

LG&E/KU – Mill Creek Station

Phase II Air Quality Control Study

WFGD System Water Supply

February 23, 2011
Revision B – Issued For Client Review

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1.0 Introduction

The makeup water source for the existing wet scrubbers for Units 1, 2, 3 and 4 is from the Clearwell Pond. The Clearwell Pond collects water from Units 3 and 4 cooling tower blowdowns and receives the balance of required make-up water from the service water system.

The current water source for the wet scrubbers will be used for the upgraded, existing wet scrubbers, including Unit 1, Unit 2, and Unit 4, which will be functioning as the new Unit 3 scrubber. The new Unit 4 WFGD will also be supplied by the Clearwell Pond.

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2.0 WFGD System Water Supply

Upgrading Unit 1, Unit 2 and Unit 4 (to be used for Unit 3) wet scrubbers are not expected to significantly change the WFGD makeup water quality and quantity requirements to those units. Adding the new Unit 4 WFGD will result in additional WFGD makeup water required and change to wastewater discharge quality and quantity. However, these changes are estimated to be minor and expected to be within the limits of the existing system. The impacts of these changes will be investigated further during detailed design.

Water quality characteristics for each of the WFGD System Water Supply are listed in Table 2-1.

Constituent	Clearwell Pond (Note 1)	Ohio River Water (Service Water)	Cooling Tower Unit 3	Cooling Tower Unit 4
Calcium, mg/L as CaCO ₃	141.79	119	161	183
Magnesium, mg/L as CaCO ₃	64.46	55	73	81
Sodium, mg/L as CaCO ₃	57.07	47.7	65.1	73.78
Potassium, mg/L as CaCO ₃	No data	No data	No data	No data
M-alkalinity, mg/L as CaCO ₃	113.91	98	125	145
Sulfate, mg/L as CaCO ₃	93.58	75.9	109.2	124.8
Chloride, mg/L as CaCO ₃	54.91	47.9	59.2	69.09
Nitrate, mg/L as CaCO ₃	No data	No data	No data	No data
Silica, mg/L as such	5.77	5.1	6.6	6.7
pH (range)	No data	7.7	8	8.2
Specific Conductance, μS/cm	550.88	481	598	689
Temperature (range), °F	No data	No data	No data	No data
Total Suspended Solids	13.65	13	19	10
Total Phosphate, mg/l as PO ₄	1.02	0.4	1.3	2.4
Aluminum, mg/L as such	No data	No data	No data	No data
Barium, mg/L as such	No data	No data	No data	No data
Boron, mg/L as such	No data	No data	No data	No data
Cadmium, mg/L as such	No data	No data	No data	No data

Chromium, mg/L as such	No data	No data	No data	No data
Copper, mg/L as such	0.17	0.14	0.28	0.13
Iron, mg/L as such	0.71	0.74	0.83	0.49
Manganese, mg/L as such	0.07	0.07	0.07	0.05
Nickel, mg/L as such	No data	No data	No data	No data
Strontium, mg/L as such	No data	No data	No data	No data
Zinc, mg/L as such	0.08	0.07	0.16	0.04
Note: 1. WFGD makeup water source is from Clearwell Pond. The ratio mixture of WFGD makeup water is Service Water: Cooling Tower Blowdown Unit 3: Cooling Tower Unit 4 = 0.57 : 0.215 : 0.215				
References: • GE Power & Water “Water Analysis Report” to LG&E, Sampled date: 04-AUG-2010.				

2.1 Unit 4 WFGD Water Mass Balance

The design basis water balance for the new Mill Creek Unit 4 WFGD system is shown in Appendix A, Unit 4 WFGD Water Mass Balance.

The Unit 4 WFGD system will receive makeup water from the Clearwell Pond. The makeup water will be used for absorber mist eliminator wash, oxidation air humidification, vacuum filter seals wash, makeup water to reagent preparation, and makeup water to absorber.

Absorber slurry bleed from the Unit 4 WFGD system will be directed to the new Unit 4 hydrocyclone to obtain a coarse fraction of gypsum solids. In order to eliminate the fine gypsum particles and maintain chloride concentration in the absorber slurry liquor, a portion of the hydrocyclone overflow will discharge to the Rim Ditch trench, which runs north towards the Ash Pond. Suspended solids in the wastewater settle out in the ditch and are removed and hauled to the landfill. From the Rim Ditch, the WFGD wastewater flows into the Ash Pond. The remaining portion of the hydrocyclone overflow will be returned to the Unit 4 WFGD absorber reaction tank.

The hydrocyclone underflow slurry will be directed to the existing common dewatering system for further dewatering process. The filtrate from the existing common dewatering system will be discharged to the Settling Ponds. In the Settling Ponds, the suspended solids are settled down and the wastewater from the Settling Ponds will be finally discharged to the Ohio River. Dewatered gypsum from the existing common dewatering system will be hauled to the on-site landfill or sold.

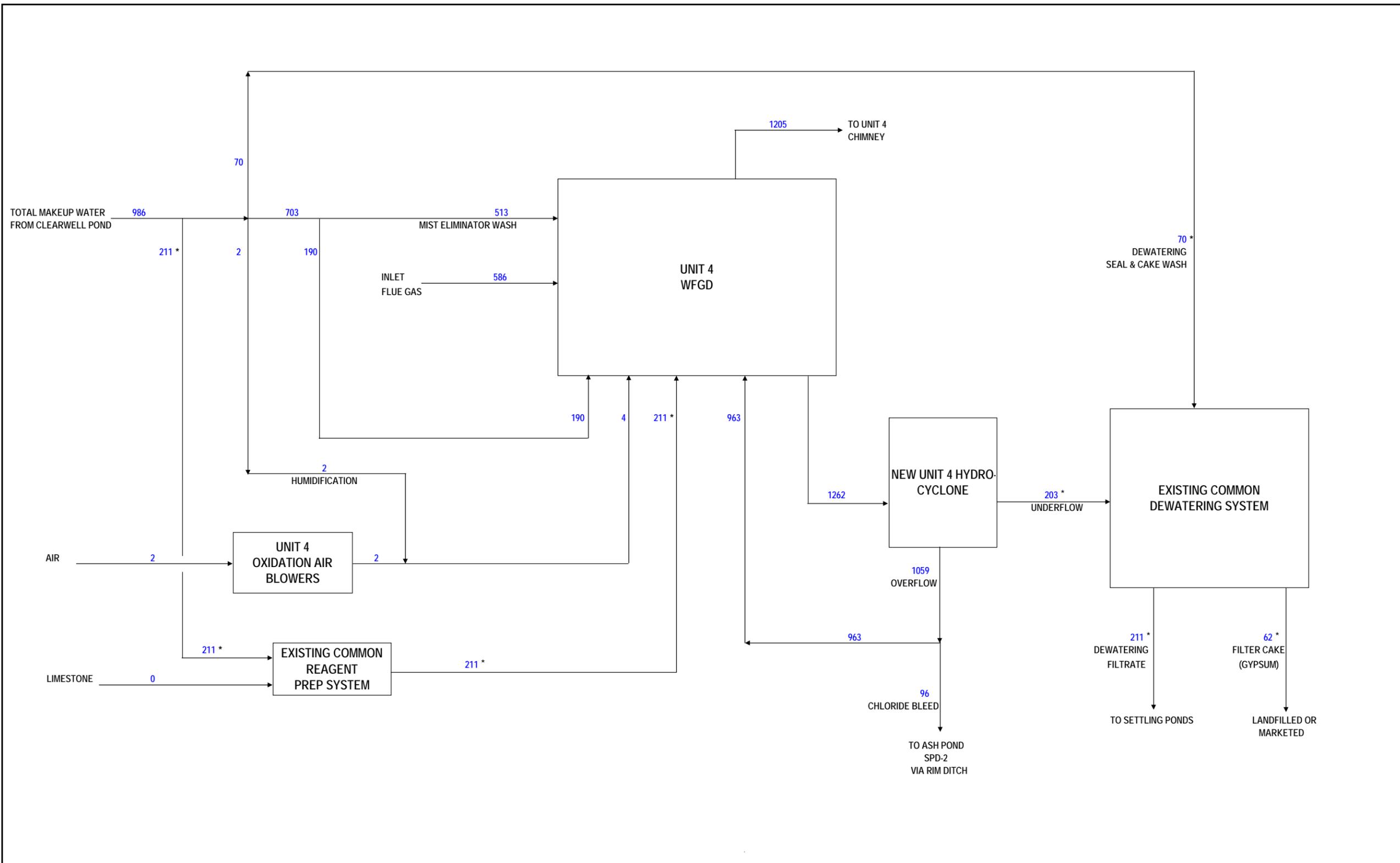
3.0 Summary

Adding the new Unit 4 WFGD, utilizing the existing Unit 4 WFGD for Unit 3, and decommissioning the existing Unit 3 WFGD will result in changes to the FGD makeup water quantity and wastewater discharge quality and quantity. However, these changes are minor and expected to be within the capabilities of the existing system.

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Appendix A
Unit 4 WFGD Water Mass Balance

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NOTE:
 1. Flows are in US GPM.
 2. WFGD makeup water source is from Clearwell Pond.
 3. Flows include water from hydration in gypsum.
 4. Flows to and from common system are for WFGD Unit 4 only (Denoted by *)
 5. Conditions at Rated Load: 5,122 MBtu/HR, 6 lb/Mbtu SO₂

NO.	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
B	2/23/2011	ISSUED FOR CLIENT REVIEW	SNG	SNG	MCP		
A	1/20/2011	ISSUED FOR IN HOUSE REVIEW	SNG	SNG	MCP		

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ENGINEER	SNG	DRAWN	SNG
CHECKED		DATE	2/23/2011

**LG&E/KU - MILL CREEK STATION
 PHASE II: AIR QUALITY CONTROL STUDY**

**UNIT 4
 WFGD WATER MASS BALANCE**

PROJECT	DRAWING NUMBER	REV
168908	M4WMB-1	B
CODE		
AREA		