

Focus Group Information

Metro Water Services Comprehensive Odor Study

Dry Creek WWTP Focus Group

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Metro Water Services Comprehensive Odor Study

Focus Group Meeting #1 Dry Creek WWTP

October 9, 2001

AGENDA

- 1. Introductions**
- 2. Establish Objectives of Focus Group**
- 3. Definition of an Odor Problem**
- 4. Brief Discussion on Odor Science**
- 5. Odor Study Steps**
- 6. Schedule of Tasks**
- 7. Odor Occurrence Logs**
- 8. Next Meeting Objectives and Potential Date**
- 9. Discussion**

Definition of an Odor Problem

1. Odor Source

- Incoming wastewater
- Treatment processes within facility

2. Release

- Open tanks
- Channels
- Vents
- Fans

3. Transport

- Meteorological conditions
- Low wind speed
- High stability

4. Receptor (Nose)

- Location
- Threshold of odor
- Perception of odor

Basic Principles of Odor Science

1. Odor constituents

- Odors from waste treatment facilities are comprised of numerous constituents
- Constituents in low concentrations are not a concern to public health
- Odors are considered a “nuisance”

2. Distance of **odor transport** dependent on “Odor emission rate” (OER) – OER is equal to the concentration of odor times the amount of air being emitted

3. Threshold science

- Must reduce odor concentration below threshold concentration at the receptor location
- Reducing the concentration well below the threshold could result in high costs with little additional benefit

4. Odors from different sources are **not necessarily additive**

- Must determine the source (odor) which travels the farthest
- Eliminating lesser odors will not provide benefit

Odor Study Steps

1. Determine all potential sources of odors
2. Sample and analyze air from all potential sources
3. Determine air exhaust rates from all potential sources
4. Calculate odor emission rates from each source
5. Rank all data (worst to best)
6. Model (screen) data to determine maximum distance that each odor (from each potential source) will travel during varying weather conditions
7. Establish Objectives - These objectives may include:
 - Acceptable odor level at: (1) receptors (off-site) or; (2) property line
 - Acceptable frequency of odor occurrences
 - Cost budget
8. Determine % removal to meet above objectives
9. Analyze and characterize odorous air from problem sources
10. Determine the alternatives for reducing odor (from each source) to meet above % removals
11. Evaluate alternatives based on:
 - Meeting above objectives
 - Cost
 - Long term implications
 - Other
12. Select alternative
13. Design

Schedule of Tasks

1. Determine all potential sources - complete
2. Sample and analyze air from all potential sources – complete
3. Determine air exhaust rates – 50 percent complete
4. Calculate odor emission rates – 50 percent complete
5. Determine distances – November, 2001
6. Odor Ranking – November, 2001
7. Technical Memorandum #1 – November, 2001
8. Focus Group Meeting #2 – November, 2001
9. % Removal Determination – December, 2001
10. Alternatives Screening – December, 2001
11. Technical Memorandum #2 – December, 2001
12. Focus Group Meeting #3 – December, 2001
13. Draft Report Preparation – January, 2002
14. Final Report – February, 2002

Focus Group Meeting #2

Preliminary Agenda

1. Review all data
2. Review modeling (screen) results
3. Establish Objectives

**Comprehensive Odor Evaluation
Focus Group Meeting
January 28, 2002**

AGENDA

1. Review Study Steps
2. Review Sample Locations
3. Discuss Sampling Results
4. Present Transport Model Results
5. Discuss Odor Priority
6. Discuss Abatement Objective

Model Results

**Table 1
Base Data**

Nashville - Dry Creek

Name of Facility	Nashville - Dry Creek						
Date of Run	04/29/03						
Number of Sources	29						
Dilution Series 1	27	7	1				
Dilution Series 2	567	189	1				
Turbulence Factors	None	0.05	Light	0.1	Moderate	0.2	High 0.3
Endpoints	Avg	1	Peak	1	5		
Slope Correction	Avg	-0.3	Peak	-0.5	aiting D/T 100	aiting D/T 500	
Peaking Factors	Area	10	Point	3	aiting OEF 0.2	aiting OEF 0.5	
Design Average	x	5					
Design Peak	x	1					

Sample Type Factors

A,P or V 1 = None 2 = Light 3 = Mod 4 = High

Sample #	Sample Location	Date	Time	Sample Type	Factor	Process ID	D/T	Base Sensory Data							Source Information		
								Dil 3	Dil 2	Dil 1	Dil Series	H2S	Mer	NH3	Area	cfm	Height
1	Primary Channel Influent	08/20/01	-	V	-	PRICH1	289	71	114	191	1	1.3	0	0	3908	2500	5
2	Primary Clarifier Influent	08/16/01	-	A	1	PRIQ	217	33	60	174	1	0.22	0	0	11500		5
3	Primary Clarifier Midpoint	08/16/01	-	A	1	PRIQ	128	56	73	351	1	0.4	0	0.05	11500		5
4	Primary Clarifier Weir 1	08/16/01	-	A	3	PRIW	1362	197	466	502	1	6.6	0	0	11500		5
5	Primary Effluent Channel	08/20/01	-	V	-	PRICH2	44	36	112	265	1	0.15	0	0	4650	3000	5
6	Aeration Basin Influent (1)	08/06/01	-	V	-	AB3	87	28	30	35	1	0.13	0	0	20210	10667	5
7	Aeration Basin Midpoint (1)	08/06/01	-	V	-	AB4	26	18	25	19	1	0.007	0	0	20210	10667	5
8	Aeration Basin End (1)	08/06/01	-	V	-	AB5	14	18	21	23	1	0.002	0	0	20210	10667	5
9	Mixed Liquor Channel	08/06/01	-	V	-	FINCH	14	16	16	16	1	0.003	0	0	3867	2500	5
10	Final Clarifier	08/20/01	-	A	1	FINQ	12	11	13	16	1	0.014	0	0	34383		5
11	EQ Basin - 20 ft.	08/06/01	-	A	2	REQUAL	840	92	107	122	1	0.13	0	1.1	89320		20
12	Dewatered Sludge w/Permanganate	08/22/01	-	A	1	DSTORE	457	121	228	502	1	2.2	0	0	72		-
13	Dewatered Sludge w/o Permanganate	08/22/01	-	A	1	DSTORE	327	121	232	419	1	3	0	0	72		-
14	Dewatering Bldg. w/ Permanganate	08/22/01	-	P	-	DWDP	249	42	94	173	1	7.4	0	0			-
15	Dewatering Bldg. w/o Permanganate	08/22/01	-	P	-	DWDP	618	81	225	419	1	17	0	0			-
16	Solids Scrubber Exhaust 1	08/16/01	-	P	-	WSCRUB	325	51	71	232	2	6.6	0	0	15.9	30000	30
17	Headworks Scrubber Exhaust	08/20/01	-	P	-	WSCRUB	550	144	299	381	1	0	0	-	3.14	3000	23.25
18	Total Primaries	-	-	A	2	-	408	79	165	297	1	-	-	-	43058		-
19	Total Aeration 1	-	-	V	-	-	42	21	25	26	1	-	-	-	60630	32001	-
20	EQ Basin - 14 ft.	10/08/01	-	A	2	REQUAL	584	135	314	544	1	0.26	0	0	89320		20
21	Dry Creek Lift Station	10/08/01	-	P	-	WW	191	46	124	228	1	0.57	0	0		5000	15
22	Primaries w/o Weir Area	-	-	A	1	-	170	49	90	245	1	-	-	-	31558		-
23	Solids Scrubber Exhaust 2	11/26/01	-	P	-	WSCRUB	565	355	500	774	1	8	0	0		30000	-
24	Primary Clarifier Midpoint (2)	02/25/02	-	A	1	PRIQ	15	8	9	15	1	0	0	0	11500		-
25	Primary Clarifier Weir 2	02/25/02	-	A	3	PRIW	50	23	36	50	1	0	0.2	0	11500		-
26	Aeration Basin Influent (2)	02/25/02	-	V	-	AB3	329	71	177	331	1	0	0.5	0.3	20210	10667	-
27	Aeration Basin Midpoint (2)	02/25/02	-	V	-	AB4	133	28	51	60	1	0	0	0.1	20210	10667	-
28	Aeration Basin End (2)	02/25/02	-	V	-	AB5	113	55	102	193	1	0	0	0	20210	10667	-
29	Total Aeration 2	-	-	V	-	-	192	51	110	195	1	-	-	-	60,630	32,001	-

Table 2
Sensory Data
Nashville - Dry Creek

Sample #	Sample Type	Sample Location	D/T	Dilutions					Dose -Response Data						
									Logs	m	b	r	Test		
1	V	Primary Channel Influent	289	71	114	191	1.8513	2.0569	2.2810	2.4609	-0.1746	2.1956	-0.997	Okay	
2	A	Primary Clarifier Influent	217	33	60	174	1.5185	1.7782	2.2405	2.3365	-0.3090	2.0802	-0.998	Okay	
3	A	Primary Clarifier Midpoint	128	56	73	351	1.7482	1.8633	2.5453	2.1072	-0.3783	2.3393	-0.96	Okay	
4	A	Primary Clarifier Weir 1	1362	197	466	502	2.2945	2.6684	2.7007	3.1342	-0.1296	2.6529	-0.849	Check	
5	V	Primary Effluent Channel	44	36	112	265	1.5563	2.0492	2.4232	1.6435	-0.5275	2.4099	-0.983	Okay	
6	V	Aeration Basin Influent (1)	87	28	30	35	1.4472	1.4771	1.5441	1.9395	-0.0500	1.5274	-0.994	Okay	
7	V	Aeration Basin Midpoint (1)	26	18	25	19	1.2553	1.3979	1.2788	1.4150	-0.0166	1.3232	-0.05	Check	
8	V	Aeration Basin End (1)	14	18	21	23	1.2553	1.3222	1.3617	1.1461	-0.0929	1.3836	-0.968	Okay	
9	V	Mixed Liquor Channel	14	16	16	16	1.2041	1.2041	1.2041	1.1461	0.0000	1.2041	0	Check	
10	A	Final Clarifier	12	11	13	16	1.0414	1.1139	1.2041	1.0792	-0.1508	1.2342	-0.999	Okay	
11	A	EQ Basin - 20 ft.	840	92	107	122	1.9638	2.0294	2.0864	2.9243	-0.0419	2.0583	-0.99	Okay	
12	A	Dewatered Sludge w/Permanganate	457	121	228	502	2.0828	2.3579	2.7007	2.6599	-0.2323	2.5568	-0.999	Okay	
13	A	Dewatered Sludge w/o Permanganate	327	121	232	419	2.0828	2.3655	2.6222	2.5145	-0.2145	2.5196	-0.991	Okay	
14	P	Dewatering Bldg. w/ Permanganate	249	42	94	173	1.6232	1.9731	2.2380	2.3962	-0.2566	2.1395	-0.983	Okay	
15	P	Dewatering Bldg. w/o Permanganate	618	81	225	419	1.9085	2.3522	2.6222	2.7910	-0.2557	2.4883	-0.97	Okay	
16	P	Solids Scrubber Exhaust 1	325	51	71	232	1.7076	1.8513	2.3655	2.5119	-0.2619	2.4139	-0.999	Okay	
17	P	Headworks Scrubber Exhaust	550	144	299	381	2.1584	2.4757	2.5809	2.7404	-0.1542	2.5220	-0.926	Okay	
18	A	Total Primaries	408	79	165	297	1.8954	2.2175	2.4722	2.6107	-0.2209	2.3627	-0.985	Okay	
19	V	Total Aeration 1	42.33	21	25	26	1.3291	1.4037	1.4094	1.6267	-0.0494	1.4182	-0.845	Check	
20	A	EQ Basin - 14 ft.	584	135	314	544	2.1303	2.4969	2.7356	2.7664	-0.2188	2.6203	-0.975	Okay	
21	P	Dry Creek Lift Station	191	46	124	228	1.6628	2.0934	2.3579	2.2810	-0.3048	2.2693	-0.971	Okay	
22	A	Primaries w/o Weir Area	169.5	49	90	245	1.6902	1.9530	2.3896	2.2292	-0.3138	2.2490	-0.999	Okay	
23	P	Solids Scrubber Exhaust 2	565	355	500	774	2.5502	2.6990	2.8887	2.7520	-0.1230	2.8060	-0.999	Okay	
24	A	Primary Clarifier Midpoint (2)	15	8	9	15	0.9031	0.9542	1.1761	1.1761	-0.2321	1.1873	-0.971	Okay	
25	A	Primary Clarifier Weir 2	50	23	36	50	1.3617	1.5563	1.6990	1.6990	-0.1985	1.6896	-0.981	Okay	
26	V	Aeration Basin Influent (2)	329	71	177	331	1.8513	2.2480	2.5198	2.5172	-0.2656	2.4079	-0.978	Okay	
27	V	Aeration Basin Midpoint (2)	133	28	51	60	1.4472	1.7076	1.7782	2.1239	-0.1558	1.7626	-0.912	Okay	
28	V	Aeration Basin End (2)	113	55	102	193	1.7404	2.0086	2.2856	2.0531	-0.2655	2.2130	-0.996	Okay	
29	V	Total Aeration 2	191.7	51	110	195	1.7104	2.0414	2.2893	2.2825	-0.2536	2.2061	-0.983	Okay	

Table 3
Exhaust Rates
Nashville - Dry Creek

Sample #	Sample Location	Sample Type	Area (ft ³)	Area (m ³)	Total Exhaust Rate (ft ³ /min)	Total Exhaust Rate (m3/sec)	Unit Exhaust Rate (ft3/min/ft2)	Unit Exhaust Rate (m3/sec/m2)
1	Primary Channel Influent	V	3908	363.05	2500	1.18	0.640	0.0033
2	Primary Clarifier Influent	A	11500	1068.35	575	0.27	0.050	0.0003
3	Primary Clarifier Midpoint	A	11500	1068.35	575	0.27	0.050	0.0003
4	Primary Clarifier Weir 1	A	11500	1068.35	2300	1.09	0.200	0.0010
5	Primary Effluent Channel	V	4650	431.99	3000	1.42	0.645	0.0033
6	Aeration Basin Influent (1)	V	20210	1877.51	10667	5.03	0.528	0.0027
7	Aeration Basin Midpoint (1)	V	20210	1877.51	10667	5.03	0.528	0.0027
8	Aeration Basin End (1)	V	20210	1877.51	10667	5.03	0.528	0.0027
9	Mixed Liquor Channel	V	3867	359.24	2500	1.18	0.646	0.0033
10	Final Clarifier	A	34383	3194.18	1719	0.81	0.050	0.0003
11	EQ Basin - 20 ft.	A	89320	8297.83	8932	4.22	0.100	0.0005
12	Dewatered Sludge w/Permanganate	A	72	6.69	4	0.00	0.050	0.0003
13	Dewatered Sludge w/o Permanganate	A	72	6.69	4	0.00	0.050	0.0003
14	Dewatering Bldg. w/ Permanganate	P			0	0.00	Point	Point
15	Dewatering Bldg. w/o Permanganate	P			0	0.00	Point	Point
16	Solids Scrubber Exhaust 1	P	15.9	1.48	30000	14.16	Point	Point
17	Headworks Scrubber Exhaust	P	3.14	0.29	3000	1.42	Point	Point
18	Total Primaries	A	43058	4000.09	4306	2.03	0.100	0.0005
19	Total Aeration 1	V	60630	5632.53	32001	15.10	0.528	0.0027
20	EQ Basin - 14 ft.	A	89320	8297.83	8932	4.22	0.100	0.0005
21	Dry Creek Lift Station	P			5000	2.36	Point	Point
22	Primaries w/o Weir Area	A	31558	2931.74	1578	0.74	0.050	0.0003
23	Solids Scrubber Exhaust 2	P			30000	14.16	Point	Point
24	Primary Clarifier Midpoint (2)	A	11500	1068.35	575	0.27	0.050	0.0003
25	Primary Clarifier Weir 2	A	11500	1068.35	2300	1.09	0.200	0.0010
26	Aeration Basin Influent (2)	V	20210	1877.51	10667	5.03	0.528	0.0027
27	Aeration Basin Midpoint (2)	V	20210	1877.51	10667	5.03	0.528	0.0027
28	Aeration Basin End (2)	V	20210	1877.51	10667	5.03	0.528	0.0027
29	Total Aeration 2	V	60630	5632.53	32001	15.10	0.528	0.0027

Table 4
Odor Emission Rates
Nashville - Dry Creek

Sample #	Sample Location	Odor Emission Rate (O.U.-ft³/min X 10⁶)	Odor Emission Rate (O.U.-m³/sec)	Butanol Odor Emission Rate (gr/sec)
1	Primary Channel Influent	0.72250	341.0	0.7
2	Primary Clarifier Influent	0.12478	58.9	0.1
3	Primary Clarifier Midpoint	0.07360	34.7	0.3
4	Primary Clarifier Weir 1	3.13260	1478.6	1.6
5	Primary Effluent Channel	0.13200	62.3	1.1
6	Aeration Basin Influent (1)	0.92803	438.0	0.5
7	Aeration Basin Midpoint (1)	0.27734	130.9	0.3
8	Aeration Basin End (1)	0.14934	70.5	0.3
9	Mixed Liquor Channel	0.03500	16.5	0.1
10	Final Clarifier	0.02063	9.7	0.0
11	EQ Basin - 20 ft.	7.50288	3541.4	1.6
12	Dewatered Sludge w/Permanganate	0.00165	0.8	0.0
13	Dewatered Sludge w/o Permanganate	0.00118	0.6	0.0
14	Dewatering Bldg. w/ Permanganate	0.00000	0.0	0.0
15	Dewatering Bldg. w/o Permanganate	0.00000	0.0	0.0
16	Solids Scrubber Exhaust 1	9.75000	4602.0	9.9
17	Headworks Scrubber Exhaust	1.65000	778.8	1.6
18	Total Primaries	4.18548	1975.5	3.9
19	Total Aeration 1	1.38971	655.9	1.2
20	EQ Basin - 14 ft.	5.21629	2462.1	6.9
21	Dry Creek Lift Station	0.95500	450.8	1.6
22	Primaries w/o Weir Area	0.26745	126.2	0.6
23	Solids Scrubber Exhaust 2	16.95000	8000.4	33.1
24	Primary Clarifier Midpoint (2)	0.00863	4.1	0.0
25	Primary Clarifier Weir 2	0.11500	54.3	0.2
26	Aeration Basin Influent (2)	3.50944	1656.5	5.0
27	Aeration Basin Midpoint (2)	1.41871	669.6	0.9
28	Aeration Basin End (2)	1.20537	568.9	2.9
29	Total Aeration 2	6.13353	2895.0	8.9

**Table 5
D/T Sort**

Nashville - Dry Creek

Sample #	Sample Location	D/T	Rank	Sample #	Sample Location	D/T	Rank
1	Primary Channel Influent	289	12	4	Primary Clarifier Weir 1	1362	1
2	Primary Clarifier Influent	217	14	11	EQ Basin - 20 ft.	840	2
3	Primary Clarifier Midpoint	128	19	15	Dewatering Bldg. w/o Permanganate	618	3
4	Primary Clarifier Weir 1	1362	1	20	EQ Basin - 14 ft.	584	4
5	Primary Effluent Channel	44	23	23	Solids Scrubber Exhaust 2	565	5
6	Aeration Basin Influent (1)	87	21	17	Headworks Scrubber Exhaust	550	6
7	Aeration Basin Midpoint (1)	26	25	12	Dewatered Sludge w/Permanganate	457	7
8	Aeration Basin End (1)	14	27	18	Total Primaries	408	8
9	Mixed Liquor Channel	14	28	26	Aeration Basin Influent (2)	329	9
10	Final Clarifier	12	29	13	Dewatered Sludge w/o Permanganate	327	10
11	EQ Basin - 20 ft.	840	2	16	Solids Scrubber Exhaust 1	325	11
12	Dewatered Sludge w/Permanganate	457	7	1	Primary Channel Influent	289	12
13	Dewatered Sludge w/o Permanganate	327	10	14	Dewatering Bldg. w/ Permanganate	249	13
14	Dewatering Bldg. w/ Permanganate	249	13	2	Primary Clarifier Influent	217	14
15	Dewatering Bldg. w/o Permanganate	618	3	29	Total Aeration 2	192	15
16	Solids Scrubber Exhaust 1	325	11	21	Dry Creek Lift Station	191	16
17	Headworks Scrubber Exhaust	550	6	22	Primaries w/o Weir Area	170	17
18	Total Primaries	408	8	27	Aeration Basin Midpoint (2)	133	18
19	Total Aeration 1	42	24	3	Primary Clarifier Midpoint	128	19
20	EQ Basin - 14 ft.	584	4	28	Aeration Basin End (2)	113	20
21	Dry Creek Lift Station	191	16	6	Aeration Basin Influent (1)	87	21
22	Primaries w/o Weir Area	170	17	25	Primary Clarifier Weir 2	50	22
23	Solids Scrubber Exhaust 2	565	5	5	Primary Effluent Channel	44	23
24	Primary Clarifier Midpoint (2)	15	26	19	Total Aeration 1	42	24
25	Primary Clarifier Weir 2	50	22	7	Aeration Basin Midpoint (1)	26	25
26	Aeration Basin Influent (2)	329	9	24	Primary Clarifier Midpoint (2)	15	26
27	Aeration Basin Midpoint (2)	133	18	8	Aeration Basin End (1)	14	27
28	Aeration Basin End (2)	113	20	9	Mixed Liquor Channel	14	28
29	Total Aeration 2	192	15	10	Final Clarifier	12	29

**Table 6
OER Sort**

Nashville - Dry Creek

Sample #	Sample Location	OER	Rank	Sample #	Sample Location	OER	Rank
1	Primary Channel Influent	0.72250	15	23	Solids Scrubber Exhaust 2	16.950	1
2	Primary Clarifier Influent	0.12478	20	16	Solids Scrubber Exhaust 1	9.750	2
3	Primary Clarifier Midpoint	0.07360	22	11	EQ Basin - 20 ft.	7.503	3
4	Primary Clarifier Weir 1	3.13260	8	29	Total Aeration 2	6.134	4
5	Primary Effluent Channel	0.13200	19	20	EQ Basin - 14 ft.	5.216	5
6	Aeration Basin Influent (1)	0.92803	14	18	Total Primaries	4.185	6
7	Aeration Basin Midpoint (1)	0.27734	16	26	Aeration Basin Influent (2)	3.509	7
8	Aeration Basin End (1)	0.14934	18	4	Primary Clarifier Weir 1	3.133	8
9	Mixed Liquor Channel	0.03500	23	17	Headworks Scrubber Exhaust	1.650	9
10	Final Clarifier	0.02063	24	27	Aeration Basin Midpoint (2)	1.419	10
11	EQ Basin - 20 ft.	7.50288	3	19	Total Aeration 1	1.390	11
12	Dewatered Sludge w/Permanganate	0.00165	26	28	Aeration Basin End (2)	1.205	12
13	Dewatered Sludge w/o Permanganate	0.00118	27	21	Dry Creek Lift Station	0.955	13
14	Dewatering Bldg. w/ Permanganate	0.00000	28	6	Aeration Basin Influent (1)	0.928	14
15	Dewatering Bldg. w/o Permanganate	0.00000	29	1	Primary Channel Influent	0.723	15
16	Solids Scrubber Exhaust 1	9.75000	2	7	Aeration Basin Midpoint (1)	0.277	16
17	Headworks Scrubber Exhaust	1.65000	9	22	Primaries w/o Weir Area	0.267	17
18	Total Primaries	4.18548	6	8	Aeration Basin End (1)	0.149	18
19	Total Aeration 1	1.38971	11	5	Primary Effluent Channel	0.132	19
20	EQ Basin - 14 ft.	5.21629	5	2	Primary Clarifier Influent	0.125	20
21	Dry Creek Lift Station	0.95500	13	25	Primary Clarifier Weir 2	0.115	21
22	Primaries w/o Weir Area	0.26745	17	3	Primary Clarifier Midpoint	0.074	22
23	Solids Scrubber Exhaust 2	16.95000	1	9	Mixed Liquor Channel	0.035	23
24	Primary Clarifier Midpoint (2)	0.00863	25	10	Final Clarifier	0.021	24
25	Primary Clarifier Weir 2	0.11500	21	24	Primary Clarifier Midpoint (2)	0.009	25
26	Aeration Basin Influent (2)	3.50944	7	12	Dewatered Sludge w/Permanganate	0.002	26
27	Aeration Basin Midpoint (2)	1.41871	10	13	Dewatered Sludge w/o Permanganate	0.001	27
28	Aeration Basin End (2)	1.20537	12	14	Dewatering Bldg. w/ Permanganate	0.000	28
29	Total Aeration 2	6.13353	4	15	Dewatering Bldg. w/o Permanganate	0.000	29

Table 7
Intensity Sort
Nashville - Dry Creek

Sample #	Sample Location	Intensity	Rank	Sample #	Sample Location	Intensity	Rank
1	Primary Channel Influent	0.681	15	23	Solids Scrubber Exhaust 2	33.103	1
2	Primary Clarifier Influent	0.143	22	16	Solids Scrubber Exhaust 1	9.922	2
3	Primary Clarifier Midpoint	0.288	20	29	Total Aeration 2	8.881	3
4	Primary Clarifier Weir 1	1.646	8	20	EQ Basin - 14 ft.	6.927	4
5	Primary Effluent Channel	1.133	13	26	Aeration Basin Influent (2)	5.034	5
6	Aeration Basin Influent (1)	0.532	17	18	Total Primaries	3.891	6
7	Aeration Basin Midpoint (1)	0.289	19	28	Aeration Basin End (2)	2.935	7
8	Aeration Basin End (1)	0.350	18	4	Primary Clarifier Weir 1	1.646	8
9	Mixed Liquor Channel	0.057	23	17	Headworks Scrubber Exhaust	1.629	9
10	Final Clarifier	0.039	24	21	Dry Creek Lift Station	1.625	10
11	EQ Basin - 20 ft.	1.554	11	11	EQ Basin - 20 ft.	1.554	11
12	Dewatered Sludge w/Permanganate	0.003	26	19	Total Aeration 1	1.228	12
13	Dewatered Sludge w/o Permanganate	0.002	27	5	Primary Effluent Channel	1.133	13
14	Dewatering Bldg. w/ Permanganate	0.000	28	27	Aeration Basin Midpoint (2)	0.912	14
15	Dewatering Bldg. w/o Permanganate	0.000	29	1	Primary Channel Influent	0.681	15
16	Solids Scrubber Exhaust 1	9.922	2	22	Primaries w/o Weir Area	0.552	16
17	Headworks Scrubber Exhaust	1.629	9	6	Aeration Basin Influent (1)	0.532	17
18	Total Primaries	3.891	6	8	Aeration Basin End (1)	0.350	18
19	Total Aeration 1	1.228	12	7	Aeration Basin Midpoint (1)	0.289	19
20	EQ Basin - 14 ft.	6.927	4	3	Primary Clarifier Midpoint	0.288	20
21	Dry Creek Lift Station	1.625	10	25	Primary Clarifier Weir 2	0.164	21
22	Primaries w/o Weir Area	0.552	16	2	Primary Clarifier Influent	0.143	22
23	Solids Scrubber Exhaust 2	33.103	1	9	Mixed Liquor Channel	0.057	23
24	Primary Clarifier Midpoint (2)	0.012	25	10	Final Clarifier	0.039	24
25	Primary Clarifier Weir 2	0.164	21	24	Primary Clarifier Midpoint (2)	0.012	25
26	Aeration Basin Influent (2)	5.034	5	12	Dewatered Sludge w/Permanganate	0.003	26
27	Aeration Basin Midpoint (2)	0.912	14	13	Dewatered Sludge w/o Permanganate	0.002	27
28	Aeration Basin End (2)	2.935	7	14	Dewatering Bldg. w/ Permanganate	0.000	28
29	Total Aeration 2	8.881	3	15	Dewatering Bldg. w/o Permanganate	0.000	29

Table 8
Combined Sort
Nashville - Dry Creek

D/T Sample Location	OER Sample Location	Intensity Sample Location
Primary Clarifier Weir 1	Solids Scrubber Exhaust 2	Solids Scrubber Exhaust 2
EQ Basin - 20 ft.	Solids Scrubber Exhaust 1	Solids Scrubber Exhaust 1
Dewatering Bldg. w/o Permanganate	EQ Basin - 20 ft.	Total Aeration 2
EQ Basin - 14 ft.	Total Aeration 2	EQ Basin - 14 ft.
Solids Scrubber Exhaust 2	EQ Basin - 14 ft.	Aeration Basin Influent (2)
Headworks Scrubber Exhaust	Total Primaries	Total Primaries
Dewatered Sludge w/Permanganate	Aeration Basin Influent (2)	Aeration Basin End (2)
Total Primaries	Primary Clarifier Weir 1	Primary Clarifier Weir 1
Aeration Basin Influent (2)	Headworks Scrubber Exhaust	Headworks Scrubber Exhaust
Dewatered Sludge w/o Permanganate	Aeration Basin Midpoint (2)	Dry Creek Lift Station
Solids Scrubber Exhaust 1	Total Aeration 1	EQ Basin - 20 ft.
Primary Channel Influent	Aeration Basin End (2)	Total Aeration 1
Dewatering Bldg. w/ Permanganate	Dry Creek Lift Station	Primary Effluent Channel
Primary Clarifier Influent	Aeration Basin Influent (1)	Aeration Basin Midpoint (2)
Total Aeration 2	Primary Channel Influent	Primary Channel Influent
Dry Creek Lift Station	Aeration Basin Midpoint (1)	Primaries w/o Weir Area
Primaries w/o Weir Area	Primaries w/o Weir Area	Aeration Basin Influent (1)
Aeration Basin Midpoint (2)	Aeration Basin End (1)	Aeration Basin End (1)
Primary Clarifier Midpoint	Primary Effluent Channel	Aeration Basin Midpoint (1)
Aeration Basin End (2)	Primary Clarifier Influent	Primary Clarifier Midpoint
Aeration Basin Influent (1)	Primary Clarifier Weir 2	Primary Clarifier Weir 2
Primary Clarifier Weir 2	Primary Clarifier Midpoint	Primary Clarifier Influent
Primary Effluent Channel	Mixed Liquor Channel	Mixed Liquor Channel
Total Aeration 1	Final Clarifier	Final Clarifier
Aeration Basin Midpoint (1)	Primary Clarifier Midpoint (2)	Primary Clarifier Midpoint (2)
Primary Clarifier Midpoint (2)	Dewatered Sludge w/Permanganate	Dewatered Sludge w/Permanganate
Aeration Basin End (1)	Dewatered Sludge w/o Permanganate	Dewatered Sludge w/o Permanganate
Mixed Liquor Channel	Dewatering Bldg. w/ Permanganate	Dewatering Bldg. w/ Permanganate
Final Clarifier	Dewatering Bldg. w/o Permanganate	Dewatering Bldg. w/o Permanganate

Table 9
Average Model Input Data
Nashville - Dry Creek

Sample #	Sample Location	Initial D/T x m3/sec	Final D/T x m3/sec	Slope Correction	Final Endpoint
23	Solids Scrubber Exhaust 2	8000.40	1.00	-0.3	0.410
16	Solids Scrubber Exhaust 1	4602.00	1.00	-0.3	0.873
11	EQ Basin - 20 ft.	3541.36	1.00	-0.3	0.140
29	Total Aeration 2	2895.02	1.00	-0.3	0.845
20	EQ Basin - 14 ft.	2462.09	1.00	-0.3	0.729
18	Total Primaries	1975.54	1.00	-0.3	0.736
26	Aeration Basin Influent (2)	1656.46	1.00	-0.3	0.885
4	Primary Clarifier Weir 1	1478.59	1.00	-0.3	0.432
17	Headworks Scrubber Exhaust	778.80	1.00	-0.3	0.514
27	Aeration Basin Midpoint (2)	669.63	1.00	-0.3	0.519
19	Total Aeration 1	655.94	1.00	-0.3	0.165
28	Aeration Basin End (2)	568.94	1.00	-0.3	0.885
21	Dry Creek Lift Station	450.76	1.00	-0.3	1.016
6	Aeration Basin Influent (1)	438.03	1.00	-0.3	0.167
1	Primary Channel Influent	341.02	1.00	-0.3	0.582
7	Aeration Basin Midpoint (1)	130.91	1.00	-0.3	0.055
22	Primaries w/o Weir Area	126.24	1.00	-0.3	1.046
8	Aeration Basin End (1)	70.49	1.00	-0.3	0.310
5	Primary Effluent Channel	62.30	1.00	-0.3	1.758
2	Primary Clarifier Influent	58.89	1.00	-0.3	1.030
25	Primary Clarifier Weir 2	54.28	1.00	-0.3	0.662
3	Primary Clarifier Midpoint	34.74	1.00	-0.3	1.261
9	Mixed Liquor Channel	16.52	1.00	-0.3	0.000
10	Final Clarifier	9.74	1.00	-0.3	0.503
24	Primary Clarifier Midpoint (2)	4.07	1.00	-0.3	0.774
12	Dewatered Sludge w/Permanganate	0.78	1.00	-0.3	0.774
13	Dewatered Sludge w/o Permanganate	0.56	1.00	-0.3	0.715
14	Dewatering Bldg. w/ Permanganate	0.00	1.00	-0.3	0.855
15	Dewatering Bldg. w/o Permanganate	0.00	1.00	-0.3	0.852

Table 10
Peak Model Input Data
Nashville - Dry Creek

Sample #	Sample Location	Initial D/T x m3/sec	Final Endpoint
23	Solids Scrubber Exhaust 2	24001.20	1.00
16	Solids Scrubber Exhaust 1	13806.00	1.00
11	EQ Basin - 20 ft.	35413.59	1.00
29	Total Aeration 2	28950.24	1.00
20	EQ Basin - 14 ft.	24620.88	1.00
18	Total Primaries	19755.44	1.00
26	Aeration Basin Influent (2)	16564.57	1.00
4	Primary Clarifier Weir 1	14785.87	1.00
17	Headworks Scrubber Exhaust	2336.40	1.00
27	Aeration Basin Midpoint (2)	6696.32	1.00
19	Total Aeration 1	6559.43	1.00
28	Aeration Basin End (2)	5689.35	1.00
21	Dry Creek Lift Station	1352.28	1.00
6	Aeration Basin Influent (1)	4380.30	1.00
1	Primary Channel Influent	3410.20	1.00
7	Aeration Basin Midpoint (1)	1309.05	1.00
22	Primaries w/o Weir Area	1262.38	1.00
8	Aeration Basin End (1)	704.88	1.00
5	Primary Effluent Channel	623.04	1.00
2	Primary Clarifier Influent	588.94	1.00
25	Primary Clarifier Weir 2	542.80	1.00
3	Primary Clarifier Midpoint	347.39	1.00
9	Mixed Liquor Channel	165.20	1.00
10	Final Clarifier	97.37	1.00
24	Primary Clarifier Midpoint (2)	40.71	1.00
12	Dewatered Sludge w/Permanganate	7.77	1.00
13	Dewatered Sludge w/o Permanganate	5.56	1.00
14	Dewatering Bldg. w/ Permanganate	0.00	1.00
15	Dewatering Bldg. w/o Permanganate	0.00	1.00

**Table 11
Average Transport Distances**

Nashville - Dry Creek

Location	Allowable	Stability Class 6						Stability Class 4					
		1 m/s		2 m/s		4 m/s		1 m/s		2 m/s		4 m/s	
		Max/Dist	1	Max/Dist	1	Max/Dist	1	Max/Dist	1	Max/Dist	1	Max/Dist	1
Solids Scrubber Exhaust 2	0.410	.775/1423	650	.564/1813	650	.398/941	-	.18/1321	-	.32/706	-	.44/394	500
Solids Scrubber Exhaust 1	0.873	.45/1423	-	.32/1119	-	.23/941	-	.1/1041	-	NR	NR	NR	NR
EQ Basin - 20 ft.	0.140	4.08/174	>2000	2.04/174	>2000	1.02/174	>2000	3.94/103	>2000	2.0/103	1410	.984/103	890
Total Aeration 2	0.845	8.3/95	1620	4.1/95	920	2.1/95	520	7.5/67	630	3.8/67	380	1.9/67	220
EQ Basin - 14 ft.	0.729	2.8/174	1490	1.4/174	790	.71/174	-	2.7/103	580	1.4/103	350	.68/103	-
Total Primaries	0.736	7.45/85	>2000	3.72/85	>2000	1.86/85	1750	6.98/56	>2000	3.5/56	650	1.75/56	620
Aeration Basin Influent (2)	0.885	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Primary Clarifier Weir 1	0.432	9.4/69	>2000	4.7/69	>2000	2.3/69	1750	9.1/41	>2000	4.5/41	650	2.3/41	620
Headworks Scrubber Exhaust	0.514	.547/440	350	.37/355	-	NR	NR	.41/440	-	NR	NR	NR	NR
Aeration Basin Midpoint (2)	0.519	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Total Aeration 1	0.895	1.88/95	450	.94/95	120	.47/95	-	1.7/67	150	.852/67	-	.43/67	-
Aeration Basin End (2)	0.885	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Dry Creek Lift Station	1.016	.244/504	-	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Aeration Basin Influent (1)	0.167	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Primary Channel Influent	0.582	3.4/60	350	1.7/60	200	.86/60	80	3.3/32	250	1.69/32	180	.845/32	50
Aeration Basin Midpoint (1)	0.055	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Primaries w/o Weir Area	1.046	.46/132	-	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Aeration Basin End (1)	0.310	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Primary Effluent Channel	1.758	.59/61	-	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Primary Clarifier Influent	1.030	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Primary Clarifier Weir 2	0.662	.34/69	-	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Primary Clarifier Midpoint	1.261	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Mixed Liquor Channel	0.000	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Final Clarifier	0.503	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Primary Clarifier Midpoint (2)	0.774	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Dewatered Sludge w/Permanganate	0.774	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Dewatered Sludge w/o Permanganate	0.715	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Dewatering Bldg. w/ Permanganate	0.855	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Dewatering Bldg. w/o Permanganate	0.852	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

**Table 12
Peak Transport Distances**

Nashville - Dry Creek

Location	Allowable	Allowable	Stability Class 6									Stability Class 4								
			1 m/s			2 m/s			4 m/s			1 m/s			2 m/s			4 m/s		
			Max/Dist	1	5	Max/Dist	1	5	Max/Dist	1	5	Max/Dist	1	5	Max/Dist	1	5	Max/Dist	1	5
Solids Scrubber Exhaust 2	1	5	2.3/1423	>2000	-	1.69/1119	>2000	-	1.19/941	1500	-	.54/1321	-	-	.96/706	-	-	1.33/394	650	-
Solids Scrubber Exhaust 1	1	5	1.34/1421	>2000	-	.97/1119	-	-	NR	NR	NR	.31/1321	-	-	NR	NR	NR	NR	NR	NR
EQ Basin - 20 ft.	1	5	41/174	>2000	>2000	20.5/174	>2000	1550	10.2/174	>2000	870	39.5/173	>2000	580	19.8/103	1800	600	9.9/103	1120	350
Total Aeration 2	1	5	24.9/95	>2000	980	12.5/95	1900	520	6.2/95	1110	2220	22.6/67	1100	300	11.3/67	690	220	5.6/67	450	80
EQ Basin - 14 ft.	1	5	28.4/174	>2000	1910	14.2/174	>2000	1150	7.1/174	>2000	520	27.4/103	>2000	160	13.7/103	1400	470	6.8/103	850	250
Total Primaries	1	5	74.5/85	>2000	1850	37.2/85	>2000	1110	18.6/85	>2000	750	69.8/56	1910	690	34.9/56	1210	450	17.5/56	800	280
Aeration Basin Influent (2)	1	5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Primary Clarifier Weir 1	1	5	93.7/69	>2000	1490	46.8/69	>2000	950	23.4/69	1750	590	91.0/41	1620	600	45.4/41	1010	380	22.7/41	680	250
Headworks Scrubber Exhaust	1	5	1.6/440	1000	-	1.1/355	400	-	1.0/208	-	-	1.2/440	350	-	1.3/152	100	-	NR	NR	NR
Aeration Basin Midpoint (2)	1	5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Total Aeration 1	1	5	18.3/95	>2000	750	9.4/95	1510	380	4.7/95	910	-	17/67	910	320	8.5/67	610	150	4.3/67	380	-
Aeration Basin End (2)	1	5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Dry Creek Lift Station	1	5	.73/504	-	-	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Aeration Basin Influent (1)	1	5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Primary Channel Influent	1	5	34.4/60	1690	580	17.2/60	1050	350	8.6/60	650	200	33.8/32	650	250	16.9/32	420	180	8.44/32	280	80
Aeration Basin Midpoint (1)	1	5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Primaries w/o Weir Area	1	5	4.6/132	810	-	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Aeration Basin End (1)	1	5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Primary Effluent Channel	1	5	5.9/61	520	120	2.9/61	310	-	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Primary Clarifier Influent	1	5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Primary Clarifier Weir 2	1	5	3.4/69	450	-	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Primary Clarifier Midpoint	1	5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Mixed Liquor Channel	1	5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Final Clarifier	1	5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Primary Clarifier Midpoint (2)	1	5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Dewatered Sludge w/Permanganate	1	5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Dewatered Sludge w/o Permanganate	1	5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Dewatering Bldg. w/ Permanganate	1	5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Dewatering Bldg. w/o Permanganate	1	5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

Table 13
Required Percent Removals (Average)
Nashville - Dry Creek

Sample #	Location	Distance (Feet)	Initial OER	Des. Endpoints		Final OER		Required % Removal	
				5	1	5	1	5	1
23	Solids Scrubber Exhaust 2	500	8000.40	2.050	0.410	8000.4	4250	0%	47%
16	Solids Scrubber Exhaust 1	500	BT	BT	BT			0%	0%
11	EQ Basin - 20 ft.	300	3541.36	0.699	0.140	600	120	83%	97%
29	Total Aeration 2	300	2895.02	4.227	0.845	1500	300	48%	90%
20	EQ Basin - 14 ft.	300	2462.09	3.647	0.729	2462.1	625	0%	75%
18	Total Primaries	100	1975.54	3.682	0.736	950	195	52%	90%
26	Aeration Basin Influent (2)	100	NR	NR	NR			NR	NR
4	Primary Clarifier Weir 1	100	1478.59	2.160	0.432	340	68	77%	95%
17	Headworks Scrubber Exhaust	200	778.80	2.570	0.514	778.8	700	0%	10%
27	Aeration Basin Midpoint (2)	300	NR	NR	NR			NR	NR
19	Total Aeration 1	300	655.94	0.823	0.165	285	75	57%	89%
28	Aeration Basin End (2)	300	NR	NR	NR			NR	NR
21	Dry Creek Lift Station	300	BT	BT	BT			0%	0%
6	Aeration Basin Influent (1)	200	NR	NR	NR			NR	NR
1	Primary Channel Influent	200	341.02	2.911	0.582	290	60	15%	82%
7	Aeration Basin Midpoint (1)	300	NR	NR	NR			NR	NR
22	Primaries w/o Weir Area	100	BT	BT	BT			0%	0%
8	Aeration Basin End (1)	300	NR	NR	NR			NR	NR
5	Primary Effluent Channel	150	BT	BT	BT			0%	0%
2	Primary Clarifier Influent	50	NR	NR	NR			NR	NR
25	Primary Clarifier Weir 2	100	BT	BT	BT			0%	0%
3	Primary Clarifier Midpoint	100	NR	NR	NR			NR	NR
9	Mixed Liquor Channel	400	NR	NR	NR			NR	NR
10	Final Clarifier	400	NR	NR	NR			NR	NR
24	Primary Clarifier Midpoint (2)		NR	NR	NR			NR	NR
12	Dewatered Sludge w/Permanganate		NR	NR	NR			NR	NR
13	Dewatered Sludge w/o Permanganate		NR	NR	NR			NR	NR
14	Dewatering Bldg. w/ Permanganate		NR	NR	NR			NR	NR
15	Dewatering Bldg. w/o Permanganate		NR	NR	NR			NR	NR

Table 14
Required % Removals (Peak)
Nashville - Dry Creek

Sample #	Location	Distance (Feet)	Initial OER	Design Endpoints	Final OER	Required % Removal
23	Solids Scrubber Exhaust 2	500	24001.20	1	10500	56%
16	Solids Scrubber Exhaust 1	500	13806.00	1	10500	24%
11	EQ Basin - 20 ft.	300	35413.59	1	870	98%
29	Total Aeration 2	300	28950.24	1	350	99%
20	EQ Basin - 14 ft.	300	24620.88	1	880	96%
18	Total Primaries	100	19755.44	1	265	99%
26	Aeration Basin Influent (2)	100	NR	1		NR
4	Primary Clarifier Weir 1	100	14785.87	1	160	99%
17	Headworks Scrubber Exhaust	200	2336.40	1	1400	40%
27	Aeration Basin Midpoint (2)	300	NR	1		NR
19	Total Aeration 1	300	6559.43	1	350	95%
28	Aeration Basin End (2)	300	NR	1		NR
21	Dry Creek Lift Station	300	BT	1	-	0%
6	Aeration Basin Influent (1)	200	NR	1		NR
1	Primary Channel Influent	200	3410.20	1	100	97%
7	Aeration Basin Midpoint (1)	300	NR	1		NR
22	Primaries w/o Weir Area	100	1262.38	1	275	78%
8	Aeration Basin End (1)	300	NR	1		NR
5	Primary Effluent Channel	150	623.04	1	105	83%
2	Primary Clarifier Influent	50	NR	1		NR
25	Primary Clarifier Weir 2	100	542.80	1	157	71%
3	Primary Clarifier Midpoint	100	NR	1		NR
9	Mixed Liquor Channel	400	NR	1		NR
10	Final Clarifier	400	NR	1		NR
24	Primary Clarifier Midpoint (2)		NR	1		NR
12	Dewatered Sludge w/Permanganate		NR	1		NR
13	Dewatered Sludge w/o Permanganate		NR	1		NR
14	Dewatering Bldg. w/ Permanganate		NR	1		NR
15	Dewatering Bldg. w/o Permanganate		NR	1		NR

Table 15
Priority Odor Sources
Class 1

Nashville - Dry Creek

Rank	Class 1 Sources Average	Rank	Class 1 Sources Peak
1	EQ Basin - 20 ft.	1	EQ Basin - 20 ft.
2	Total Primaries	2	EQ Basin - 14 ft.
3	Primary Clarifier Weir 1	3	Total Primaries
4	Total Aeration 2	4	Primary Clarifier Weir 1
5	EQ Basin - 14 ft.	5	Total Aeration 2
6	Solids Scrubber Exhaust 2	6	Total Aeration 1
7	Total Aeration 1	7	Primary Channel Influent
8	Headworks Scrubber Exhaust	8	Primary Effluent Channel
9	Primary Channel Influent		

Table 16
Priority of Odor Sources
Class 2

Nashville - Dry Creek

Solids Scrubber Exhaust 1
Total Primaries
Total Aeration 2
Aeration Basin Influent (2)
Primary Channel Influent
Aeration Basin Midpoint (2)
Dry Creek Lift Station
Aeration Basin End (2)
Aeration Basin Influent (1)
Total Aeration 1
Primaries w/o Weir Area
Solids Scrubber Exhaust 2
EQ Basin - 20 ft.
EQ Basin - 14 ft.
Primary Clarifier Weir 1
Headworks Scrubber Exhaust
Dewatering Bldg. w/o Permanganate

Odor Logs

Dry Creek WWTP GPS Data
 K Harrison
 6/14/2002

Reference	Location	N	W
1	Center Grit Chambers	36 17.345	086 41.417
2	Center Influent Channel at end of Grit Chamber	36 17.342	086 41.398
3	Influent Channel at 90 turn	36 17.340	086 41.397
4	Influent Scrubber Stack	36 17.341	086 41.412
5	Influent Channel at Equipment Building	36 17.353	086 41.355
6	Primary Clarifier #1 Influent End	36 17.365	086 41.322
7	Primary Clarifier #2 Influent End	36 17.368	086 41.315
8	Primary Clarifier #3 Influent End	36 17.374	086 41.326
9	Primary Clarifier #4 Influent End	36 17.377	086 41.319
10	Primary Clarifier #5 Influent End	36 17.371	086 41.306
11	Primary Clarifier #6 Influent End	36 17.374	086 41.299
12	Primary Clarifier #7 Influent End	36 17.379	086 41.310
13	Primary Clarifier #8 Influent End	36 17.381	086 41.302
14	Primary Clarifier #1 Effluent End	36 17.353	086 41.317
15	Primary Clarifier #2 Effluent End	36 17.356	086 41.310
16	Primary Clarifier #3 Effluent End	36 17.391	086 41.334
17	Primary Clarifier #4 Effluent End	36 17.393	086 41.326
18	Primary Clarifier #5 Effluent End	36 17.357	086 41.301
19	Primary Clarifier #6 Effluent End	36 17.359	086 41.294
20	Primary Clarifier #7 Effluent End	36 17.395	086 41.318
21	Primary Clarifier #8 Effluent End	36 17.397	086 41.310
22	Effluent Flume near #8	36 17.398	086 41.313
23	Effluent Flume near #6	36 17.357	086 41.296
24	Effluent Flume near #2	36 17.354	086 41.312
25	Effluent Flume near #4	36 17.393	086 41.330
26	Aeration Basin 1-1 West End	36 17.348	086 41.315
27	Aeration Basin 1-2 West End	36 17.344	086 41.314
28	Aeration Basin 1-3 West End	36 17.340	086 41.312
29	Aeration Basin 1-4 West End	36 17.337	086 41.311
30	Aeration Basin 2-1 West End	36 17.333	086 41.309
31	Aeration Basin 2-2 West End	36 17.329	086 41.307
32	Aeration Basin 2-3 West End	36 17.325	086 41.305
33	Aeration Basin 2-4 West End	36 17.312	086 41.304
34	Aeration Basin 3-1 West End	36 17.317	086 41.302
35	Aeration Basin 3-2 West End	36 17.313	086 41.301
36	Aeration Basin 3-3 West End	36 17.309	086 41.298
37	Aeration Basin 3-4 West End	36 17.305	086 41.297
38	Aeration Basin 1-1 East End	36 17.361	086 41.276
39	Aeration Basin 1-2 East End	36 17.357	086 41.274
40	Aeration Basin 1-3 East End	36 17.353	086 41.272
41	Aeration Basin 1-4 East End	36 17.349	086 41.270
42	Aeration Basin 2-1 East End	36 17.345	086 41.269
43	Aeration Basin 2-2 East End	36 17.341	086 41.267
44	Aeration Basin 2-3 East End	36 17.337	086 41.265
45	Aeration Basin 2-4 East End	36 17.333	086 41.263
46	Aeration Basin 3-1 East End	36 17.329	086 41.262
47	Aeration Basin 3-2 East End	36 17.325	086 41.260

48 Aeration Basin 3-3 East End	36 17.321	086 41.257
49 Aeration Basin 3-4 East End	36 17.317	086 41.255
50 Final Clarifier #7 Center	36 17.290	086 41.291
51 Final Clarifier #8 Center	36 17.299	086 41.265
52 Final Clarifier #9 Center	36 17.269	086 41.279
53 Aeration Basin Effluent Channel Between FC #7 & #8	36 17.307	086 41.281
54 Aeration Basin Effluent Channel at 90 turn	36 17.302	086 41.301
55 Aeration Basin Effluent Channel at North end	36 17.344	086 41.321
56 Final Clarifier #1 Center	36 17.336	086 41.337
57 Final Clarifier #2 Center	36 17.320	086 41.329
58 Final Clarifier #3 Center	36 17.332	086 41.353
59 Final Clarifier #4 Center	36 17.316	086 41.345
60 Final Clarifier #5 Center	36 17.327	086 41.368
61 Final Clarifier #6 Center	36 17.311	086 41.360
62 Final Clarifier Effluent Channel between #1 & #2	36 17.329	086 41.332
63 Final Clarifier Effluent Channel west end	36 17.320	086 41.359
64 Pump Station Scrubber Stack	36 17.289	086 41.359
65 Sludge Building Scrubber Stack	36 17.300	086 41.380
66 Sludge Loading Chute	36 17.317	086 41.414
67 EQ Basin NW Corner	36 17.294	086 41.503
68 EQ Basin NE Corner	36 17.311	086 41.444
69 EQ Basin SW Corner	36 17.247	086 41.483
70 EQ Basin SE Corner	36 17.288	086 41.424
71 EQ Basin Center	36 17.280	086 41.464

Dry Creek WWTP Odor Log Data
 K. Harrison
 6/14/2002

Date	Time	Location	N	W
10/10/2001	6:30 AM	1903 Spring Branch Rd	36 17.703	086 41.528
10/10/2001	6:45 AM	Myatt Drive at bridge	36 17.320	086 41.599
10/10/2001	7:30 AM	Myatt Drive at bridge	36 17.320	086 41.599
10/11/2001	6:35 AM	1903 Spring Branch Rd	36 17.703	086 41.528
10/11/2001	6:45 AM	Myatt Drive at bridge	36 17.320	086 41.599
10/11/2001	5:30 PM	Myatt Drive at bridge	36 17.320	086 41.599
10/11/2001	5:45 PM	1903 Spring Branch Rd	36 17.703	086 41.528
10/17/2001	6:45 AM	Myatt Drive at bridge	36 17.320	086 41.599
10/17/2001	9:05 AM	1217 Northgate Business Pkwy	36 17.151	086 41.385
10/17/2001	5:45 PM	1903 Spring Branch Rd	36 17.703	086 41.528
10/18/2001	7:00 PM	1903 Spring Branch Rd	36 17.703	086 41.528
10/19/2001	7:00 AM	1903 Spring Branch Rd	36 17.703	086 41.528
10/20/2001	6:45 AM	1903 Spring Branch Rd	36 17.703	086 41.528
10/23/2001	5:30 PM	1903 Spring Branch Rd	36 17.703	086 41.528
10/24/2001	6:45 AM	1903 Spring Branch Rd	36 17.703	086 41.528
10/25/2001	6:45 AM	1903 Spring Branch Rd	36 17.703	086 41.528
10/26/2001	6:30 AM	1903 Spring Branch Rd	36 17.703	086 41.528
10/27/2001	6:00 PM	1903 Spring Branch Rd	36 17.703	086 41.528
10/28/2001	5:50 PM	1903 Spring Branch Rd	36 17.703	086 41.528
10/29/2001	6:45 AM	1903 Spring Branch Rd	36 17.703	086 41.528
10/29/2001	10:15 AM	2105 East Hill Dr	36 17.775	086 41.075
10/29/2001	6:00 PM	1217 Northgate Business Pkwy	36 17.151	086 41.385
10/30/2001	4:45 PM	1903 Spring Branch Rd	36 17.703	086 41.528
10/31/2001	7:30 AM	1217 Northgate Business Pkwy	36 17.151	086 41.385
10/31/2001	5:30 PM	1903 Spring Branch Rd	36 17.703	086 41.528
10/31/2001	8:00 PM	2105 East Hill Dr	36 17.775	086 41.075
11/1/2001	6:45 AM	1903 Spring Branch Rd	36 17.703	086 41.528
11/1/2001	10:00 AM	2105 East Hill Dr	36 17.775	086 41.075
11/2/2001	9:55 AM	2105 East Hill Dr	36 17.775	086 41.075
11/2/2001	3:45 PM	2105 East Hill Dr	36 17.775	086 41.075
11/2/2001	5:15 PM	1903 Spring Branch Rd	36 17.703	086 41.528
11/4/2001	8:00 PM	1903 Spring Branch Rd	36 17.703	086 41.528
11/8/2001	6:20 PM	2105 East Hill Dr	36 17.775	086 41.075
11/8/2001	8:00 PM	1903 Spring Branch Rd	36 17.703	086 41.528
11/10/2001	9:00 AM	Myatt Dr At Dollar General	36 16.586	086 41.362
11/14/2001	6:00 PM	1903 Spring Branch Rd	36 17.703	086 41.528
11/14/2001	7:45 PM	2105 East Hill Dr	36 17.775	086 41.075
11/21/2001	5:45 PM	1903 Spring Branch Rd	36 17.703	086 41.528
11/22/2001	12:00 PM	1903 Spring Branch Rd	36 17.703	086 41.528
11/22/2001	8:00 PM	1903 Spring Branch Rd	36 17.703	086 41.528
12/2/2001	7:40 PM	2105 East Hill Dr	36 17.775	086 41.075

Table 1
Odor Occurrence Vector Program
Source and Receptor Information
Nashville - Dry Creek

Client	Metro Water Services	Final D/T	0.5	
Facility	Nashville - Dry Creek	Deviations	Less	Greater
Date of Run	4/29/2003	Wind Speed (m/s)	5	5
		Vectors	40	10
		Source Vector Deviation	5	
		Source Distance Deviation	500	

Source Information (Maximum of 20)

Number of Sources	19				OER		
	Source	Lat.	Long.	Initial	Final	Dilutions	
1	Influent Channel - HW	36 17.340	86	41.397	289	0.50	578
2	Grit Scrubber	36 17.341	86	41.412	380	0.50	760
3	Influent Channel -Mid	36 17.353	86	41.355	289	0.50	578
4	Pri. Clarifier #3 Inf.	36 17.374	86	41.326	217	0.50	434
5	Pri. Clarifier #7 Inf.	36 17.379	86	41.310	217	0.50	434
6	Pri. Clarifier #3 Eff.	36 17.391	86	41.334	44	0.50	88
7	Pri. Clarifier #7 Eff.	36 17.395	86	41.318	44	0.50	88
8	Flume Near Pri. #6	36 17.357	86	41.296	1362	0.50	2724
9	Flume Near Pri. #4	36 17.393	86	41.330	1362	0.50	2724
10	Aeration Basin 1-1 West	36 17.348	86	41.315	87	0.50	174
11	Aeration Basin 2-1 West	36 17.333	86	41.309	87	0.50	174
12	Aeration Basin 3-1 West	36 17.317	86	41.302	87	0.50	174
13	Aeration Basin 1-1 East	36 17.361	86	41.276	87	0.50	174
14	Aeration Basin 2-1 East	36 17.345	86	41.269	87	0.50	174
15	Aeration Basin 3-1 East	36 17.329	86	41.262	87	0.50	174
16	Pump Station Scrubber	36 17.289	86	41.359	191	0.50	382
17	Solids Building Scrubber	36 17.3	86	41.38	325	0.50	650
18	Sludge Loading Chute	36 17.317	86	41.414	1447	0.50	2894
19	EQ Basin	36 17.28	86	41.464	840	0.50	1680

Receptor Information (Maximum of 20)

Number of Receptors	5			
	Receptor	Lat	Long.	
1	1903 Spring Branch Rd	36 17.703	86	41.528
2	Myatt Dr. at Bridge	36 17.320	86	41.599
3	1217 Northgate Bus. Pkw	36 17.151	86	41.385
4	2105 East Hill Dr	36 17.775	86	41.075
5	Myatt Dr at Dollar Gen	36 16.586	86	41.362

**Table 2
Odor Occurrence Vector Program
Vectors and Distances**

Nashville - Dry Creek

Vectors and Distances			Distance			Receptor	Directional Range		
From	Receptor	Source	To	Meters	Vector		Average	Min	Max
1	1	Influent Channel - HW	1903 Spring Branch Rd	700.14	343.78	1	337	329	353
2	1	Grit Scrubber	1903 Spring Branch Rd	692.42	345.52	2	264	251	290
3	1	Influent Channel -Mid	1903 Spring Branch Rd	697.75	338.28	3	190	154	209
4	1	Pri. Clarifier #3 Inf.	1903 Spring Branch Rd	679.84	333.67	4	26	19	32
5	1	Pri. Clarifier #7 Inf.	1903 Spring Branch Rd	682.61	331.53	5	181	173	186
6	1	Pri. Clarifier #3 Eff.	1903 Spring Branch Rd	646.33	333.38				
7	1	Pri. Clarifier #7 Eff.	1903 Spring Branch Rd	650.88	331.21				
8	1	Flume Near Pri. #6	1903 Spring Branch Rd	728.39	331.61				
9	1	Flume Near Pri. #4	1903 Spring Branch Rd	645.73	332.76				
10	1	Aeration Basin 1-1 West	1903 Spring Branch Rd	730.31	334.19				
11	1	Aeration Basin 2-1 West	1903 Spring Branch Rd	759.23	334.50				
12	1	Aeration Basin 3-1 West	1903 Spring Branch Rd	790.48	334.74				
13	1	Aeration Basin 1-1 East	1903 Spring Branch Rd	736.67	329.30				
14	1	Aeration Basin 2-1 East	1903 Spring Branch Rd	767.50	329.75				
15	1	Aeration Basin 3-1 East	1903 Spring Branch Rd	798.39	330.18				
16	1	Pump Station Scrubber	1903 Spring Branch Rd	807.16	341.79				
17	1	Solids Building Scrubber	1903 Spring Branch Rd	778.37	343.51				
18	1	Sludge Loading Chute	1903 Spring Branch Rd	734.85	346.61				
19	1	EQ Basin	1903 Spring Branch Rd	789.20	353.05				
1	2	Influent Channel - HW	Myatt Dr. at Bridge	303.81	263.00				
2	2	Grit Scrubber	Myatt Dr. at Bridge	281.85	262.07				
3	2	Influent Channel -Mid	Myatt Dr. at Bridge	369.33	260.48				
4	2	Pri. Clarifier #3 Inf.	Myatt Dr. at Bridge	419.62	256.21				
5	2	Pri. Clarifier #7 Inf.	Myatt Dr. at Bridge	445.04	255.79				
6	2	Pri. Clarifier #3 Eff.	Myatt Dr. at Bridge	416.87	251.61				
7	2	Pri. Clarifier #7 Eff.	Myatt Dr. at Bridge	441.87	251.68				
8	2	Flume Near Pri. #6	Myatt Dr. at Bridge	457.48	261.39				
9	2	Flume Near Pri. #4	Myatt Dr. at Bridge	423.71	251.39				
10	2	Aeration Basin 1-1 West	Myatt Dr. at Bridge	427.11	263.03				
11	2	Aeration Basin 2-1 West	Myatt Dr. at Bridge	433.58	266.82				
12	2	Aeration Basin 3-1 West	Myatt Dr. at Bridge	443.39	270.72				
13	2	Aeration Basin 1-1 East	Myatt Dr. at Bridge	488.11	261.05				
14	2	Aeration Basin 2-1 East	Myatt Dr. at Bridge	494.79	264.63				
15	2	Aeration Basin 3-1 East	Myatt Dr. at Bridge	503.35	268.10				
16	2	Pump Station Scrubber	Myatt Dr. at Bridge	362.84	279.11				
17	2	Solids Building Scrubber	Myatt Dr. at Bridge	329.01	276.47				
18	2	Sludge Loading Chute	Myatt Dr. at Bridge	276.22	271.15				
19	2	EQ Basin	Myatt Dr. at Bridge	214.71	290.18				
1	3	Influent Channel - HW	1217 Northgate Bus. Pkw	350.49	177.07				
2	3	Grit Scrubber	1217 Northgate Bus. Pkw	354.18	173.46				
3	3	Influent Channel -Mid	1217 Northgate Bus. Pkw	376.78	186.83				
4	3	Pri. Clarifier #3 Inf.	1217 Northgate Bus. Pkw	422.28	192.04				
5	3	Pri. Clarifier #7 Inf.	1217 Northgate Bus. Pkw	436.85	194.85				
6	3	Pri. Clarifier #3 Eff.	1217 Northgate Bus. Pkw	450.95	189.72				
7	3	Pri. Clarifier #7 Eff.	1217 Northgate Bus. Pkw	462.82	192.48				
8	3	Flume Near Pri. #6	1217 Northgate Bus. Pkw	403.98	199.20				
9	3	Flume Near Pri. #4	1217 Northgate Bus. Pkw	455.64	190.38				
10	3	Aeration Basin 1-1 West	1217 Northgate Bus. Pkw	379.51	195.98				
11	3	Aeration Basin 2-1 West	1217 Northgate Bus. Pkw	355.65	198.60				
12	3	Aeration Basin 3-1 West	1217 Northgate Bus. Pkw	331.46	201.95				
13	3	Aeration Basin 1-1 East	1217 Northgate Bus. Pkw	421.59	202.70				
14	3	Aeration Basin 2-1 East	1217 Northgate Bus. Pkw	398.84	205.73				

Table 2
Odor Occurrence Vector Program
Vectors and Distances

15	3	Aeration Basin 3-1 East	1217 Northgate Bus. Pkw	377.34	209.12
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Table 2
Odor Occurrence Vector Program
Vectors and Distances

Vectors and Distances				Distance	
From	Receptor	Source	To	Meters	Vector
16	3	Pump Station Scrubber	1217 Northgate Bus. Pkw	258.51	188.64
17	3	Solids Building Scrubber	1217 Northgate Bus. Pkw	276.05	181.55
18	3	Sludge Loading Chute	1217 Northgate Bus. Pkw	310.47	171.98
19	3	EQ Basin	1217 Northgate Bus. Pkw	266.43	153.73
1	4	Influent Channel - HW	2105 East Hill Dr	938.11	30.82
2	4	Grit Scrubber	2105 East Hill Dr	948.21	32.04
3	4	Influent Channel -Mid	2105 East Hill Dr	886.29	28.14
4	4	Pri. Clarifier #3 Inf.	2105 East Hill Dr	831.81	26.77
5	4	Pri. Clarifier #7 Inf.	2105 East Hill Dr	812.97	25.56
6	4	Pri. Clarifier #3 Eff.	2105 East Hill Dr	809.46	28.53
7	4	Pri. Clarifier #7 Eff.	2105 East Hill Dr	791.74	27.27
8	4	Flume Near Pri. #6	2105 East Hill Dr	841.50	23.08
9	4	Flume Near Pri. #4	2105 East Hill Dr	803.36	28.28
10	4	Aeration Basin 1-1 West	2105 East Hill Dr	868.17	24.37
11	4	Aeration Basin 2-1 West	2105 East Hill Dr	889.99	23.11
12	4	Aeration Basin 3-1 West	2105 East Hill Dr	913.39	21.77
13	4	Aeration Basin 1-1 East	2105 East Hill Dr	823.34	21.37
14	4	Aeration Basin 2-1 East	2105 East Hill Dr	847.38	19.98
15	4	Aeration Basin 3-1 East	2105 East Hill Dr	871.88	18.67
16	4	Pump Station Scrubber	2105 East Hill Dr	994.91	25.22
17	4	Solids Building Scrubber	2105 East Hill Dr	990.53	27.36
18	4	Sludge Loading Chute	2105 East Hill Dr	987.69	30.82
19	4	EQ Basin	2105 East Hill Dr	1085.17	32.35
1	5	Influent Channel - HW	Myatt Dr at Dollar Gen	1397.39	177.86
2	5	Grit Scrubber	Myatt Dr at Dollar Gen	1400.25	176.94
3	5	Influent Channel -Mid	Myatt Dr at Dollar Gen	1420.52	180.42
4	5	Pri. Clarifier #3 Inf.	Myatt Dr at Dollar Gen	1460.37	182.11
5	5	Pri. Clarifier #7 Inf.	Myatt Dr at Dollar Gen	1470.69	183.03
6	5	Pri. Clarifier #3 Eff.	Myatt Dr at Dollar Gen	1491.45	181.61
7	5	Pri. Clarifier #7 Eff.	Myatt Dr at Dollar Gen	1499.71	182.51
8	5	Flume Near Pri. #6	Myatt Dr at Dollar Gen	1431.29	183.95
9	5	Flume Near Pri. #4	Myatt Dr at Dollar Gen	1495.33	181.83
10	5	Aeration Basin 1-1 West	Myatt Dr at Dollar Gen	1412.97	182.85
11	5	Aeration Basin 2-1 West	Myatt Dr at Dollar Gen	1385.70	183.27
12	5	Aeration Basin 3-1 West	Myatt Dr at Dollar Gen	1356.77	183.79
13	5	Aeration Basin 1-1 East	Myatt Dr at Dollar Gen	1441.03	185.11
14	5	Aeration Basin 2-1 East	Myatt Dr at Dollar Gen	1412.51	185.64
15	5	Aeration Basin 3-1 East	Myatt Dr at Dollar Gen	1384.11	186.19
16	5	Pump Station Scrubber	Myatt Dr at Dollar Gen	1301.96	180.20
17	5	Solids Building Scrubber	Myatt Dr at Dollar Gen	1322.60	178.84
18	5	Sludge Loading Chute	Myatt Dr at Dollar Gen	1356.04	176.72
19	5	EQ Basin	Myatt Dr at Dollar Gen	1294.28	173.24

Table 3
Odor Occurrence Vector Program
Event Information
Nashville - Dry Creek

Receptor #	Number of Events	
1	24	24
2	5	29
3	3	32
4	8	40
5	1	41

Total **41**

Event Number	Receptor	Date	Time	Wind Speed		Cloud Cov	Temp	Temp	Ceiling	Final Stability	Dir. Prob.	Dir Range		
				Wind Dir	Kts							M/S	Min	Max
1	1	10/10/2001	630	150	4	2.06	0.8	57	14	20000	6	Random	Random	Random
2	1	10/11/2001	635	180	7	3.60	0.8	65	18	6500	6	Random	Random	Random
3	1	10/11/2001	1745	140	6	3.09	0.8	68	20	12000	4	140	100	180
4	1	10/17/2001	1745	10	4	2.06	0.1	53	12	20000	4	10	330	50
5	1	10/18/2001	1900	170	6	3.09	0.8	56	13	25000	4	170	130	210
6	1	10/19/2001	700	180	3	1.54	0.8	49	9	25000	6	Random	Random	Random
7	1	10/20/2001	645	170	4	2.06	0	45	7	40000	7	Random	Random	Random
8	1	10/23/2001	1730	190	6	3.09	1	74	23	25000	6	Random	Random	Random
9	1	10/24/2001	645	210	9	4.63	1	70	21	7000	4	210	170	250
10	1	10/25/2001	645	240	3	1.54	0	50	10	40000	7	Random	Random	Random
11	1	10/26/2001	630	260	10	5.14	0	46	8	40000	7	Random	Random	Random
12	1	10/27/2001	1800	360	5	2.57	0	44	7	40000	4	360	320	680
13	1	10/28/2001	1750	50	3	1.54	0.1	49	9	25000	4	50	10	90
14	1	10/29/2001	645	30	4	2.06	0	52	11	40000	7	Random	Random	Random
15	1	10/30/2001	1645	360	0	0.00	0.3	64	18	25000	4	Random	Random	Random
16	1	10/31/2001	1730	170	5	2.57	0.8	59	15	25000	4	170	130	210
17	1	11/1/2001	645	180	7	3.60	0.3	56	13	25000	7	Random	Random	Random
18	1	11/2/2001	1715	360	0	0.00	0.8	75	24	9500	4	Random	Random	Random
19	1	11/4/2001	2000	350	3	1.54	0	65	18	40000	4	350	310	670
20	1	11/8/2001	2000	360	5	2.57	0.3	62	17	25000	4	360	320	680
21	1	11/14/2001	1800	50	4	2.06	0	59	15	40000	4	50	10	90
22	1	11/21/2001	1745	190	4	2.06	0.2	50	10	20000	4	190	150	230
23	1	11/22/2001	1200	200	7	3.60	0.8	57	14	15000	4	200	160	240
24	1	11/22/2001	2000	150	5	2.57	1	50	10	10000	7	Random	Random	Random
25	2	10/10/2001	645	150	4	2.06	0.8	57	14	20000	6	Random	Random	Random

Table 3
Odor Occurrence Vector Program
Event Information

Event		Date	Time	Wind Speed			Cloud Cov	Temp	Temp	Ceiling	Final Stability	Dir. Prob.	Dir Range		
Number	Receptor			Wind Dir	Kts	M/S							Dir. Prob.	Dir Range	Dir Range
26	2	10/10/2001	730	180	12	6.17	0.3	63	17	25000	7	Random	Random	Random	
27	2	10/11/2001	645	180	7	3.60	0.8	65	18	6500	6	Random	Random	Random	
28	2	10/11/2001	1730	140	6	3.09	1	68	20	12000	6	Random	Random	Random	
29	2	10/17/2001	645	260	4	2.06	0	39	4	40000	7	Random	Random	Random	
30	3	10/17/2001	905	300	4	2.06	0	48	9	40000	4	300	260	340	
31	3	10/29/2001	1800	160	3	1.54	0	58	14	40000	4	160	120	200	
32	3	10/31/2001	730	360	0	0.00	0.2	47	8	20000	7	Random	Random	Random	
33	4	10/29/2001	1015	170	8	4.12	0	57	14	40000	4	170	130	210	
34	4	10/31/2001	2000	180	8	4.12	0.8	56	13	25000	4	180	140	220	
35	4	11/1/2001	1000	190	12	6.17	0.8	69	21	20000	4	190	180	200	
36	4	11/2/2001	955	200	10	5.14	0.8	71	22	20000	4	200	190	210	
37	4	11/2/2001	1545	200	5	2.57	0.8	77	25	9500	4	200	160	240	
38	4	11/8/2001	1820	360	0	0.00	1	64	18	8000	6	Random	Random	Random	
39	4	11/14/2001	1945	360	0	0.00	0	52	11	40000	4	Random	Random	Random	
40	4	12/2/2001	1940						-18		4	0	350	10	
41	5	11/10/2001	900	360	0	0.00	0.2	46	8	4000	4	Random	Random	Random	

Table 4
Odor Occurrence Vector Program
Test/Prediction
Nashville - Dry Creek

Event	Receptor	Date	Time	Source Range			Receptor Range			Test1	Test 2	Validation	Vector	Potential Source	Dilutions	Potential Source
				Avg	Min	Max	Avg	Min	Max							
1	1	10/10/01	630	Random	Random	Random	337	329	353	Maybe	Maybe	Valid	Random			
2	1	10/11/01	635	Random	Random	Random	337	329	353	Maybe	Maybe	Valid	Random			
3	1	10/11/01	1745	140	100	180	337	329	353	No	No	Not Valid	-			
4	1	10/17/01	1745	10	330	50	337	329	353	No	No	Not Valid	-			
5	1	10/18/01	1900	170	130	210	337	329	353	No	No	Not Valid	-			
6	1	10/19/01	700	Random	Random	Random	337	329	353	Maybe	Maybe	Valid	Random			
7	1	10/20/01	645	Random	Random	Random	337	329	353	Maybe	Maybe	Valid	Random			
8	1	10/23/01	1730	Random	Random	Random	337	329	353	Maybe	Maybe	Valid	Random			
9	1	10/24/01	645	210	170	250	337	329	353	No	No	Not Valid	-			
10	1	10/25/01	645	Random	Random	Random	337	329	353	Maybe	Maybe	Valid	Random			
11	1	10/26/01	630	Random	Random	Random	337	329	353	Maybe	Maybe	Valid	Random			
12	1	10/27/01	1800	360	320	680	337	329	353	No	Yes	Valid	360	EQ Basin	1680	Influent Channel - HW
13	1	10/28/01	1750	50	10	90	337	329	353	No	No	Not Valid	-			
14	1	10/29/01	645	Random	Random	Random	337	329	353	Maybe	Maybe	Valid	Random			
15	1	10/30/01	1645	Random	Random	Random	337	329	353	Maybe	Maybe	Valid	Random			
16	1	10/31/01	1730	170	130	210	337	329	353	No	No	Not Valid	-			
17	1	11/01/01	645	Random	Random	Random	337	329	353	Maybe	Maybe	Valid	Random			
18	1	11/02/01	1715	Random	Random	Random	337	329	353	Maybe	Maybe	Valid	Random			
19	1	11/04/01	2000	350	310	670	337	329	353	Yes	Yes	Valid	350	EQ Basin	1680	Aeration Basin 2-1 East
20	1	11/08/01	2000	360	320	680	337	329	353	No	Yes	Valid	360	EQ Basin	1680	Influent Channel - HW
21	1	11/14/01	1800	50	10	90	337	329	353	No	No	Not Valid	-			
22	1	11/21/01	1745	190	150	230	337	329	353	No	No	Not Valid	-			
23	1	11/22/01	1200	200	160	240	337	329	353	No	No	Not Valid	-			
24	1	11/22/01	2000	Random	Random	Random	337	329	353	Maybe	Maybe	Valid	Random			
25	2	10/10/01	645	Random	Random	Random	264	251	290	Maybe	Maybe	Valid	Random			
26	2	10/10/01	730	Random	Random	Random	264	251	290	Maybe	Maybe	Valid	Random			
27	2	10/11/01	645	Random	Random	Random	264	251	290	Maybe	Maybe	Valid	Random			
28	2	10/11/01	1730	Random	Random	Random	264	251	290	Maybe	Maybe	Valid	Random			
29	2	10/17/01	645	Random	Random	Random	264	251	290	Maybe	Maybe	Valid	Random			
30	3	10/17/01	905	300	260	340	190	154	209	No	No	Not Valid	-			
31	3	10/29/01	1800	160	120	200	190	154	209	Yes	Yes	Valid	160	EQ Basin	1680	Pri. Clarifier #7 Eff.
32	3	10/31/01	730	Random	Random	Random	190	154	209	Maybe	Maybe	Valid	Random			
33	4	10/29/01	1015	170	130	210	26	19	32	No	No	Not Valid	-			
34	4	10/31/01	2000	180	140	220	26	19	32	No	No	Not Valid	-			
35	4	11/01/01	1000	190	180	200	26	19	32	No	No	Not Valid	-			
36	4	11/02/01	955	200	190	210	26	19	32	No	No	Not Valid	-			
37	4	11/02/01	1545	200	160	240	26	19	32	No	No	Not Valid	-			
38	4	11/08/01	1820	Random	Random	Random	26	19	32	Maybe	Maybe	Valid	Random			
39	4	11/14/01	1945	Random	Random	Random	26	19	32	Maybe	Maybe	Valid	Random			
40	4	12/02/01	1940	0	350	10	26	19	32	No	No	Not Valid	-			
41	5	11/10/01	900	Random	Random	Random	181	173	186	Maybe	Maybe	Valid	Random			

Scrubber O&M Costs

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Alkaline Stage(s)										
Mercaptan										
Skip This Section and Go To H2S										
Gas #/Hr	Velocity	Tank Dia	Adj. Tk Dia.	Final Tank Dia.	Final Velocity	Tank Area	NOG(Req)	Packing Size	Flow Rate	
21600.0		0.00		4.0	0.00	12.56	0.00			
L'	Des. Flow	L	L(Cor)	G'	Des Air	G	G(Cor)	HTU	HTU(Cor)	
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Z(Req)	Z(Fin)	Depth/Stage	Set Depth	Z(Prelim)	Z(Final)	NOG(Fin)	NOG(1)	NOG(2)		
0.00	0.00	0.00		0	0	0.00	0.00	0.00		
H ₂ S										
Gas #/Hr	Velocity	Tank Dia	Adj. Tk Dia.	Final Tank Dia.	Final Velocity	Tank Area	NOG(Req)	Packing Size	Flow Rate	
21600.00	500.00	3.50	4.00	4.00	382.17	12.56	5.30	3.50	82.0	
Des. Flow	L	L(Cor)	G'	Des Air	G	G(Cor)	HTU	HTU(Cor)	Z(Req)	
33.41	3266.94	0.74	1229.00	3430.28	1719.75	1.07	1.83	1.45	7.70	
L'	Z(Fin)	Depth/Stage	Set Depth	Z(Prelim)	Z(Final)	NOG(Fin)	NOG(1)	NOG(2)		
1331.00	9.24	9.24	10.00	10	10	6.88	6.88	0.00		
Final										
Acid										
Tank Dia	Tank Area	Velocity	Z	Flow Rate	Stages					
0.00	0.00	0.00	0	0	0					
Alkaline										
Tank Dia	Tank Area	Velocity	Z	Flow Rate	Stages					
4.00	12.56	382.17	10	82	1					
NH ₃										
Average										
Stage 1				Stage 2				Total		
Inlet	Outlet	Lbs/Hr	% Removal	Inlet	Outlet	Lbs/Hr	% Removal	Lbs/Hr	% Removal	% Removal (Corr.)
0.00	0.00	0.00	0.00%	0.00	0.00	0.00	0.00%	0.00	0.00%	0.00%
Peak										
Stage 1				Stage 2				Total		
Inlet	Outlet	Lbs/Hr	% Removal	Inlet	Outlet	Lbs/Hr	% Removal	Lbs/Hr	% Removal	% Removal (Corr.)
0.00	0.00	0.00	0.00%	0.00	0.00	0.00	0.00%	0.00	0.00%	0.00%
H ₂ S										
Average										
Stage 1				Stage 2				Total		
Inlet	Outlet	Lbs/Hr	% Removal	Inlet	Outlet	Lbs/Hr	% Removal	Lbs/Hr	% Removal	% Removal (Corr.)
8.00	0.01	0.20	99.90%	0.00	0.00	0.00	0.00%	0.20	99.90%	99.90%
Peak										
Stage 1				Stage 2				Total		
Inlet	Outlet	Lbs/Hr	% Removal	Inlet	Outlet	Lbs/Hr	% Removal	Lbs/Hr	% Removal	% Removal (Corr.)
20.00	0.02	0.51	99.90%	0.00	0.00	0.00	0.00%	0.51	99.90%	99.90%
Mercaptan										
Average										
Stage 1				Stage 2				Total		
Inlet	Outlet	Lbs/Hr	% Removal	Inlet	Outlet	Lbs/Hr	% Removal	Lbs/Hr	% Removal	% Removal (Corr.)
0.00	0.00	0.00	0.00%	0.00	0.00	0.00	0.00%	0.00	0.00%	0.00%
Peak										
Stage 1				Stage 2				Total		
Inlet	Outlet	Lbs/Hr	% Removal	Inlet	Outlet	Lbs/Hr	% Removal	Lbs/Hr	% Removal	% Removal (Corr.)
0.00	0.00	0.00	0.00%	0.00	0.00	0.00	0.00%	0.00	0.00%	0.00%

Scrubber Design
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Output Data										
Chemical Usage										
Acid										
Average										
Stage 1		Stage 2		Total						
	Lbs/Hr	Gal/Hr	Lbs/Hr	Gal/Hr	Gal/Hr	Gal/Day				
H ₂ SO ₄	0.00	0.00	0.00	0.00	0.00	0.00				
Peak										
Stage 1		Stage 2		Total						
	Lbs/Hr	Gal/Hr	Lbs/Hr	Gal/Hr	Gal/Hr	Gal/Day				
H ₂ SO ₄	0.00	0.00	0.00	0.00	0.00	0.00				
Alkaline										
Average										
Stage 1		Stage 2		Total						
	Lbs/Hr	Gal/Hr	Lbs/Hr	Gal/Hr	Gal/Hr	Gal/Day				
NaOH	0.49	0.19	0.00	0.00	0.19	4.68				
NaOCl	1.81	1.85	0.00	0.00	1.85	44.33				
Peak										
Stage 1		Stage 2		Total						
	Lbs/Hr	Gal/Hr	Lbs/Hr	Gal/Hr	Gal/Hr	Gal/Day				
NaOH	1.22	0.49	0.00	0.00	0.49	11.70				
NaOCl	4.52	4.62	0.00	0.00	4.62	110.82				
Metering Pumps										
Stage 1					Stage 2					
	Gals/Hr	GPM	Gals/Hr	GPM						
NaOH	0.49	0.01	0.00	0.00						
NaOCl	4.62	0.08	0.00	0.00						
H ₂ SO ₄	0.00	0.00	0.00	0.00						
Chemical Storage Tanks										
Blowdown Rate										
			Amount	Solubility	GPM					
NaOH	140		NH ₄ SO ₄	0.00	71.00	0.00				
NaOCl	1330		NaCl	1.40	36.00	0.02				
H ₂ SO ₄	0		Na ₂ SO ₄	0.85	19.00	0.03				
			Evaporation	10.00		0.80				
			Total			0.85				
Operating Costs										
Electrical										
	Fan	Recirculation Pumps				Chemical Metering Pumps				
		Acid		Alkaline		Acid		Alkaline		
		Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2	
HP	6.80	0.00	0.00	2.47	0.00	0	0.00	0.50	0.00	
Adjusted HP	10.00			5.00			0.50			
Kw-Hrs	179.04	0.00	0.00	89.52	0.00	0.00	0.00	8.95	0.00	
Cost	\$6	\$0	\$0	\$3	\$0	\$0	\$0	\$0	\$0	
Chemicals										
	Acid			Alkaline						
	Stage 1	Stage 2	NaOH	NaOCl	NaOH	NaOCl				
lbs/hr	0.00	0.00	0.49	1.81	0.00	0.00				
Cost/day	\$0	\$0	\$5	\$32	\$0.00	\$0.00				
Annual Cost										
Labor	\$4,800									
Electrical	\$3,545									
Chemicals	\$13,491									
Total	\$21,836									

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Alkaline Stage(s)										
Mercaptan										
Skip This Section and Go To H2S										
Gas #/Hr	Velocity	Tank Dia	Adj. Tk Dia.	Final Tank Dia.	Final Velocity	Tank Area	NOG(Req)	Packing Size	Flow Rate	
49500.0		0.00		5.0	0.00	19.63	0.00			
L'	Des. Flow	L	L(Cor)	G'	Des Air	G	G(Cor)	HTU	HTU(Cor)	
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Z(Req)	Z(Fin)	Depth/Stage	Set Depth	Z(Prelim)	Z(Final)	NOG(Fin)	NOG(1)	NOG(2)		
0.00	0.00	0.00		0	0	0.00	0.00	0.00		
H ₂ S										
Gas #/Hr	Velocity	Tank Dia	Adj. Tk Dia.	Final Tank Dia.	Final Velocity	Tank Area	NOG(Req)	Packing Size	Flow Rate	
49500.00	500.00	5.29	5.00	5.00	560.51	19.63	5.30	3.50	126.0	
Des. Flow	L	L(Cor)	G'	Des Air	G	G(Cor)	HTU	HTU(Cor)	Z(Req)	
52.20	3212.76	0.75	1229.00	5359.81	2522.29	1.15	1.83	1.58	8.36	
L'	Z(Fin)	Depth/Stage	Set Depth	Z(Prelim)	Z(Final)	NOG(Fin)	NOG(1)	NOG(2)		
1331.00	10.03	10.03	10.00	10	10	6.34	6.34	0.00		
Final										
Acid										
Tank Dia	Tank Area	Velocity	Z	Flow Rate	Stages					
0.00	0.00	0.00	0	0	0					
Alkaline										
Tank Dia	Tank Area	Velocity	Z	Flow Rate	Stages					
5.00	19.63	560.51	10	126	1					
NH ₃										
Average										
Stage 1				Stage 2				Total		
Inlet	Outlet	Lbs/Hr	% Removal	Inlet	Outlet	Lbs/Hr	% Removal	Lbs/Hr	% Removal	% Removal (Corr.)
0.00	0.00	0.00	0.00%	0.00	0.00	0.00	0.00%	0.00	0.00%	0.00%
Peak										
Stage 1				Stage 2				Total		
Inlet	Outlet	Lbs/Hr	% Removal	Inlet	Outlet	Lbs/Hr	% Removal	Lbs/Hr	% Removal	% Removal (Corr.)
0.00	0.00	0.00	0.00%	0.00	0.00	0.00	0.00%	0.00	0.00%	0.00%
H ₂ S										
Average										
Stage 1				Stage 2				Total		
Inlet	Outlet	Lbs/Hr	% Removal	Inlet	Outlet	Lbs/Hr	% Removal	Lbs/Hr	% Removal	% Removal (Corr.)
5.00	0.01	0.29	99.82%	0.00	0.00	0.00	0.00%	0.29	99.82%	99.62%
Peak										
Stage 1				Stage 2				Total		
Inlet	Outlet	Lbs/Hr	% Removal	Inlet	Outlet	Lbs/Hr	% Removal	Lbs/Hr	% Removal	% Removal (Corr.)
10.00	0.02	0.58	99.82%	0.00	0.00	0.00	0.00%	0.58	99.82%	99.62%
Mercaptan										
Average										
Stage 1				Stage 2				Total		
Inlet	Outlet	Lbs/Hr	% Removal	Inlet	Outlet	Lbs/Hr	% Removal	Lbs/Hr	% Removal	% Removal (Corr.)
0.00	0.00	0.00	0.00%	0.00	0.00	0.00	0.00%	0.00	0.00%	0.00%
Peak										
Stage 1				Stage 2				Total		
Inlet	Outlet	Lbs/Hr	% Removal	Inlet	Outlet	Lbs/Hr	% Removal	Lbs/Hr	% Removal	% Removal (Corr.)
0.00	0.00	0.00	0.00%	0.00	0.00	0.00	0.00%	0.00	0.00%	0.00%

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Output Data										
Chemical Usage										
Acid										
Average										
	Stage 1		Stage 2		Total					
	Lbs/Hr	Gal/Hr	Lbs/Hr	Gal/Hr	Gal/Hr	Gal/Day				
H ₂ SO ₄	0.00	0.00	0.00	0.00	0.00	0.00				
Peak										
	Stage 1		Stage 2		Total					
	Lbs/Hr	Gal/Hr	Lbs/Hr	Gal/Hr	Gal/Hr	Gal/Day				
H ₂ SO ₄	0.00	0.00	0.00	0.00	0.00	0.00				
Alkaline										
Average										
	Stage 1		Stage 2		Total					
	Lbs/Hr	Gal/Hr	Lbs/Hr	Gal/Hr	Gal/Hr	Gal/Day				
NaOH	0.70	0.28	0.00	0.00	0.28	6.70				
NaOCl	2.59	2.64	0.00	0.00	2.64	63.44				
Peak										
	Stage 1		Stage 2		Total					
	Lbs/Hr	Gal/Hr	Lbs/Hr	Gal/Hr	Gal/Hr	Gal/Day				
NaOH	1.40	0.56	0.00	0.00	0.56	13.40				
NaOCl	5.17	5.29	0.00	0.00	5.29	126.89				
Metering Pumps										
	Stage 1		Stage 2							
	Gals/Hr	GPM	Gals/Hr	GPM						
NaOH	0.56	0.01	0.00	0.00						
NaOCl	5.29	0.09	0.00	0.00						
H ₂ SO ₄	0.00	0.00	0.00	0.00						
Chemical Storage Tanks										
Blowdown Rate										
			Amount	Solubility	GPM					
NaOH	201		NH ₄ SO ₄	0.00	71.00	0.00				
NaOCl	1903		NaCl	2.01	36.00	0.03				
H ₂ SO ₄	0		Na ₂ SO ₄	1.22	19.00	0.04				
			Evaporation	10.00		1.83				
			Total			1.91				
Operating Costs										
Electrical										
	Fan	Recirculation Pumps				Chemical Metering Pumps				
		Acid		Alkaline		Acid		Alkaline		
		Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2	
HP	15.58	0.00	0.00	3.79	0.00	0	0.00	0.50	0.00	
Adjusted HP	20.00			5.00					0.50	
Kw-Hrs	358.08	0.00	0.00	89.52	0.00	0.00	0.00	8.95	0.00	
Cost	\$13	\$0	\$0	\$3	\$0	\$0	\$0	\$0	\$0	
Chemicals										
	Acid		Alkaline							
	Stage 1	Stage 2	Stage 1		Stage 2					
			NaOH	NaOCl	NaOH	NaOCl				
lbs/hr	0.00	0.00	0.70	2.59	0.00	0.00				
Cost/day	\$0	\$0	\$8	\$45	\$0.00	\$0.00				
Annual Cost										
Labor	\$11,000									
Electrical	\$5,832									
Chemicals	\$19,308									
Total	\$36,141									

Scrubber Design
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Alkaline Stage(s)										
Mercaptan										
Skip This Section and Go To H2S										
Gas #/Hr	Velocity	Tank Dia	Adj. Tk Dia.	Final Tank Dia.	Final Velocity	Tank Area	NOG(Req)	Packing Size	Flow Rate	
157500.0		0.00		10.0	0.00	78.50	0.00			
L'	Des. Flow	L	L(Cor)	G'	Des Air	G	G(Cor)	HTU	HTU(Cor)	
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Z(Req)	Z(Fin)	Depth/Stage	Set Depth	Z(Prelim)	Z(Final)	NOG(Fin)	NOG(1)	NOG(2)		
0.00	0.00	0.00		0	0	0.00	0.00	0.00		
H ₂ S										
Gas #/Hr	Velocity	Tank Dia	Adj. Tk Dia.	Final Tank Dia.	Final Velocity	Tank Area	NOG(Req)	Packing Size	Flow Rate	
157500.00	500.00	9.44	10.00	10.00	445.86	78.50	6.09	3.50	510.0	
Des. Flow	L	L(Cor)	G'	Des Air	G	G(Cor)	HTU	HTU(Cor)	Z(Req)	
208.80	3251.01	0.74	1229.00	21439.22	2006.37	1.10	1.83	1.50	9.13	
L'	Z(Fin)	Depth/Stage	Set Depth	Z(Prelim)	Z(Final)	NOG(Fin)	NOG(1)	NOG(2)		
1331.00	10.96	5.48	10.00	20	20	13.33	6.66	6.66		
Final										
Acid										
Tank Dia	Tank Area	Velocity	Z	Flow Rate	Stages					
0.00	0.00	0.00	0	0	0					
Alkaline										
Tank Dia	Tank Area	Velocity	Z	Flow Rate	Stages					
10.00	78.50	445.86	20	510	2					
NH ₃										
Average										
Stage 1				Stage 2				Total		
Inlet	Outlet	Lbs/Hr	% Removal	Inlet	Outlet	Lbs/Hr	% Removal	Lbs/Hr	% Removal	% Removal (Corr.)
0.00	0.00	0.00	0.00%	0.00	0.00	0.00	0.00%	0.00	0.00%	0.00%
Peak										
Stage 1				Stage 2				Total		
Inlet	Outlet	Lbs/Hr	% Removal	Inlet	Outlet	Lbs/Hr	% Removal	Lbs/Hr	% Removal	% Removal (Corr.)
0.00	0.00	0.00	0.00%	0.00	0.00	0.00	0.00%	0.00	0.00%	0.00%
H ₂ S										
Average										
Stage 1				Stage 2				Total		
Inlet	Outlet	Lbs/Hr	% Removal	Inlet	Outlet	Lbs/Hr	% Removal	Lbs/Hr	% Removal	% Removal (Corr.)
22.00	0.03	4.07	99.87%	0.03	0.00	0.00	99.87%	4.07	100.00%	100.00%
Peak										
Stage 1				Stage 2				Total		
Inlet	Outlet	Lbs/Hr	% Removal	Inlet	Outlet	Lbs/Hr	% Removal	Lbs/Hr	% Removal	% Removal (Corr.)
44.00	0.06	8.14	99.87%	0.06	0.00	0.01	99.87%	8.15	100.00%	100.00%
Mercaptan										
Average										
Stage 1				Stage 2				Total		
Inlet	Outlet	Lbs/Hr	% Removal	Inlet	Outlet	Lbs/Hr	% Removal	Lbs/Hr	% Removal	% Removal (Corr.)
0.00	0.00	0.00	0.00%	0.00	0.00	0.00	0.00%	0.00	0.00%	0.00%
Peak										
Stage 1				Stage 2				Total		
Inlet	Outlet	Lbs/Hr	% Removal	Inlet	Outlet	Lbs/Hr	% Removal	Lbs/Hr	% Removal	% Removal (Corr.)
0.00	0.00	0.00	0.00%	0.00	0.00	0.00	0.00%	0.00	0.00%	0.00%

Scrubber Design
by
Huber Environmental, Inc.

Output Data										
Chemical Usage										
Acid										
Average										
Stage 1		Stage 2		Total						
	Lbs/Hr	Gal/Hr	Lbs/Hr	Gal/Hr	Gal/Hr	Gal/Day				
H ₂ SO ₄	0.00	0.00	0.00	0.00	0.00	0.00				
Peak										
Stage 1		Stage 2		Total						
	Lbs/Hr	Gal/Hr	Lbs/Hr	Gal/Hr	Gal/Hr	Gal/Day				
H ₂ SO ₄	0.00	0.00	0.00	0.00	0.00	0.00				
Alkaline										
Average										
Stage 1		Stage 2		Total						
	Lbs/Hr	Gal/Hr	Lbs/Hr	Gal/Hr	Gal/Hr	Gal/Day				
NaOH	9.77	3.91	0.00	0.00	3.91	93.82				
NaOCl	36.24	37.03	0.00	0.00	37.03	888.65				
Peak										
Stage 1		Stage 2		Total						
	Lbs/Hr	Gal/Hr	Lbs/Hr	Gal/Hr	Gal/Hr	Gal/Day				
NaOH	19.55	7.82	0.02	0.01	7.83	187.88				
NaOCl	72.48	74.05	0.09	0.09	74.15	1779.58				
Metering Pumps										
Stage 1					Stage 2					
	Gals/Hr	GPM	Gals/Hr	GPM						
NaOH	7.82	0.13	0.01	0.00						
NaOCl	74.05	1.23	0.09	0.00						
H ₂ SO ₄	0.00	0.00	0.00	0.00						
Chemical Storage Tanks										
					Blowdown Rate					
	Amount	Solubility		GPM						
NaOH	2815	NH ₄ SO ₄		0.00						
NaOCl	26660	NaCl		28.10						
H ₂ SO ₄	0	Na ₂ SO ₄		17.10						
		Evaporation		10.00						
		Total		6.84						
Operating Costs										
Electrical										
	Fan	Recirculation Pumps				Chemical Metering Pumps				
		Acid		Alkaline		Acid		Alkaline		
		Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2	
HP	74.34	0.00	0.00	15.33	15.33	0	0.00	0.50	0.50	
Adjusted HP	75.00	20.00								
Kw-Hrs	1342.80	0.00	0.00	358.08	0.00	0.00	0.00	8.95	0.00	
Cost	\$47	\$0	\$0	\$13	\$0	\$0	\$0	\$0	\$0	
Chemicals										
	Acid			Alkaline						
	Stage 1	Stage 2	Stage 1		Stage 2					
lbs/hr	0.00	0.00	NaOH	NaOCl	NaOH	NaOCl				
Cost/day	\$0	\$0	\$106	\$635	\$0.00	\$0.00				
Annual Cost										
Labor	\$35,000									
Electrical	\$21,843									
Chemicals	\$270,445									
Total	\$327,288									