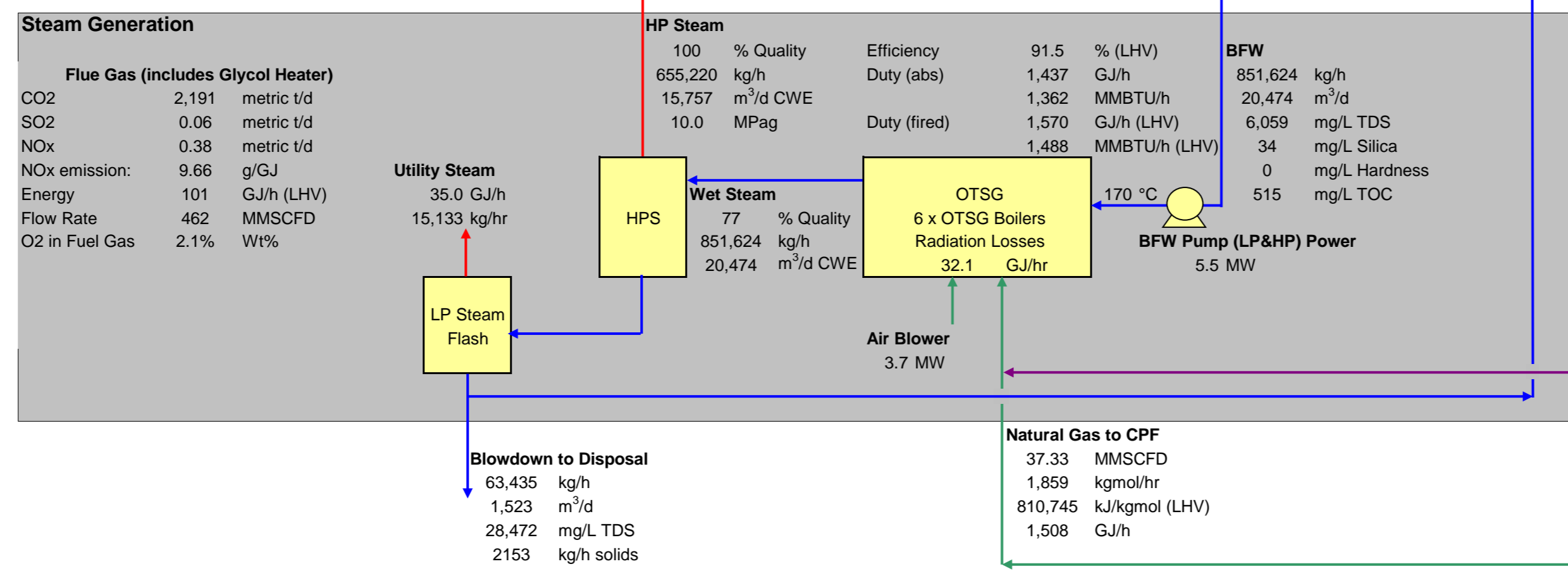
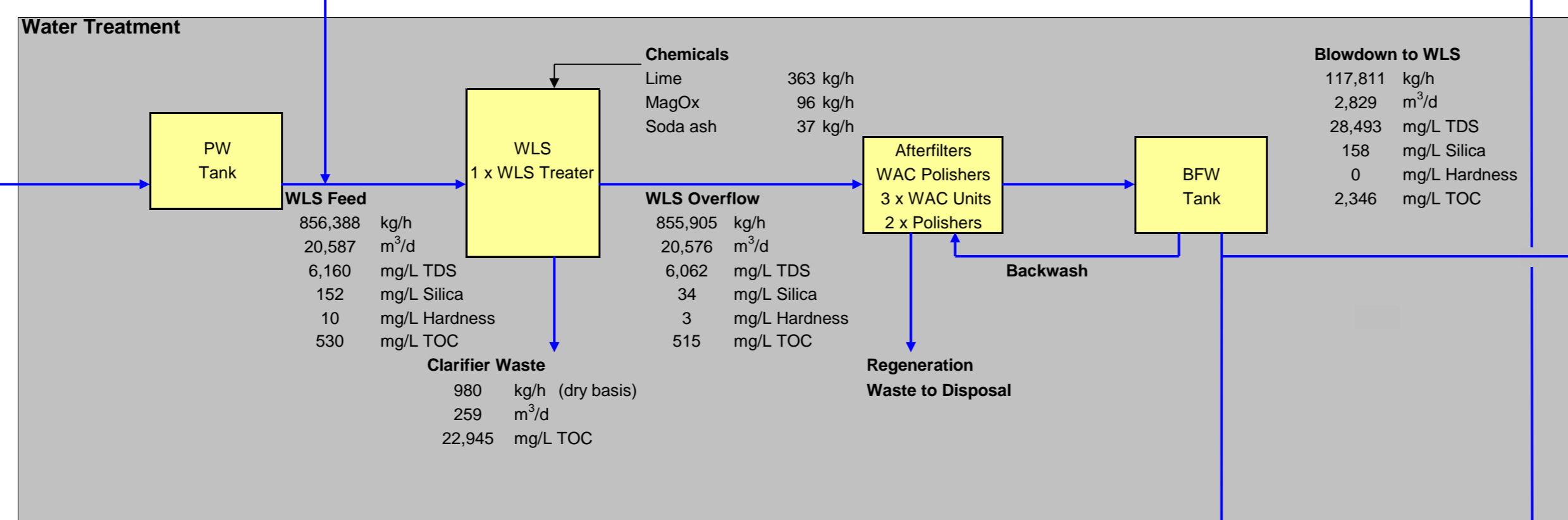
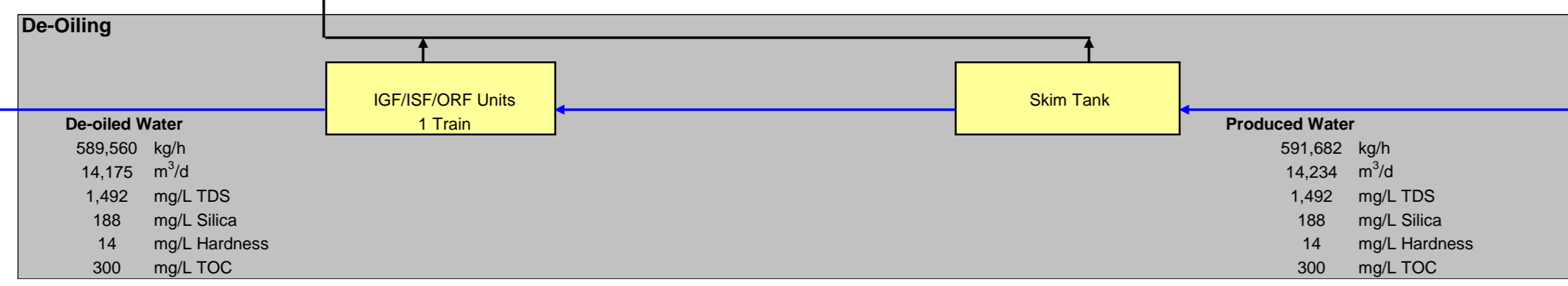
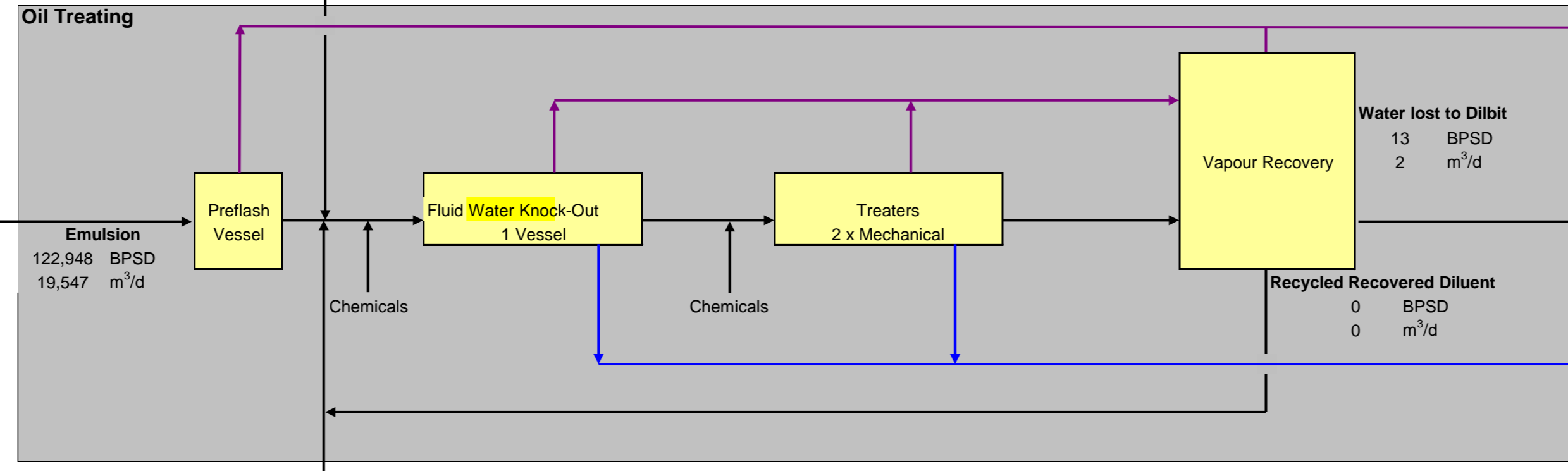
65,522 kg/h  
 1,576 m<sup>3</sup>/d  
 10 % Losses



**Produced Gas Composition**

H2	0.3	Mol%
CO2	30.0	Mol%
N2	1.3	Mol%
H2S	0.13	Mol%
C1	63.6	Mol%
C2	1.63	Mol%
C3	1.98	Mol%
C4	0.3	Mol%
C5+	0.88	Mol%

(comp at test separator)



**Summary Table**

MU TDS (ppm)	7,172
PW TDS (ppm)	1,492
PW TOC (ppm)	300
LP Flash BD (%)	8%
BD Recycle (%)	60%
TDS to Boiler (ppm)	6,059
Boiler TOC (ppm)	515
MU Flowrate (kg/d)	149,027
WLS Sludge (kg/d)	23,530
Disposal Type (L,S)	L
Disposal Rate (kg/h)	63,435
Disposal Solids (kg/d)	51,662

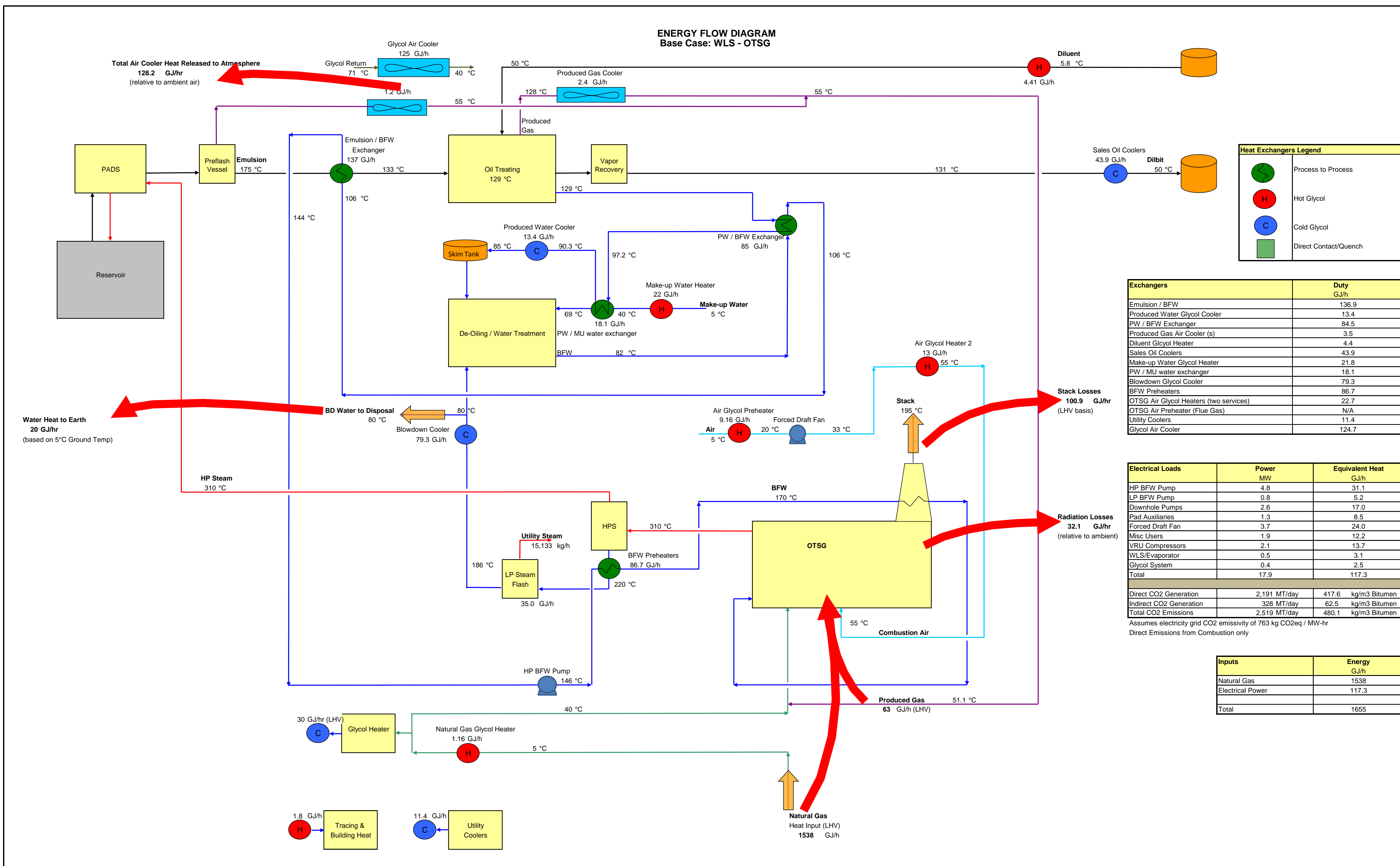
**Water Balance**

Stream	Flow kg/h	Flow m <sup>3</sup> /d	TDS ppm	Silica ppm	Hardness ppm
Steam to reservoir	655,220	15,757	-	-	-
Losses to reservoir	65,522	1,576	-	-	-
Produced Water	591,682	14,234	1,492	188	14
Losses to production	85	2	-	-	-
De-oiled Water	589,560	14,175	1,492	188	14
Make-up Water	149,027	3,584	7,172	7	204
Supernatant					
WLS Feed	856,388	20,587	6,160	152	10
WLS Overflow	855,905	20,576	6,062	34	3
Clarifier Waste to Land	980	259			
Blowdown to Disposal	63,435	1,523	28,472	158	0
LP Steam to WT	0	0	0	0	0
LP Steam to Header	15,133	363,198	0	0	0
Service Water	4,280	103	6,059	34	0
BFW	851,624	20,474	6,059	34	0

**Emissions Summary**

Source	SO2 metric t/d	S metric t/d	CO2 metric t/d	NOx metric t/d
OTSG Flue Gas	0.06	0.03	2191	0.38
Recovered Sulfur	-	0.00	-	-

**ENERGY FLOW DIAGRAM**  
Base Case: WLS - OTSG



**Heat Exchangers Legend**

- Process to Process
- Hot Glycol
- Cold Glycol
- Direct Contact/Quench

Exchangers	Duty GJ/h
Emulsion / BFW	136.9
Produced Water Glycol Cooler	13.4
PW / BFW Exchanger	84.5
Produced Gas Air Cooler (s)	3.5
Diluent Glycol Heater	4.4
Sales Oil Coolers	43.9
Make-up Water Glycol Heater	21.8
PW / MU water exchanger	18.1
Blowdown Glycol Cooler	79.3
BFW Preheaters	86.7
OTSG Air Glycol Heaters (two services)	22.7
OTSG Air Preheater (Flue Gas)	N/A
Utility Coolers	11.4
Glycol Air Cooler	124.7

Electrical Loads	Power MW	Equivalent Heat GJ/h
HP BFW Pump	4.8	31.1
LP BFW Pump	0.8	5.2
Downhole Pumps	2.6	17.0
Pad Auxiliaries	1.3	8.5
Forced Draft Fan	3.7	24.0
Misc Users	1.9	12.2
VRU Compressors	2.1	13.7
WLS/Evaporator	0.5	3.1
Glycol System	0.4	2.5
<b>Total</b>	<b>17.9</b>	<b>117.3</b>

Direct CO2 Generation	2,191 MT/day	417.6 kg/m3 Bitumen
Indirect CO2 Generation	328 MT/day	62.5 kg/m3 Bitumen
<b>Total CO2 Emissions</b>	<b>2,519 MT/day</b>	<b>480.1 kg/m3 Bitumen</b>

Assumes electricity grid CO2 emissivity of 763 kg CO2eq / MW-hr  
Direct Emissions from Combustion only

Inputs	Energy GJ/h
Natural Gas	1538
Electrical Power	117.3
<b>Total</b>	<b>1655</b>