APPENDIX G
FINAL DRAWING LIST

Nevada Environmental Response Trust (NERT)
DRAWING LIST

DRAWING NO.	DRAWING TITLE	ISSUED FOR APPROVAL		ISSUED FOR CONSTRUCTION		LATEST REVISION		REMARKS	
		DATE	REV	DATE	REV	NO.	DATE		
	PROCESS								
A-0	Cover Sheet - Overall					1	9/20/06		
P-0	Cover Sheet			1/9/06	0	3	11/15/13		
PFD-1 Sht 1	Process Flow Diagram	7/25/05	H	1/9/06	0	3	11/15/13		
PFD-1 Sht 2	Process Flow Diagram Mass Balance	7/25/05	H	1/9/06	0	3	11/15/13		
PFD-2	Process Flow Diagram Well & EQ System	7/25/05	B	1/9/06	0	3	11/15/13		
PID-LA	P&ID Legend Sheets					2	11/15/13		
PID-LB	P&ID Legend Sheets					2	11/15/13		
PID-N1	P&ID Process Notes	7/21/05	F	1/9/06	0	3	11/15/13		
PID-1A	P&ID Fluid Bed Perchlorate System	7/21/05	E	1/9/06	0	3	11/15/13		
PID-1B	P&ID Fluid Bed Perchlorate System	7/21/05	E	1/9/06	0	2	11/15/13		
PID-2A	P&ID Fluid Bed Perchlorate System	7/21/05	D	1/9/06	0	3	11/15/13		
PID-2B	P&ID Fluid Bed Perchlorate System	4/25/05	C	1/9/06	0	2	11/15/13		
PID-3A	P&ID Fluid Bed Perchlorate System	7/21/05	E	1/9/06	0	3	11/15/13		
PID-3B	P&ID Fluid Bed Perchlorate System	4/25/05	B	1/9/06	0	2	11/15/13		
PID-3C	P&ID Fluid Bed Perchlorate System	7/7/05	C	1/9/06	0	2	11/15/13		
PID-3D	P&ID Fluid Bed Perchlorate System	7/7/05	C	1/9/06	0	2	11/15/13		
PID-4	P&ID Fluid Bed Perchlorate System	7/21/05	D	1/9/06	0	3	11/15/13		
PID-5	P&ID Fluid Bed Perchlorate System	7/21/05	F	1/9/06	0	2	11/15/13		
PID-6	P&ID Fluid Bed Perchlorate System	7/21/05	G	1/9/06	0	4	11/15/13		
PID-7A	P&ID Fluid Bed Perchlorate System	7/21/05	G	1/9/06	0	3	11/15/13		

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		DATE	REV	DATE	REV	NO.	DATE		
PID-7B	P&ID Fluid Bed Perchlorate System	7/21/05	F	1/9/06	0	2	11/15/13		
PID-7C	P&ID Fluid Bed Perchlorate System	7/1/05	E	1/9/06	0	2	11/15/13		
PID-8	P&ID Fluid Bed Perchlorate System	7/21/05	D	1/9/06	0	3	11/15/13		
PID-9	P&ID Fluid Bed Perchlorate System	7/21/05	E	1/9/06	0	4	11/15/13		
PID-10A	P&ID Existing EQ Area & Modifications	7/21/05	E	1/9/06	0	5	11/15/13		
PID-10B	P&ID Existing EQ Area & Modifications	4/25/05	B	1/9/06	0	3	11/15/13		
PID-10C	P&ID Existing EQ Area & Modifications	7/21/05	F	1/9/06	0	5	11/15/13		
PID-11	P&ID Utility Systems	7/21/05	F	1/9/06	0	4	11/15/13		
PID-12	P&ID Utility Systems	7/21/05	F	1/9/06	0	4	11/15/13		
PID-13	P&ID AP-5 Pond Equipment	7/21/05	G	1/9/06	0	3	11/15/13		
PID-14	P&ID FBR-A System	7/21/05	G	1/9/06	0	3	11/15/13		
PID-15	P&ID Phosphoric Acid Feed	7/21/05	G	1/9/06	0	4	11/15/13		
PID-16	P&ID Sludge Storage & Oxygen Skid	7/21/05	G	1/9/06	0	4	11/15/13		
PID-17	P&ID Sand Filter	7/21/05	G	1/9/06	0	3	11/15/13		
HYD-1 Sheet 1	Hydraulic Profile	12/21/05	A	1/9/06	0	4	11/15/13		
HYD-1 Sheet 2	Hydraulic Profile	12/21/05	A	1/9/06	0	4	11/15/13		

Nevada Environmental Response Trust (NERT)
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DRAWING NO.	DRAWING TITLE	ISSUED FOR APPROVAL		ISSUED FOR CONSTRUCTION		LATEST REVISION		REMARKS	
		DATE	REV	DATE	REV	NO.	DATE		
	Mechanical								
FC-1	Fire Code Review								
GA-1 Sht 1	Overall Equipment Arrangement	7/26/05	D2					DRAWING NO.S NOT USED AFTER ORIGINAL APPROVAL.	
GA-1 Sht 2	AP-5 Pond Area	7/26/05	D2						
GA-1 Sht 3	FBR-A Area	7/26/05	D2						
GA-1 Sht 4	Sand Filter	7/26/05	D2						
GA-1 Sht 5	D-1 Building	7/26/05	D2						
GA-1 Sht 6	Chemical Feeds	7/26/05	D2						
KP-1	Piping Drawing Key Plan	1/30/06	A			4	10/2/06		
M-1	Overall Plant Arrangement	1/30/06	A		0	0	9/27/06	REINSTATED DWG NO.	
M-2	Equipment Location Plan	1/30/06	A	4/17/06	2	3	9/27/06	2 SHEETS	
M-3	Equipment Location Plan AP-5 Pond Area	3/7/06	A	3/21/06	0	1	9/27/06	DUPL NO M-3	
M-04	PE Stamp Drawing Cover Sheet				0	0	9/27/06		
M-10	Piping Plan					7	10/2/06		
M-11	Piping Plan					6	10/25/06		
M-12	Piping Plan					3	4/7/04		
M-13	Piping Plan					3	4/7/04		
M-14	Piping Plan					6	10/3/06		
M-15	Piping Plan					5	10/3/06		
M-16	Piping Plan					8	10/3/06		
M-17	Piping Plan					7	10/3/06		

Nevada Environmental Response Trust (NERT)
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DRAWING NO.	DRAWING TITLE	ISSUED FOR APPROVAL		ISSUED FOR CONSTRUCTION		LATEST REVISION		REMARKS	
		DATE	REV	DATE	REV	NO.	DATE		
M-18	Piping Plan & Sections					7	10/3/06		
M-19	Piping Plan & Diagram					4	3/18/04		
M-20	Piping Sections					5	10/3/06		
M-21	Piping Sections					5	4/28/06		
M-22	Piping Sections					5	4/7/04		
M-23	Piping Sections					4	4/7/04		
M-27	Enlarged Piping Plan Biofilter Area					5	10/10/06		
M-3	Equipment Location Plan, EQ Area					3	4/23/04	DUPL NO M-3	
M-30	Piping Plan, EQ Area					2	4/7/04		
M-31	Piping Sections, EQ Area					4	10/4/06		
M-32	Piping Sections, EQ Area					2	4/7/04		
M-39	Structural Notes					3	4/2/04		
M-40	Pipe Support Rack A Plan View & Details					2	12/2/03		
M-41	Pipe Support Rack A Sections & Details					3	12/2/03		
M-42	Pipe Support Racks B1 to B4 Plan View Sections & Details					2	12/2/03		
M-43	Tank Farm Area Misc. Pipe Supports					2	12/2/03		
M-44	Tank Farm Area Misc. Pipe Support Locations					1	12/2/03		
M-45	Misc. Supports Plan View					2	12/2/03		
M-46	Pipe Rack D and E Plans					2	12/2/03		
M-47	Pipe Rack D and E Plan & Sections					2	12/2/03		

Nevada Environmental Response Trust (NERT)
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DRAWING NO.	DRAWING TITLE	ISSUED FOR APPROVAL		ISSUED FOR CONSTRUCTION		LATEST REVISION		REMARKS	
		DATE	REV	DATE	REV	NO.	DATE		
M-48	Pipe Rack D Sections and Details					2	12/2/03		
M-49	Pipe Rack D & E Sections and Details					2	12/2/03		
M-50	Pipe Rack D and E Plans					2	12/2/03		
M-51	Pipe Rack D and E Plan & Sections					1	12/2/03		
M-52	Pipe Rack D Sections and Details					1	12/2/03		
M-53	Pipe Rack D & E Sections and Details					1	12/2/03		
M-54	Pipe Rack C Sections and Details					1	12/2/03		
M-55	Electrical Tray & Pipe Supports Details					1	12/2/03		
M-56	Pipe & Electrical Trays Supports Location Plan FluidIzed Bed Area					2	12/2/03		
M-57	Pipe Support Details Fluidized Bed Area					3	12/2/03		
M-58	Pipe Support Details Fluidized Bed Area					1	12/2/03		
M-59	Pipe Supports - Sections and Details					1	12/2/03		
M-60	Column and Beam Schedule					1	12/2/03		
M-61	Column and Beam Schedule					1	12/2/03		
M-62	Column & Beam Schedule Pipe Racks C & D					2	12/2/03		
M-65	Piping Plan & Details	4/5/06	A	4/17/06	0	1	10/9/06		
M-66	Piping Plan & Details	4/5/06	A	4/17/06	0	3	10/9/06		
M-67	Piping Plan & Details	4/5/06	A	4/17/06	0	3	10/16/06		
M-68	Piping Plan & Details	4/5/06	A	4/17/06	0	3	10/5/06		
M-69	Overall Piping Plan	4/5/06	A	4/17/06	0	2	10/4/06	2 SHEETS	

Nevada Environmental Response Trust (NERT)
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DRAWING NO.	DRAWING TITLE	ISSUED FOR APPROVAL		ISSUED FOR CONSTRUCTION		LATEST REVISION		REMARKS	
		DATE	REV	DATE	REV	NO.	DATE		
M-70	Piping Plan & Details	4/5/06	A	4/17/06	0	2	10/4/06		
M-71	Piping Plan & Details	4/5/06	A	4/17/06	0	3	10/4/06		
M-72	Piping Supports Plan Locations	4/28/06	A	5/15/06	0	1	10/25/06		
M-73	Piping Supports Plan Locations	4/28/06	A	5/15/06	0	1	10/25/06		
M-74	Piping Support Details	4/28/06	A	5/15/06	0	2	10/25/06		
M-100	Arrangement - Sand Reactors FBR's 3&4					1	3/4/04		
M-101	Arrangement - Sand Reactors FBR's 1&2					1	3/4/04		
M-110	Arrangement - Separators T-2011, -2012					1	3/4/04		
M-130	Arrangement - Aeration Tank T-401					1	3/4/04		
M-120	Arrangement - GAC Reactors FBR's 5&6					1	3/4/04		
M-121	Arrangement - GAC Reactors FBR's 7&8					2	10/25/06		
40591-600	Arrangement - DAF's					1	3/11/04		
40591-601	Arrangement - DAF's					2	3/11/04		
40591-602	Arrangement - DAF's					3	3/11/04		
40591-603	Arrangement - DAF's					1	3/11/04		
40591-604	Arrangement - DAF's					3	3/11/04		
40591-500	Arrangement - Aeration Equipment					1	3/11/04		
40591-501	Arrangement - Aeration Equipment					1	3/11/04		
M-102	Arrangement - Separators T-3011, -3012					1	4/7/04		
M-180	Arrangement - Solids Conditioning Tank T-901					1	3/4/04		
M-140	Arrangement - Effluent Tank T-601					1	3/4/04		

Nevada Environmental Response Trust (NERT)
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DRAWING NO.	DRAWING TITLE	ISSUED FOR APPROVAL		ISSUED FOR CONSTRUCTION		LATEST REVISION		REMARKS	
		DATE	REV	DATE	REV	NO.	DATE		
M-170	Arrangement - Ferric Chloride Tank T-751					1	3/4/04		
M-150	Arrangement - Nutrient Tank T-702					1	3/4/04		
M-190	Arrangement - Filtrate Tank T-902					1	3/4/04		
M-160	Arrangement - Ethanol Tank T-703					2	3/4/04		
40591-200	Component Specs - FBR Pump Skids 1-2 & 3-4					1	3/11/04		
40591-201	Arrangement - FBR Pump Skid 1-2					3	4/13/04		
40591-202	Arrangement - FBR Pump Skid 1-2					2	4/13/04		
40591-203	Arrangement - FBR Pump Skid 3-4					3	4/13/04		
40591-204	Arrangement - FBR Pump Skid 3-4					2	4/13/04		
40591-220	Component Specs - FBR Pump Skids 5-6 & 7-8					1	3/11/04		
40591-221	Arrangement - FBR Pump Skid 5-6					3	4/13/04		
40591-222	Arrangement - FBR Pump Skid 5-6					3	4/13/04		
40591-223	Arrangement - FBR Pump Skid 7-8					3	4/13/04		
40591-224	Arrangement - FBR Pump Skid 7-8					3	4/13/04		
40591-240	Arrangement - Effluent Pump Skid					1	3/11/04		
40591-241 Sht.1	Arrangement - Effluent Pump Skid					2	3/11/04		
40591-241 Sht.2	Arrangement - Effluent Pump Skid					2	3/11/04		
M-165	Arrangement - Ethanol Pump Skid	5/17/06	4			6	10/25/06		
M-135	Arrangement - Biofilter					1	3/4/04		
M-136	Arrangement - Biofilter					2	10/25/06		

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		DATE	REV	DATE	REV	NO.	DATE		
TSOV-4408	Arrangement - Caustic Pump Skid	5/17/06	B	5/23/06	B				
TSOV-4409	Arrangement - Nutrient Pump Skid	5/17/06	B	5/23/06	B				
	AP-5 EQUIPMENT ARRANGEMENTS								
M-103	Arrangement - FBR-A	1/17/06	A	4/6/06	0	2	10/25/06		
M-104	Arrangement - FBR-A Separator	1/17/06	A	4/6/06	0	2	10/25/06		
M-105	Arrangement - FBR-A Fluidization Pumps			4/6/06	0	2	10/25/06		
M-111	Arrangement - Sludge Tank T-1603			5/15/06	0	0	3/30/06		
M-112	Arrangement - Effluent Pump Suction Tank T-621			5/15/06	0	1	10/25/06		
M-113	Arrangement - Polymer Feed System			5/15/06	0	0	5/15/06		
M-114	Arrangement - AP-5 Pond Pump Skid	2/28/06	B	4/6/06	0	1	5/18/06		
M-115	Arrangement - Caustic Tank T-701	2/28/06	A	5/15/06	0	1	10/25/06		
M-116	Arrangement - Oxygenation System					0	3/30/06		
M-117	Arrangement - Sand Filter Basin T-1702			5/15/06	0	1	10/25/06	Appvd as GA-1 sht 4	
M-118	Arrangement Backwash Pump Skid P-1701A/B	2/28/06	A	4/6/06	0	2	10/25/06		
M-119	Arrangement - Filter Reject Tank	2/28/06	A	5/15/06	0	1	10/25/06		
M-125	Arrangement Phosphoric Acid Pump Skid		A			0	5/15/06		
	2013 NERT MODIFICATIONS								
1373 M-204	FBR 1-4 BIOMASS SEPARATOR INSTALLATION					A	11/15/13		
1373 M-205	FBR 1-4 BIOMASS SEPARATOR AIR PANEL					0	11/15/13		
1373 M-300	FBR 1-4 BIOMASS SEPARATOR DETAIL					0	11/15/13		

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		DATE	REV	DATE	REV	NO.	DATE		
1373 M-301	Equalization Area Piping Revisions					A	11/15/13		
1373 M-302	Equalization Area Piping Revisions					A	11/15/13		
1373 M-303	Equalization Area Piping Revisions					A	11/15/13		
1373 M-304	Equalization Area Piping Revisions					A	11/15/13		
1373 M-305	Equalization Area Piping Revisions					C	11/15/13		
1373 M-350	GW-11 Pond Suction Fitting					D	11/15/13		
	CIVIL								
C-1	Site Plan					0	2/6/04		
C-2	Drainage Plan					0	2/6/04		
C-3	North Elevation View					0	2/6/04		
C-4	Site Grading Plan					3	3/31/04		
C-5	Site Plan Evacuation Route					1	4/2/04		
	STRUCTURAL								
S-1	Concrete Foundation					6	2/6/04		
S-2	Floor Plan					11	2/6/04		
S-3	Sections and Details					7	3/31/04		
S-4	Tank Walkway					8	2/6/04		
S-5	Tank Walkway					4	3/31/04		
S-6	Tank Walkway Plan					4	12/2/03		
S-7	Pipe Bridge, DAF & Solids Tk Walkway Plan					6	2/6/04		

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		DATE	REV	DATE	REV	NO.	DATE		
S-8	Stairs & Platform Sections and Details					2	12/2/03		
S-9	Pipe Bridge Sections and Details					3	12/2/03		
S-10	Sections and Details					2	2/6/04		
S-11	Guide Rail Ethanol Tank					1	2/6/04		
S-12	Concrete Plan & Sections - Equalization Area					2	2/6/04		
KP-2	Steel Platform and Pipe Rack Key Plan					3	12/2/03		
	AP-5 STRUCTURAL								
S-21	Sand Filter Concrete Layout	7/25/05	A	1/13/06	0	5	10/16/06		
S-21A	Concrete Notes sand Filter			4/20/06	0	1	10/16/06		
S-22	Sand Filter Concrete Details	7/25/05	A	1/13/06	0	3	10/16/06		
S-23	Sand Filter Concrete Details	7/25/05	A	1/13/06	0	3	10/16/06		
S-24	FBR-A Concrete Layout	7/25/05	A	1/13/06	0	2	10/16/06		
S-25	FBR-A Concrete Details	7/25/05	A	1/13/06	0	2	10/16/06		
S-26	FBR-A Catwalk Extension	7/25/05	A	1/13/06	0	2	10/18/06		
S-27	FBR D-1 Bldg New Pad Layouts and Detail	7/25/05	A	1/13/06	0	5	10/18/06		
S-28	Stair Notes			4/20/06	0	1	10/18/06		
S-29	Stair Plan Sand Filter			4/20/06	0	2	10/18/06		
S-30	Concrete Sections			4/20/06	0	2	10/19/06		
S-31	Stair Sections & Details			4/20/06	0	2	10/19/06		

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		DATE	REV	DATE	REV	NO.	DATE		
	ELECTRICAL								
E-0	Electrical Drawing List	7/25/05	2	1/13/06	3	5	4/19/06		
E-1	Single Line Diagram					1	3/19/04		
E-2	Single Line Diagram					1	3/19/04		
E-3	Elementary Diagram					1	3/19/04		
E-4	Elementary Diagram					2	3/19/04		
E-5	Elementary Diagram					1	3/19/04		
E-6	Elementary Diagram					1	3/19/04		
E-7	Elementary Diagram					1	3/19/04		
E-8	Elementary Diagram					1	3/19/04		
E-9	Site Grounding	7/25/05	6	1/13/06	7	8	2/21/06		
E-10	Grounding Details & Sections			1/13/06	3				
E-11	Lighting Plan - Tank Containment Area	7/25/05	3	1/13/06	4				
E-12	Schedules and General Notes	7/25/05	4	1/13/06	5				
E-13	Cable Tray Plan	7/25/05	4	1/13/06	5	6	2/16/06		
E-14	Cable Tray Section & Details & B/M	7/25/05	2	1/13/06	3				
E-15	Cable Tray Section & Details					1	3/19/04		
E-16	Exposed Conduit Plan					2	3/19/04		
E-17	Exposed Conduit Plan	7/25/05	4	1/13/06	5	6	2/16/06		
E-18	Exposed Conduit Plan					3	3/19/04		
E-19	Exposed Conduit Plan					4	3/19/04		

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		DATE	REV	DATE	REV	NO.	DATE		
E-20	Exposed Conduit Plan					4	3/19/04		
E-21	Exposed Conduit Plan	7/25/05	2	1/13/06	3				
E-22	Exposed Conduit Plan					1	3/19/04		
E-23	Partial Exposed Conduit Plan	7/25/05	6	1/13/06	7				
E-24	Standard Details					1	3/19/04		
E-25	Conduit and Cable Schedule					1	3/19/04		
E-26	Conduit and Cable Schedule					1	3/19/04		
E-27	Conduit and Cable Schedule					2	3/19/04		
E-28	Conduit and Cable Schedule					1	3/19/04		
E-29	Conduit and Cable Schedule					5	3/19/04		
E-30	Conduit and Cable Schedule					2	3/19/04		
E-31	Conduit and Cable Schedule					1	3/19/04		
E-32	Conduit and Cable Schedule					2	3/19/04		
E-33	Conduit and Cable Schedule					1	3/19/04		
E-34	Conduit and Cable Schedule					2	3/19/04		
E-35	Conduit and Cable Schedule					3	3/19/04		
E-36	Conduit and Cable Schedule					4	3/19/04		
E-38	Exposed Conduit Plan					2	4/13/04		
E-40	Heat Trace - Standard Details					1	3/19/04		

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		DATE	REV	DATE	REV	NO.	DATE		
E-41	Heat Trace - Schematic Diagram					2	3/19/04		
E-42	Heat Trace - Schematic Diagram	7/25/05	2	1/13/06	3	4	2/16/06		
E-43	Heat Trace - Schematic Diagram								
E-45	Heat Trace - Schedule					2	3/19/04		
E-46	Heat Trace - Schedule & Bill of Materials								
E-47	Grounding Details EQ Area					1	3/19/04		
E-48	Grounding Plan	7/25/05	A	1/13/06	0				
E-49	Lighting Plan	7/25/05	A	1/13/06	0	1	2/16/06		
E-50	Conduit and Cable Tray Extension Plan	7/25/05	A	1/13/06	0	2	5/9/06		
E-51	Conduit Plan	7/25/05	A	1/13/06	0	1	2/16/06		
E-52	Conduit Plan	7/25/05	A	1/13/06	0	1	2/16/06		
E-53	Electrical Elementary Diagram	7/25/05	A	1/13/06	0	2	5/9/06		
E-54	Electrical Elementary Diagram	7/25/05	A	1/13/06	0	1	2/16/06		
E-55	Electrical Elementary Diagram	7/25/05	A	1/13/06	0	1	2/16/06		
E-56	Conduit and Cable Schedule	7/25/05	A	1/13/06	0	1	2/16/06		
E-57	Conduit and Cable Schedule	7/25/05	A	1/13/06	0	2	5/9/06		
E-58	Conduit and Cable Schedule	7/25/05	A	1/13/06	0	2	4/3/06		
E-59	Conduit and Cable Schedule	7/25/05	A	1/13/06	0	1	2/16/06		
E-60	System Architecture	7/25/05	A	1/13/06	0				
E-61	Building D-1 MCC-1 Front Elevation	7/25/05	A	1/13/06	0	2	5/9/06		

Nevada Environmental Response Trust (NERT)
DRAWING LIST

DRAWING NO.	DRAWING TITLE	ISSUED FOR APPROVAL		ISSUED FOR CONSTRUCTION		LATEST REVISION		REMARKS	
		DATE	REV	DATE	REV	NO.	DATE		
E-62	Building D-1 MCC-1 One Line Diagram	7/25/05	A	1/13/06	0	3	5/9/06		
E-63	Building D-1 MCC-1 One Line Diagram	7/25/05	A	1/13/06	0	2	4/19/06		
E-64	Building D-1 MCC-2 Layout	7/25/05	A	1/13/06	0	1	2/16/06		
E-65	Building D-1 MCC-2 One Line Diagram	7/25/05	A	1/13/06	0	2	4/19/06		
E-66	Building D-1 MCC-2 One Line Diagram	7/25/05	A	1/13/06	0	2	4/19/06		
E-67	Building D-1 MCC-2 One Line Diagram	7/25/05	A	1/13/06	0	1	2/16/06		
E-68	Building D-1 MCC-1 PLC I/O	7/25/05	A	1/13/06	0	1	2/16/06		
E-69	Building D-1 MCC-1 PLC I/O	7/25/05	A	1/13/06	0	1	2/16/06		
E-70	Building D-1 MCC-1 PLC I/O	7/25/05	A	1/13/06	0	1	2/16/06		
E-71	Building D-1 MCC-1 PLC I/O	7/25/05	A	1/13/06	0	1	4/19/06		
E-72	Building D-1 MCC-1 PLC I/O	7/25/05	A	1/13/06	0	1	2/16/06		
E-73	Building D-1 MCC-2 PLC I/O	7/25/05	A	1/13/06	0	1	2/16/06		
E-74	Building D-1 MCC-2 PLC I/O	7/25/05	A	1/13/06	0	1	2/16/06		
E-75	Building D-1 MCC-2 PLC I/O	7/25/05	A	1/13/06	0	1	2/16/06		
E-76	MCC Building PLC I/O	7/25/05	A	1/13/06	0				
E-77	Electrical Schematic Diagram AP-5 Control Panel	8/8/05	A	1/13/06	0	1	2/16/06		
E-78	Electrical Schematic Diagram AP-5 Control Panel	8/8/05	A	1/13/06	0				
E-79	Electrical Details AP-5 Control Panel	8/8/05	A	1/13/06	0	1	2/16/06		
E-80	Electrical Details AP-5 Control Panel	8/8/05	A	1/13/06	0	1	2/16/06		

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		DATE	REV	DATE	REV	NO.	DATE		
	ELECTRICAL REFERENCE DRAWINGS								
E-165-1	Bill of Materials, Electron Donor Skid- Sht 1					1	11/24/03		
E-165-2	Electrical Details, Electron Donor Skid- Sht 2					1	11/24/03		
E-165-3	Electrical Details, Electron Donor Skid- Sht 3					1	11/24/03		
E-165-4	Electrical Details, Electron Donor Skid- Sht 4					1	11/24/03		
E-165-5	Electrical Details, Electron Donor Skid- Sht 5					1	11/24/03		
E-165-6	Electrical Details, Electron Donor Skid- Sht 6					1	11/24/03		
E-165-7	Electrical Details, Electron Donor Skid- Sht 7					1	11/24/03		
E-308-1	Dual H-120 Biofilter Control Panel Layout					0	11/24/03		
E-308-2	Dual H-120 Biofilter Control Panel Schematic					0	11/24/03		
	Instrumentation								
	Instrumentation Site Plan								
	Instrumentation Site Plan								
40591-894-01	PLC Panel - Electrical Schematic	7/25/05	3	1/13/06	4				
40591-894-02	PLC Panel - Electrical Schematic					2	3/11/04		
40591-894-03	PLC Panel - Electrical Schematic					2	3/11/04		
40591-894-04	PLC Panel - Electrical Schematic					2	3/11/04		
40591-894-05	PLC Panel - Electrical Schematic	7/25/05	3	1/13/06	4				
40591-894-06	PLC Panel - Electrical Schematic					2	3/11/04		
40591-894-07	PLC Panel - Electrical Schematic					1	3/11/04		

Nevada Environmental Response Trust (NERT)
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		DATE	REV	DATE	REV	NO.	DATE		
40591-894-08	PLC Panel - Electrical Schematic					2	3/11/04		
40591-894-09	PLC Panel - Electrical Schematic					1	3/11/04		
40591-894-10	PLC Panel - Electrical Schematic					2	3/11/04		
40591-894-11	PLC Panel - Electrical Schematic					2	3/11/04		
40591-894-12	PLC Panel - Electrical Schematic	7/25/05	4	1/13/06	5	6	2/16/06		
40591-894-13	PLC Panel - Electrical Schematic					1	3/11/04		
40591-894-14	PLC Panel - Electrical Schematic					1	3/11/04		
40591-894-15	PLC Panel - Electrical Schematic					2	3/11/04		
40591-894-16	PLC Panel - Electrical Schematic					3	3/11/04		
40591-894-17	PLC Panel - Electrical Schematic					1	3/11/04		
40591-894-18	PLC Panel - Electrical Schematic					2	3/11/04		
40591-894-19	PLC Panel - Electrical Schematic					3	3/11/04		
40591-894-20	PLC Panel - Interior Layout					3	3/11/04		
40591-894-21	PLC Panel - Exterior Layout and BOM					3	3/11/04		
40591-894-22	PLC Panel - List of Interconnects					3	3/11/04		
40591-894-23	PLC Panel - List of Interconnects					3	3/11/04		
40591-894-24	PLC Panel - List of Interconnects					3	3/11/04		
40591-894-25	Interconnect Diagram					1	3/11/04		

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		DATE	REV	DATE	REV	NO.	DATE		

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		DATE	REV	DATE	REV	NO.	DATE		

APPENDIX H
P&ID'S

DRAWING # 1373-P0
SHEET 1 OF 1
FILE #

NEVADA ENVIRONMENTAL RESPONSE TRUST GWETS
FLUIDIZED BED PERCHLORATE TREATMENT SYSTEM
PROCESS DRAWINGS

	DRAWING #	KMG FILE #	DESCRIPTION
X	1373-P0	A-00-0-01	Cover Sheet
X	1373-PFD01 Sht 1	A-00-1-01	Process Flow Diagram
X	1373-PFD01 Sht 2		Process Flow Diagram Mass Balance
X	1373-PFD02	A-00-1-02	Process Flow Diagram Well & EQ System
X	1373-PID-LA Sht LA	A-00-1-03	P&ID Legend Sheets
X	1373-PID-LA Sht LB	A-00-1-04	P&ID Legend Sheets
X	1373-PID-NI	A-00-1-05	P&ID Notes
X	1373-PID01A	A-00-1-06	P&ID Fluid Bed Perchlorate System
X	1373-PID01B	A-00-1-07	P&ID Fluid Bed Perchlorate System
X	1373-PID02A	A-00-1-08	P&ID Fluid Bed Perchlorate System
X	1373-PID02B	A-00-1-09	P&ID Fluid Bed Perchlorate System
X	1373-PID03A	A-00-1-10	P&ID Fluid Bed Perchlorate System
X	1373-PID03B	A-00-1-11	P&ID Fluid Bed Perchlorate System
X	1373-PID03C	A-00-1-12	P&ID Fluid Bed Perchlorate System
X	1373-PID03D	A-00-1-13	P&ID Fluid Bed Perchlorate System
X	1373-PID04	A-00-1-14	P&ID Fluid Bed Perchlorate System
X	1373-PID05	A-00-1-15	P&ID Fluid Bed Perchlorate System
X	1373-PID06	A-00-1-16	P&ID Fluid Bed Perchlorate System
X	1373-PID07A	A-00-1-17	P&ID Fluid Bed Perchlorate System
X	1373-PID07B	A-00-1-18	P&ID Fluid Bed Perchlorate System
X	1373-PID07C	A-00-1-19	P&ID Fluid Bed Perchlorate System
X	1373-PID08	A-00-1-20	P&ID Fluid Bed Perchlorate System
X	1373-PID09	A-00-1-21	P&ID Fluid Bed Perchlorate System
X	1373-PID10A	A-00-1-22	P&ID Equalization Area & Basin
X	1373-PID10B	A-00-1-23	P&ID Equalization Area, Piping & Basin
X	1373-PID10C	A-00-1-24	P&ID Equalization Area, Piping & Basin
X	1373-PID11	A-00-1-25	P&ID Utility Systems
X	1373-PID12	A-00-1-26	P&ID Utility Systems
X	1373-PID13		P&ID AP-5 Pond Equipment
X	1373-PID14		P&ID FBR-A System
X	1373-PID15		P&ID Phosphoric Acid Feed
X	1373-PID16		P&ID Sludge Storage & Oxygen Skid
X	1373-PID17		P&ID Sand Filter
X	1373-HYD01 Sht 1	A-00-1-27	Hydraulic Profile
X	1373-HYD01 Sht 2		Hydraulic Profile

NOTE: ALL ITEMS MARKED WITH "X" ARE NEW OR MODIFIED DRAWINGS

REV	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
3	11-15-13	RECORD DRAWING - REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
2	9-26-06	RECORD DRAWING	DM	RL
1	4-26-06	ISSUED FOR CONSTRUCTION, PID-10B MODIFIED	DM	RL
0	12-27-05	ISSUED FOR CONSTRUCTION	DM	SF

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CHECKED BY/DATE: SF/ 12-21-05
SHEET SIZE: D
REVISION: 3
SHEET 1 OF 1
DRAWING #: 1373-P0
FILE #: 1373-P0-3

NERT
HENDERSON, NV

PIPING & INSTRUMENTATION DIAGRAM
FLUIDIZED BED PERCHLORATE
TREATMENT SYSTEM
COVER SHEET

ENVIROGEN TECHNOLOGIES
250 PHILLIPS BLVD. SUITE 255
EWING, NJ 08618
A Lifecycle Performance Company
A member of The Amplo Group

LAST EDITED: 11/14/13 BY: DLEICH NETWORK PATH: G:\ENGR\NCI\1373-101 TRONOX SERVICES\4.0 TECHNICAL\4.4 DRAWINGS\PID\2013 RECORD DRAWINGS

REMOVED LINE CONNECTION FROM PUMP P-903

SAND FBR NO 1 (1 OF 4)
GAC FBR NO 5 (1 OF 4)
FIRST STAGE SEPARATOR (1 OF 2)
SECOND STAGE SEPARATOR (1 OF 2)
AERATION TANK T-401
MIXER
THICKENER T-602
D-501
DAF #1 (1 OF 2)
FILTER REJECT P-1701 T-1701
FILTRATION SYSTEM T-1702
EFFLUENT TANK T-601
P-601
DISINFECTION T-601
PUMP SUCTION TANK T-621
BOOSTER PUMP T-601
OXYGEN GENERATOR PX-1601
P-502
P-603
T-901 CONDITIONING TANK
P-901
X-901
FILTER PRESS (1 OF 2)
DUMPSTER (1 OF 2)
T-902
FILTRATE TANK
P-903
T-1603
P-1601
SOLIDS STORAGE TANK
T-1401
SEPARATOR
FBR -A
P-1401

PHOSPHORIC ACID
NUTRIENT SOLUTION
ELECTRON DONOR
PH SOLUTION
EQUALIZED FEED PFD-2
MICRO NUTRIENT
AERATION AIR
HYDROGEN PEROXIDE
DAF AIR
DAF POLYMER
THICKENER POLYMER
FERRIC CHLORIDE
LIME
POLYMER
DEFOAMER
OVERFLOW
EFFLUENT
EFF SPEC. PFD-2
PRESSED SOLIDS
EXCESS FBR 7 BIOMASS
EXCESS FBR 8 BIOMASS
TO FBR 1
TO FBR 2
TO FBR 3
TO FBR 4
RECYCLE TO FBR 2
FROM FBR 2
RECYCLE TO FBR 6
FROM FBR 6
FROM FBR 3 & 4
FROM FBR 7 & 8
FBR 6
FBR 7
FBR 8
TO DAF #2
FROM DAF #2
DAF #1 UNDERFLOW TO FLOAT
DAF #2 UNDERFLOW TO FLOAT
FROM PRESS #2
NO2 FILTER PRESS TO
DUMPSTER #2

REV	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
1	11-15-13	RECORD DRAWING – REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
2	9-26-06	RECORD DRAWING	DM	RL
3	5-10-06	REVISED [HOS]HORIC ACID CONCENTRATIOPN SHEET 2	DM	PT
4	12-27-05	ISSUED FOR CONSTRUCTION	DM	PT

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SHEET SIZE: D
REVISION: 3
SHEET 1 OF 2
DRAWING # 1373-PFD01
FILE # 1373-PFD01-3

NERT
HENDERSON, NV

PROCESS FLOW DIAGRAM FLUIDIZED BED PERCHLORATE TREATMENT SYSTEM

ENVIROGEN TECHNOLOGIES
250 PHILLIPS BLVD. SUITE 255
EWING, NJ 08618
A Lifecycle Performance Company
A member of The Amplio Group

MATERIAL BALANCE

THE MATERIAL BALANCE REFLECTS THE MAXIMUM DESIGN CAPABILITY OF THE 2006 PERCHLORATE TREATMENT PROCESS.

Values During Effluent Discharge at 30-Day Average Maximum Flow

Characteristic		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
WATER FLOW (NOTE 4, 9, 10, 11)	gal/min	199	2,000	1,801	-	-	-	398	995	249	1,988	1,751	473	12.5	-	-	-	-	1,052	(NOTE 12) 3.1	-	107	-	-	(NOTE 12) 523	995	4.7	-	-	(NOTE 5, 12) 2,822	2.5
AIR OR OXYGEN FLOW	scfm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	48	-	-	-	-	-	4	-	-	-	-	-	-	-
ClO_4 (NOTE 3)	mg/L	(NOTE 8)	25	25	-	-	-	25	25	25	< 0.004	< 0.004	< 0.004	< 0.004	-	-	-	-	< 0.004	< 0.004	-	< 0.004	-	-	< 0.004	< 0.004	< 0.004	-	-	< 0.004	< 0.004
ClO_3	mg/L	(NOTE 8)	< 0.1	< 0.1	-	-	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	-	-	-	< 0.1	< 0.1	-	< 0.1	-	-	< 0.1	< 0.1	< 0.1	-	-	< 0.1	< 0.1
NO_3-N	mg/L	(NOTE 8)	< 0.1	< 0.1	-	-	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	-	-	-	< 0.1	< 0.1	-	< 0.1	-	-	< 0.1	< 0.1	< 0.1	-	-	< 0.1	< 0.1
NH_3-N	mg/L	12	0.5	0.5	-	-	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	-	-	-	-	1.5	1.5	-	10.4	-	-	1.5	1.5	1.0	-	-	1.0	200
PO_4-P	mg/L	<1	0.5	0.5	-	-	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	-	-	-	-	0.7	0.7	-	2.5	-	-	0.7	0.7	0.6	-	-	0.6	40
Chloride	mg/L	2,000	2,316	2,316	-	-	-	2,316	2,316	2,316	2,325	2,325	2,325	2,325	-	-	-	-	2,412	2,433	-	3,190	-	-	2,433	2,433	2,382	-	-	19,581	19,581
pH		7.3	6.5	6.5	-	-	-	6.5	6.5	6.5	6.4	6.4	6.4	6.4	-	-	-	-	6.5	6.4	-	6.4	-	-	6.4	6.4	6.4	-	-	> 10.3	> 10.3
TDS	mg/L	6,400	5,882	5,882	-	-	-	5,882	5,882	5,882	5,868	5,868	5,868	5,868	-	-	-	-	5,973	5,994	-	6,901	-	-	5,994	5,994	5,936	-	-	26,516	26,516
TSS	mg/L	< 10	150	150	-	-	-	150	150	150	152	152	152	152	-	-	-	-	197	25,000	-	599	-	-	30	3	40,000	-	-	100,000	11,750
TSS	lbs/day	-	-	-	-	-	-	-	1,798	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,249	-	-	2,353	-
NUTRIENT SOLUTION (NOTE 1)	gal/day	-	-	-	9	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ELECTRON DONOR (NOTE 2)	gal/day	-	-	-	-	-	156	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CAUSTIC (25%)	gal/day	-	-	-	-	50	-	-	-	-	-	-	-	-	-	(NOTE 6)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
POLYMER #1 (DAF)	gal/day	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23	-	-	-	-	-	-	-	-
POLYMER #2 (CLARIFIER)	gal/day	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.6	-	-	-	-	-	-	-	-	-	-
FERRIC CHLORIDE (36%) (NOTE 14	gal/day	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	293	-	-	-
LIME (NOTE 13, 14)	lbs/day	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,877	-	-
HYDROGEN PEROXIDE (35%)	gal/day	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEFOAMER	gal/day	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MICRONUTRIENTS	gal/day	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PHOSPHORIC ACID (75%)	gal/day	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

GENERAL NOTES:

1. FLOW IS FOR UREA SOLUTION (4.0 LB UREA /GALLON)
2. FLOW IS FOR DENATURED ETHANOL AS ELECTRON DONOR (95%ETHANOL, 5% OTHER ORGANIC), 190 PROOF.
3. THE PERCHLORATE CONCENTRATION IS THE VALUE SHOWN OR THE MDL, WHICHEVER IS GREATER.
4. UNLESS STATED OTHERWISE, FLOWS ARE AVERAGE MAXIMUM FLOWS, NOT MAXIMUM INSTANTANEOUS FLOWS.
5. VALUES STATED ARE IN GALLONS/DAY.
6. CAUSTIC ADDED AS REQUIRED
7. VALUES STATED ARE IN CU FT/DAY AVERAGE FROM EACH PRESS.
8. LIMITS BASED ON LOAD AND CALCULATED BY THE FORMULA:
   ((0.90 x NO_3-N) + (0.17 x ClO_3) + (0.18 x ClO_4)) * ((FLOW * 1.440)/1,000,000) * 8.34 < 1.893
   WHE NO_3-N < OR = 50 mg/L AND.
   ClO_3 < OR = 500 mg/L AND.
   ClO_4 < OR = 400 mg/L
   ASSUMES OPERATION AT 100% OF FULL LOAD.
9. SYSTEM DESIGNED FOR A MAXIMUM HYDRAULIC FLOW OF 1,000 GALLONS PER MINUTE
10. SYSTEM 30-DAY AVERAGE MAXIMUM FLOW = 1,000 GPM.
11. SYSTEM DESIGN AVERAGE ANNUAL FLOW = 950 GPM.
12. LISTED FLOWS FOR TWO DAFs & FILTER PRESSES OPERATING.
13. LIME USAGE BASED ON PREVIOUS SYSTEM USAGE OF 20 TONS PER PER MONTH.

Values During Effluent Discharge at 30-Day Average Maximum Flow

Characteristic		31	32	33	34	35	36	37	90	91	92	93	94	95	96	97		101	102	103	104	107	108
WATER FLOW (NOTE 4, 9, 10, 11)	gal/min	(NOTE 7) 101	5.0	-	-	-	-	(NOTE 7) 201	199	2,000	1,801	199	-	-	-	-	-	50	995	1,045	-	-	-
AIR OR OXYGEN FLOW	scfm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	7
ClO_4 (NOTE 3)	mg/L	< 0.004	< 0.004	-	-	-	-	< 0.004	(NOTE 8)	25	25	25	-	-	-	-	-	< 0.004	< 0.004	< 0.004	-	-	-
ClO_3	mg/L	< 0.1	< 0.1	-	-	-	-	< 0.1	(NOTE 8)	< 0.1	< 0.1	< 0.1	-	-	-	-	-	< 0.1	< 0.1	< 0.1	-	-	-
NO_3-N	mg/L	< 0.1	< 0.1	-	-	-	-	< 0.1	(NOTE 8)	< 0.1	< 0.1	< 0.1	-	-	-	-	-	< 0.1	< 0.1	< 0.1	-	-	-
NH_3-N	mg/L	-	200	-	-	-	-	-	12	1	0.5	0.5	-	-	-	-	-	1.5	1.5	1.5	-	-	-
PO_4-P	mg/L	-	40	-	-	-	-	-	2	0.5	0.5	0.5	-	-	-	-	-	0.7	0.7	0.7	-	-	-
Chloride	mg/L	19,581	19,581	-	-	-	-	19,581	2,000	2,316	2,316	2,316	-	-	-	-	-	2,433	2,433	2,433	-	-	-
pH		> 10.3	> 10.3	-	-	-	-	> 10.3	7.3	6.5	6.5	6.5	-	-	-	-	-	6.4	6.4	6.4	-	-	-
TDS	mg/L	26,516	26,516	-	-	-	-	26,516	6,400	5,882	5,882	5,882	-	-	-	-	-	5,994	5,994	5,994	-	-	-
TSS	mg/L	300,000	11,750	-	-	-	-	300,000	< 10	150	150	150	-	-	-	-	-	567	3	30	-	-	-
TSS	lbs/day	1,883	-	-	-	-	-	3,765	-	-	-	-	-	-	-	-	-		-	-	-	-	-
NUTRIENT SOLUTION (NOTE 1)	gal/day	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-
ELECTRON DONOR (NOTE 2)	gal/day	-	-	-	-	-	-	-	-	-	-	-	-	-	156	-	-	-	-	-	-	-	-
CAUSTIC (25%)	gal/day	-	-	-	-	-	-	-	-	-	-	-	-	50	-	-	-	-	-	-	-	-	-
POLYMER #1 (DAF)	gal/day	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
POLYMER #2 (CLARIFIER)	gal/day	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FERRIC CHLORIDE (36%) (NOTE 14)	gal/day	-	-	95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LIME (NOTE 13, 14)	lbs/day	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HYDROGEN PEROXIDE (35%)	gal/day	-	-	-	1	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEFOAMER	gal/day	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MICRONUTRIENTS	gal/day	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	37.5	-	-
PHOSPHORIC ACID (75%)	gal/day	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.4	-	-	-	-	-	-	-

GENERAL NOTES:

14. FLOWSHEET ASSUMES WORST CASE OF USING LIME AND FERRIC CHLORIDE FOR SOLIDS CONDITIONING. FROM EXPERIENCE, USE OF POLYMER SUBSTANTIALLY REDUCES LIME AND FERRIC CHLORIDE USAGE AND REDUCES SLUDGE GENERATION.

REV	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
3	11-15-13	RECORD DRAWING – REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
2	9-26-06	RECORD DRAWING	DM	RL
1	5-10-06	REVISED PHOSPHORIC ACID CONCENTRATION	DM	PT
0	12-27-05	ISSUED FOR CONSTRUCTION	DM	PT

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REVISION: 3
SHEET 2 OF 2
DRAWING #: 1373-PFD01
FILE #: 1373-PFD01-3

NERT
HENDERSON, NV

PROCESS FLOW DIAGRAM
FLUIDIZED BED PERCHLORATE
TREATMENT SYSTEM

DRAWING # 1373-PFD01
SHEET 1 OF 1
FILE #

U.S. PATENTS 5750028, 5788842, 6706521 AND PATENTS PENDING.

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1373-PFD02

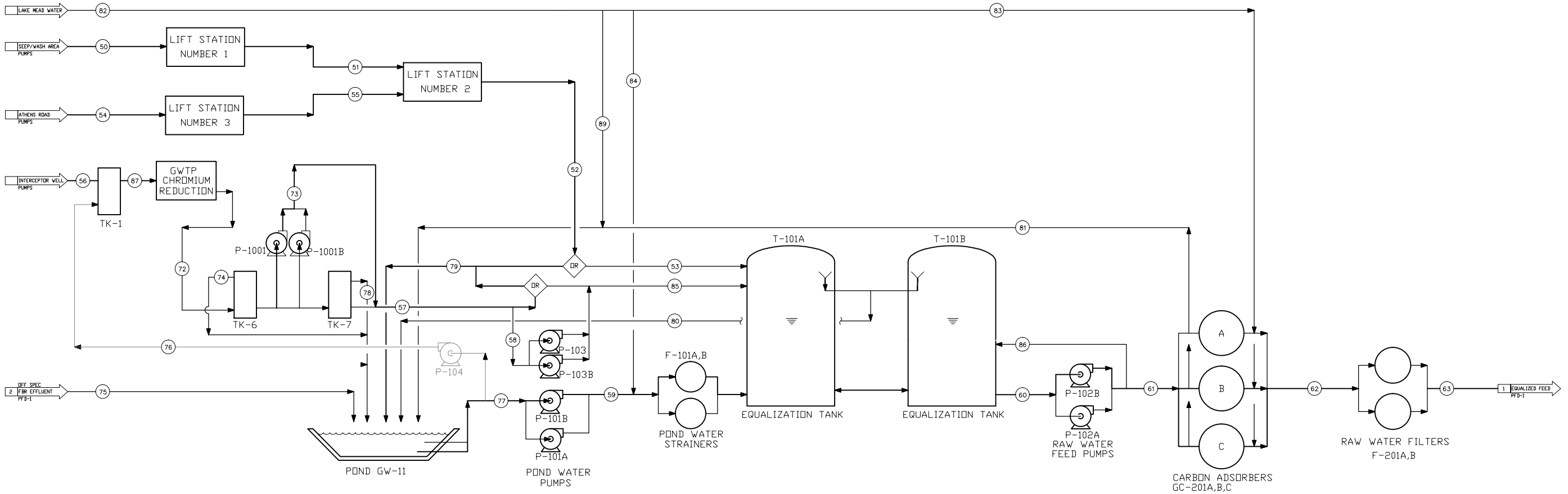
SHEET 1 OF 1

DRAWING #

FILE #

LINE STREAM NUMBERS REMOVED

64 65 66 67 68 88



THE MATERIAL BALANCE REFLECTS THE MAXIMUM DESIGN CAPABILITY OF THE 2006 PERCHLORATE TREATMENT PROCESS.

MATERIAL BALANCE

Values During Effluent Discharge at 30 Day Average Maximum Flow																																						
Characteristic		50	51	52	53	54	55	56	57	58				59	60	61	62	63	64	65	66	67	68	69	70	74	75	76 (NOTE 6)	77	78	79	80	81	82	83	84	85	86	87	88	89
FLOW (NOTES 2, 3, 4, 5)	gal/min	675	675	925	925	250	250	58	70	70	70	995	995	995	995	0	0	0	0	0	0	0	0	73	73	0	0	15	0	3	0	0	(NOTE 1)	(NOTE 1)	(NOTE 1)	0	0	0	73	400 (NOTE 7)	(NOTE 8)
ClO_4	mg/L	23	23	90	90	271	271	1,400	3,373	3,373	3,373	321	321	321	321	–	–	–	–	–	–	–	–	3,373	3,373	–	–	11,000	–	3,373	–	–	–	–	–	–	–	–	3,373	39,700	–
ClO_3	mg/L	35	35	130	130	386	386	3,200	5,008	5,008	5,008	473	473	473	473	–	–	–	–	–	–	–	–	5,008	5,008	–	–	12,000	–	5,008	–	–	–	–	–	–	–	–	5,008	325	–
NO_3–N	mg/L	6	6	17	17	46	46	42	97	97	97	22	22	22	22	–	–	–	–	–	–	–	–	97	97	–	–	310	–	97	–	–	–	–	–	–	–	–	97	115	–
TDS	mg/L	–	–	–	–	–	–	–	–	–	–	6,400	6,400	6,400	6,400	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	106,700	–

GENERAL NOTES:

1. OPERATED ONLY WHEN CARBON ADSORBERS ARE BACKWASHED.
2. UNLESS STATED OTHERWISE, FLOWS ARE AVERAGE MAXIMUM FLOWS.
3. SYSTEM DESIGNED FOR A MAXIMUM HYDRAULIC FLOW OF 1,000 GALLONS PER MINUTE
4. SYSTEM 30 DAY AVERAGE MAXIMUM FLOW = 1,000 GPM
5. SYSTEM DESIGN AVERAGE ANNUAL FLOW = 950 GPM
6. APPROXIMATE GW–11 COMPOSITION BASED ON: (1) ADDITION OF AP–5 WATER AT A RATE OF 50,000 GALLONS PER WEEK UNTIL 1.6 MILLION GALLONS HAVE BEEN TRANSFERRED; (2) MAINTAINING AN APPROXIMATE GW–11 VOLUME OF 25 MILLION GALLONS VIA STABILIZED LAKE MEAD WATER ADDITION.
7. FLOW DURING TRANSFER ASSUMES DILUTION OF 1 PART AP–5 WATER WITH 2 PARTS STABILIZED LAKE MEAD WATER.
8. AS NEEDED TO MAINTAIN GW–11 VOLUME.

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3	11–15–13	RECORD DRAWING – REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
2	9–26–06	RECORD DRAWING	DM	RL
1	5–23–06	ADD GW–11 REFILL FROM LAKE MEAD WATER, REV 88, ADD 89 NOTES 7 & 8	RL	RL
0	12–27–05	ISSUED FOR CONSTRUCTION	RL	RL

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SHEET 1 OF 1
DRAWING #: 1373-PFD02
FILE #: 1373–PFD02–3

NERT
HENDERSON, NV

PROCESS FLOW DIAGRAM
EXISTING WELL & EQUALIZATION SYSTEM

U.S. PATENTS 5750028, 5788842, 6706521 AND PATENTS PENDING.

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DRAWING # 1373-PID-LA
SHEET 1 OF 1
FILE #

PIPING SYMBOLS

- PRIMARY PROCESS FLOW PATH
- SECONDARY FLOW PATH
- HEAT TRACE
- INSULATED PIPELINE
- SKID LIMIT
- PAGE CONTINUATION: XX= SEQUENCE, YY= SERVICE, ZZ= SHEET NO.

INSTRUMENT LINE SYMBOLS

- PNEUMATIC SIGNAL
- ELECTRIC SIGNAL
- UNDEFINED SIGNAL
- INTERNAL SYSTEM LINK SOFTWARE OR DATA
- CAPILLARY TUBE

VALVE ACTUATOR SYMBOLS

(NO SYMBOL) = MANUAL FOR ON-OFF SERVICE

- HANDWHEEL (MANUAL OVERRIDE)
- ELECTRIC
- SOLENOID (WITHOUT) / (WITH) = MANUAL
- DIAPHRAGM - AIR TO AIR (WITHOUT) / (WITH) = POSITIONER
- DIAPHRAGM & SPRING: SPRING TO OPEN (WITHOUT) / SPRING TO CLOSE (WITH) = POSITIONER
- DOUBLE-ACTING CYLINDER (WITHOUT) / (WITH) = POSITIONER
- CYLINDER & SPRING: SPRING TO OPEN / SPRING TO CLOSE

SYMBOLS FOR VALVE ACTION IN THE EVENT OF ACTUATOR POWER FAILURE.

FO — SYMBOL LOCATED BY VALVE-USED ONLY WHERE NECESSARY TO INCREASE UNDERSTANDING OF THE SYSTEM.

FO = FAIL OPEN
FC = FAIL CLOSED
FL = FAIL LOCKED
FI = FAIL INDETERMINATE (LAST POSITION)
F = USED WITH 3 WAY & 4 WAY VALVE- ARROWS SHOW PATHS OPEN TO FLOW ON POWER FAILURE.

PRIME MOVERS FOR MOTOR DRIVEN EQUIPMENT

- ELECTRIC MOTOR
- PNEUMATIC ROTARY MOTOR

SYMBOLS FOR SELF-ACTUATED REGULATORS

- SELF CONTAINED
- EXTERNAL TAP
- PRESSURE REDUCING REGULATOR
- BACK PRESSURE REGULATOR
- DIFFERENTIAL PRESSURE REDUCING REGULATOR- SHOWN WITH INTERNAL AND EXTERNAL PRESSURE TAPS.
- PRESSURE RELIEF
- VACUUM RELIEF
- RUPTURE DISC OR SAFETY HEAD
- ANGLE
- STRAIGHT
- PRESSURE RELIEF
- ANGLE
- STRAIGHT WITH WELL
- VACUUM RELIEF
- PRESSURE VACUUM RELIEF
- TEMPERATURE REGULATOR FILLED SYSTEM
- LEVEL REGULATOR, FLOAT OPERATED MECHANICAL LINKAGE
- CONTINUOUS DRAINER BALL FLOAT TYPE
- TANK
- WITH EQUALIZING CONNECTION
- TRAPS

HEAT EXCHANGER SYMBOLS

- SHELL & TUBE HEAT EXCHANGER
- ELECTRICAL HEATING ELEMENT
- AIR COOLED HEAT EXCHANGER
- HEAT EXCHANGER GENERAL
- DIRECT CONTACT JET MIXER

MOTOR DRIVEN EQUIPMENT

- CENTRIFUGAL PUMP
- ROTARY BLOWER
- FAN / BLOWER
- VERTICAL CENTRIFUGAL PUMP
- VERTICAL TURBINE
- SUBMERSIBLE PUMP
- CHEMICAL FEED PUMP
- PERISTALTIC PUMP
- DIAPHRAGM CHEMICAL FEED PUMP-WITH INTERNAL RELIEF VALVE
- PROGRESSIVE CAVITY PUMP
- DIAPHRAGM PUMP (PNEUMATIC OPERATION)
- LIQUID RING VACUUM PUMP
- AGITATOR OR MIXER

PIPE LINE DESIGNATION

6"-WW-S04P80-001-HT&I or N

- NO HEAT TRACE OR INSULATION
- INSULATION
- HEAT TRACE (ELECTRIC)
- LINE NO.
- PIPING SPECIFICATION (MATERIAL,TYPE, SCHEDULE/THICKNESS)
- SERVICE
- SIZE

PIPELINE VENTS & DRAINS ARE 3/4" BALL VALVES UNLESS OTHERWISE NOTED (NO TAG NO. ASSIGNED)

PIPING ACCESSORIES AND DETAILS

- AIR FILTER
- STEAM TRAP
- Y STRAINER
- CONE STRAINER
- SCREEN STRAINER OR STATIC MIXER
- MIXING SECTION
- EJECTOR
- BACKFLOW PREVENTER
- SPRAY NOZZLE OR SPARGER
- CHEMICAL SEAL
- EXPANSION JOINT
- FLEX HOSE
- STRAIGHTENING VANES
- FILTER
- SCOPE LIMITS
- INSTRUMENT TAG
- FLOW METER
- THERMOWELL
- SIMPLEX BASKET STRAINER
- DUPLEX BASKET STRAINER
- MIST ELIMINATOR
- PULSATION DAMPER
- SIGHT GLASS
- SPECTACLE BLIND
- RESTRICTION ORIFICE
- INSULATED FLANGE OR DIELECTRIC UNION
- QUICK DISCONNECT ASSEMBLY
- SUMP/DRAIN
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER FLAT ON TOP
- ECCENTRIC REDUCER FLAT ON BOTTOM
- ORIFICE FLANGE
- INTAKE/EXHAUST MUFFLER

MATERIAL

BRZ - BRASS/BRONZE
CIR - CAST IRON
CST - CARBON STEEL
CPR - COPPER
FRP - FIBERGLASS
GCS - GALVANIZED CARBON STEEL
LCS - LINED CARBON STEEL
TEF - TEFLON
CVC - CHLORINATED POLYVINYL CHLORIDE
PET - POLYETHYLENE
POP - POLYPROPYLENE
PVC - POLYVINYL CHLORIDE
RUB - RUBBER
S04 - 304 STAINLESS STEEL
S4L - 304L STAINLESS STEEL
S16 - 316 STAINLESS STEEL
S6L - 316L STAINLESS STEEL
VIT - VITON

TYPE

D = DUCT P = PIPE
H = HOSE T = TUBE

VALVE SYMBOLS

- GATE
- GLOBE
- BALL
- PLUG
- 3 WAY PLUG
- BUTTERFLY
- CHECK
- DIAPHRAGM
- PINCH
- NEEDLE
- 3 WAY
- 4 WAY
- ANGLE
- KNIFE GATE
- WEIGHTED RELIEF
- VALVE (UNDEFINED TYPE)
- DAMPER

TANK ACCESSORIES

- MANHOLE/ACCESS
- COUPLING (HALF OR FULL)
- FLANGED NOZZLE
- INSULATION
- FLAME ARRESTOR

PIPING SERVICE MATERIAL DESIGNATIONS

SERVICE	SERVICE DESIGNATION	PIPING MATERIAL SPECIFICATION	MATERIAL OF CONSTRUCTION
BLOWER AIR	BA	S04P10	304 ST STL
SERVICE AIR	CA	CSTP40	CARBON STEEL
ELECTRON DONOR	ED	S04P10	304 ST STL
FERRIC CHLORIDE	FC	CVCP80	CPVC
INSTRUMENT AIR	IA	CSTP40	CARBON STEEL
NUTRIENT	NU	CVCP80/POPT	CPVC/POLYPRO
POLYMER	P	CVCP80	CPVC
SODIUM HYDROXIDE (CAUSTIC)	SH	CVCP80/POPT	CPVC/POLYPRO
SLUDGE	SL	CVCP80	CPVC
SERVICE WATER	SW	CVCP80	CPVC
TREATED WATER	TW	CVCP80	CPVC
WASTE WATER	WW	CVCP80/CPVCP40/FRPP	CPVC/FRP
PROCESS AIR	PA	CVCP80	CPVC
OXYGEN	02	S04P80 / S04T	304 ST STL

GENERAL NOTES:

1. FOR INSTRUMENTATION SYMBOLS, AND LIST OF RELAY FUNCTIONS. SEE SHAW DRAWING NO. PID-LB (SHEET 2 OF 2).

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2	9-26-06	RECORD DRAWING	DM	RL
1	12-27-05	ISSUED FOR CONSTRUCTION	RL	RL

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REVISION: 2

NERT
HENDERSON, NV

PIPING & INSTRUMENTATION DIAGRAM
LEGEND SHEET
SHEET 1 OF 2

SHEET 1 OF 2
DRAWING # 1373-PID-LA
FILE # 1373-PID-LA-2

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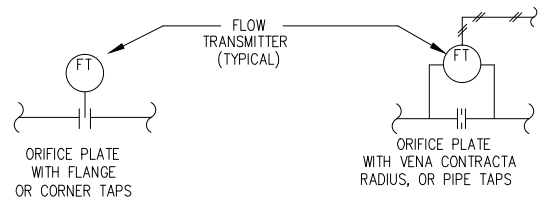
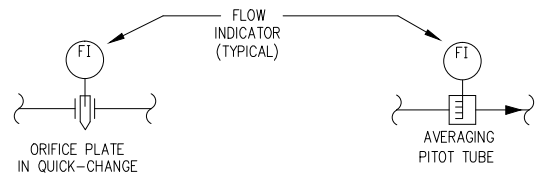
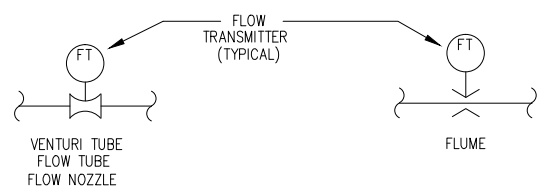
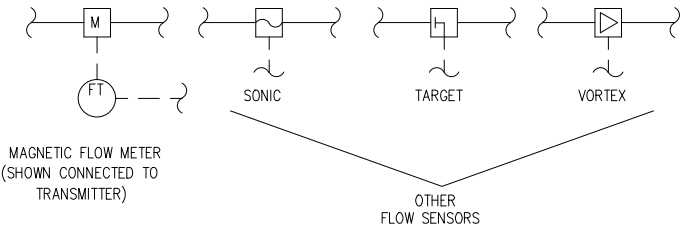
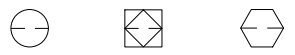
SYMBOLS FOR FLOW MEASUREMENT











(1) (2) (MAIN) (AUX.)

TYPICAL SYMBOLS FOR BEHIND-THE-PANEL INSTRUMENT OR NORMALLY INACCESSIBLE FUNCTION.

SYMBOL FOR PANEL MOUNTED INSTRUMENTS MAY HAVE PANEL DESIGNATION. IF PROJECT HAS A NUMBER OF PANELS.

INSTRUMENT FOR MULTIPLE SERVICE OR MULTIPLE FUNCTIONS SHALL BE REPRESENTED BY TWO OR MORE TANGENT CIRCLES.

MISCELLANEOUS SYMBOLS


INTEGRAL


EXPONENTIAL


NON LINEAR OR UNSPECIFIED FUNCTION


TIME FUNCTION


HIGH SELECTING


LOW SELECTING

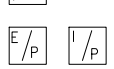

ROOT EXTRACTION


REVERSE


DERIVATIVE

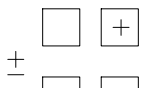

ANALOG DIGITAL

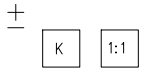

DIGITAL ANALOG


CONVERT SIGNAL FORM (TYPICAL EXAMPLES)

E = VOLTAGE
H = HYDRAULIC
I = CURRENT
O = ELECTROMAGNATIC OR SONIC
P = PNEUMATIC
R = RESISTANCE (ELECTRICAL)


REVERSE PROPORTIONAL


BIAS


PROPORTIONAL

NOTE: THE SQUARE MAY BE USED AS A FLAG.


HAND-OFF-AUTO

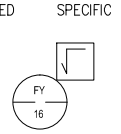

REVERSE ACTION


PURGE OR FLUSHING DEVICE


RESET FOR LATCH – TYPE ACTUATOR


INTERLOCKING FUNCTIONS

GENERALIZED SPECIFIC


(TYPICAL EXAMPLE SHOWS SQUARE ROOT EXTRACTOR IN FLOW LOOP.)

INSTRUMENT IDENTIFICATION LETTERS

FIRST LETTER		SUCCEEDING LETTERS		
MEASURE OR INIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A = ANALYSIS		ALARM		
B = BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C = USER'S CHOICE			CONTROL	
D = USER'S CHOICE	DIFFERENTIAL			
E = VOLTAGE		SENSOR (PRIMARY ELEMENT)		
F = FLOW RATE	RATIO (FRACTION)			
G = USER'S CHOICE		GLASS, VIEWING DEVICE		
H = HAND				HIGH
I = CURRENT (ELECTRICAL)		INDICATE		
J = POWER	SCAN			
K = TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L = LEVEL		LIGHT		LOW
M = USER'S CHOICE	MOMENTARY			MIDDLE, INTERMEDIATE
N = USER'S CHOICE		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
O = USER'S CHOICE		ORIFICE, RESTRICTION		
P = PRESSURE, VACUUM		POINT (TEST) CONNECTION		
Q = QUANTITY	INTERGRATE, TOTALIZE			
R = RADIATION		RECORD		
S = SPEED, FREQUENCY	SAFETY		SWITCH	
T = TEMPERATURE			TRANSMIT	
U = MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V = VIBRATION, MECH. ANALYSIS			VALVE, DAMPER, LOUVER	
W = WEIGHT, FORCE		WELL		
X = UNCLASSIFIED	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y = EVENT. STATE OR PRESENCE	Y AXIS		RELAY, COMPUTE, CONVERT	
Z = POSITION, DIMENSION	Z AXIS		DRIVE, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	

NOTES:
1. ANY FIRST LETTER COMBINED WITH MODIFIER REPRESENTS A NEW AND SEPARATE MEASURED VARIABLE.
   EXAMPLES: PD = DIFFERENTIAL PRESSURE FQ = TOTALIZED OR INTEGRATED FLOW.
   EXCEPTION IS THE MODIFIER "J" FOR MULTIPOINT SCANNING.
2. FOR ANALYSIS NOT IDENTIFIED BY A SPECIFIC LETTER IN THE TABLE, USE FIRST LETTER "A" NEAR THE INSTRUMENT SYMBOL, SPECIFY THE NATURE OF THE ANALYSIS. EXAMPLE: PH
3. MEANING OF A "USER CHOICE" LETTER SHALL BE CONSISTENT THROUGHOUT A PROJECT, AND SHALL BE SPECIFIED IN THE DRAWING LEGEND.
4. UNCLASSIFED LETTER MAY HAVE A FEW DIFFERENT MEANINGS ON A PROJECT, THE MEANING SHALL BE SPECIFIED NEAR EACH INSTRUMENT SYMBOL USING THE UNCLASSIFIED LETTER.
5. THE MODIFIER "SCAN" APPLIES TO MULTIPOINT PRINTING INSTRUMENTS, SUCH AS CJRS (MULTIPOINT CONDUCTIVITY RECORDER WITH ALARM SWITCHES).

INSTRUMENT SYMBOLS

	PRIMARY CONTROL PANEL NORMALLY ACCESSIBLE TO OPERATOR	FIELD MOUNTED	AUXILIARY PANEL OR RACK NORMALLY ACCESSIBLE TO OPERATOR
DISCRETE INSTRUMENTS			
SHARED DISPLAY, SHARED CONTROL			
COMPUTER FUNCTION INCLUDING DISTRIB. CNTL. SYS.			
PROGRAMMABLE LOGIC CONTROLLER FUNCTION			

GENERAL NOTES:

1. FOR MECHANICAL SYMBOLS AND ADDITIONAL NOTES. SEE SHAW DRAWING NO. PID-LA (SHEET 1 OF 2)

THIS IS A STANDARD PROCEDURE DRAWING, AND MAY NOT BE REVISED TO SUIT ANY PARTICULAR PROJECT OR CUSTOMER.

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1	12-27-05	ISSUED FOR CONSTRUCTION	RL	RL

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SHEET 2 OF 2
DRAWING #: 1373-PID-LB
FILE #: 1373-PID-LA-2

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PIPING & INSTRUMENTATION DIAGRAM
LEGEND SHEET

SHEET 2 OF 2

LAST EDITED: 11/14/13 BY: DLEICH NETWORK PATH: G:\ENGRNG\1373-101 RONOX SERVICE\V4.0 TECHNICAL\V4.4 DRAWINGS\PID\2013 RECORD DRAWINGS

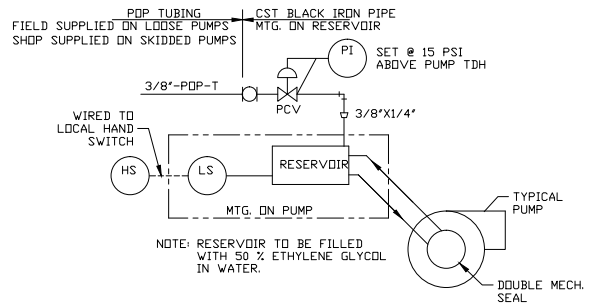
FLUID BED PERCHLORATE TREATMENT SYSTEM
PROCESS & INSTRUMENTATION DIAGRAM NOTES

DRAWING # 1373-PID-N1
SHEET 1 OF 1
FILE #

GENERAL NOTES:

1. ALL PRESSURE GAUGES IN PROCESS WATER LINES INCLUDE CPVC ISOLATION DIAPHRAGMS W/ SILICONE FILL BETWEEN GAUGE AND PROCESS CONNECTION.

2A. FRP PUMPS (OTHER THAN FBR FLUIDIZATION PUMPS) INCLUDE DOUBLE MECHANICAL SEAL WITH SELF-CONTAINED SEAL FLUID SYSTEM.



TYPICAL SEAL FLUSH ASSEMBLY

2B. FBR FLUIDIZATION PUMPS ARE PROVIDED WITH SINGLE MECHANICAL SEALS WITH SERVICE WATER FLUSH.

3. ALL OUTDOOR PIPING THAT IS 2" OR SMALLER AND SUSCEPTIBLE TO FREEZING SHALL BE INSULATED. INSULATION SHALL NOT BE APPLIED TO SELF DRAINING LINES. PIPE LINES SMALLER THAN 2" AND SUSCEPTIBLE TO FREEZING SHALL BE HEAT TRACED AND INSULATED. CONTRACT DRAWINGS TAKE PRECEDENCE OVER THESE GUIDE LINES.

4. FBR PRESSURE SWITCHES ARE SET AT STATIC PRESSURE +2.0 PSI.

5. AN "FBR SYSTEM SHUTDOWN" CONDITION CAUSES THE FOLLOWING ACTION IN THE CORRESPONDING FBR:
   - FBR FEED SHUTDOWN – FEED VALVE CLOSES AND FLOW PROPORTIONALITY FACTOR VALUE REVERTS TO ZERO.
   - FLUIDIZATION VALVE CLOSES
   - FLUIDIZATION PUMP SHUTS DOWN
   - ALL CHEMICAL FEEDS TO CORRESPONDING FBR ARE SHUTDOWN
   - SIGNAL EQUALIZATION CONTROLS TO STOP EQUALIZED FEED FLOW
   - SYSTEM DIAL OUT TO OPERATOR (TELEPHONE/BEEPER)

6. AN "FBR FEED SHUTDOWN" CONDITION CAUSES THE FOLLOWING ACTION IN THE CORRESPONDING FBR:
   - FBR FEED SHUTDOWN
   - ELECTRON DONOR AND NUTRIENT FEED TO THE CORRESPONDING FBR ARE SHUTDOWN (PH SOLUTION FEED IS MAINTAINED)
   - FLOW IS BALANCED AMONG REMAINING OPERATING FBRs. AN "FBR FEED SHUTDOWN" CONDITION FOR MORE THAN 1 FBR CAUSES A "SYSTEM FEED SHUTDOWN"
   - SYSTEM DIAL OUT TO OPERATOR (TELEPHONE/BEEPER)

7. IN A "SYSTEM FEED SHUTDOWN" CONDITION THE FEED FLOW CONTROL VALVES IN THE 1ST STAGE FBRs ARE CLOSED, AND THE 1ST STAGE FEED PROPORTIONALITY FACTORS REVERT TO ZERO.

8. HIGH POINT (H.P.) VENTS AND LOW POINT (L.P.) DRAINS FOR PIPING WILL BE SHOWN AS REQUIRED ON PIPE ROUTING DRAWINGS.

INTERLOCK NOTES

I11, I31, 407 — LOW FBR FLUIDIZATION PRESSURE ALARM CAUSES A CORRESPONDING FBR SYSTEM SHUTDOWN. AT STARTUP, FBR FEED FLOW VALVE (FV-1011, 1012, ETC.) OPENS AFTER ASSOCIATED PRESSURE SWITCH DETECTS SUFFICIENT POSITIVE PRESSURE AT INLET TO CORRESPONDING FBR.

I12 — IN AUTO MODE, FIRST STAGE FBRs FLOW CONTROL SET POINT IS CALCULATED BY THE SYSTEM AS FOLLOWS:

1. TOTAL SYSTEM FLOW MAY BE MANUALLY SET OR MAY BE CALCULATED BASED ON THE FEED EQUALIZATION TANK LEVEL.

$$\text{TOTAL SYSTEM FLOW} = FT = FMIN + \frac{(FMAX - FMIN)(L - LL)}{(LH - LL)}$$

WHERE FMIN = MINIMUM SYSTEM FLOW – 200 GPM DEFAULT
FMAX= MAXIMUM SYSTEM FLOW – 1000 GPM DEFAULT
L = ACTUAL EQUALIZATION TANK LEVEL (%)
LL = EQUALIZATION TANK LOW CONTROL LEVEL SET POINT
LH = EQUALIZATION TANK HIGH CONTROL LEVEL SET POINT

2. EACH 1ST STAGE FBR(1,2,3, 4 & A) IS ASSIGNED AN OPERATOR ADJUSTED FLOW PROPORTION FACTOR(0–100). THE FEED FLOW CONTROL SET POINT IS CALCULATED,

$$Fi = FT * (FPFi/\Sigma\ FPF)$$

WHERE Fi = FBR FEED FLOW CONTROL SET POINT FOR FBRi, i = 1,2,3,4, or A.
FPFi = FLOW PROPORTION FACTOR FOR FBRi, i = 1,2,3,4, or A
Σ FPF= SUM OF THE 1ST STAGE PROPORTIONALITY FACTORS FOR ALL OPERATING 1ST STAGE FBRs.
A FEED SHUTDOWN IN ANY FIRST STAGE FBR WILL CAUSE THE ASSOCIATED FLOW PROPORTION FACTOR TO REVERT TO 0.

I13, I33 , 405 — HIGH OR LOW PH CAUSES A FBR FEED SHUTDOWN.

I14, I34 , 406 — LOW FBR FLUIDIZATION FLOW ALARM CAUSES A CORRESPONDING FBR SYSTEM SHUTDOWN. AT STARTUP CORRESPONDING FLUIDIZATION PUMP LOW FLOW ALARM IS DELAYED BY AN APPROPRIATE TIME VALUE.

I15, I35 — HIGH ORP CAUSES A FEED SHUTDOWN IN THE CORRESPONDING FBR.

I16, I36 — LOW FEED FLOW CAUSES A FEED SHUTDOWN IN CORRESPONDING FBR.

I17 — HIGH CONDUCTIVITY STOP P-103 IF RUNNING.

I21, I37 — HIGH LEVEL IN SEPARATOR CAUSES A FEED SHUTDOWN IN CORRESPONDING FBRS.

I22, I30 — SEPARATOR MEDIA RETURN CYCLE INCLUDES OPERATOR ADJUSTABLE FREQUENCY AND BACKFLUSH, FORWARD FLUSH AND TRANSFER TIME DURATIONS.

I23, I38 — SEPARATOR TANKS' LEVEL CONTROLLERS SET TANK OUTLET CONTROL VALVES' POSITIONS PROPORTIONATELY BASED ON ASSOCIATED TANK LEVEL.

I24, I39, 404 — FBR PUMP SEAL WATER SOLENOIDS ARE INTERLOCKED WITH CORRESPONDING PUMP MOTOR STARTER.

I32 — AUTOMATIC FLOW CONTROL MAY BE USED TO CONTROL THE RELATIVE FLOWS TO FBRS 5, 6, 7, AND 8. IN AUTOMATIC FLOW CONTROL MODE, THE RELATIVE FLOWS TO THE FBRS WILL BE SET BY OPERATOR ADJUSTABLE FLOW PROPORTIONAL FACTORS (0–100).

I41 — HIGH LEVEL IN AERATION TANK CAUSES A SYSTEM FEED SHUTDOWN.

I42 — HIGH H_2S ALARM OR AERATION BLOWER LOW DISCHARGE PRESSURE ALARM CAUSES SYSTEM DIAL OUT TO OPERATOR (TELEPHONE/BEEPER) AND A FBR SYSTEM FEED SHUTDOWN.

I43 — STOP FERRIC CHLORIDE FEED ON HIGH SULFIDE.

I44 — DIAL OUT ALARM ON HIGH–HIGH SULFIDE.

I51 — LOW LEVEL IN DAF PRESSURE TANKS CAUSES CORRESPONDING PRESSURE TANK VENT SOLENOID VALVE TO OPEN FOR OPERATOR ADJUSTABLE DURATION.

I52 — HIGH LEVEL IN DAF FLOAT COMPARTMENT CAUSES THE DAF FLOAT PUMP TO START TIMED SEQUENCE.

I53 — LOW FLOW IN DAF RECYCLE STOPS CORRESPONDING DAF PRESSURE PUMP

I61 — LOW LEVEL IN EFFLUENT TANK CAUSES SHUTDOWN OF OPERATING EFFLUENT PUMP.

I62 — HIGH LEVEL IN EFFLUENT TANK CAUSES A SYSTEM FEED SHUTDOWN.

I63 — HIGH–HIGH THICKENER SCRAPER TORQUE CAUSES THE SCRAPER DRIVE TO SHUTDOWN.

I64 — EFFLUENT BOOSTER PUMPS START, STOP AND VARY SPEED BASED ON UV EFFLUENT TANK LEVEL LC-621.

I71 — LOW NUTRIENT FLOW ALARM SIGNAL CAUSES A FEED SHUTDOWN IN THE CORRESPONDING FBR.

I72 — CONDITIONING TANK SEQUENCE CONTROLLER, KC-751 CONTROLS FERRIC CHLORIDE FEED VALVE OPEN DURATION TIME, AND INITIATES LIME FEED SEQUENCE.

I73 — TANK T-703 CONTAINMENT LEAK DETECTION CAUSES ELECTRON DONOR BOOSTER PUMP TO SHUTDOWN AND CAUSES A SYSTEM FEED SHUTDOWN.

I74 — SOLENOID VALVE ENERGIZES TO OPEN IF EITHER ELECTRON DONOR BOOSTER PUMP IS ON.

I75 — LOSS OF FERRIC CHLORIDE FLOW ALARMS, CAUSES A SYSTEM DIAL OUT ALARM AND STARTS THE ALTERNATE PUMP.

I76 — LOSS OF PEROXIDE FLOW (IF CALLED FOR) ALARMS, CAUSES A SYSTEM DIAL OUT ALARM AND STARTS THE ALTERNATE PUMP.

I77 — LOSS OF DEFOAM FLOW ALARMS, CAUSES A SYSTEM DIAL OUT ALARM AND STARTS THE ALTERNATE PUMP.

I81 — LOW INSTRUMENT AIR PRESSURE CAUSES A SYSTEM SHUTDOWN.

I91 — CONDITIONING TANK MIXER IS DISABLED WHEN TANK LEVEL IS BELOW LOW LEVEL.

I92 — LOW LEVEL IN FILTRATE TANK DISABLES AUTOMATIC OPERATION OF FILTRATE RECYCLE PUMP.

I93 — HIGH HIGH LEVEL IN FILTRATE TANK DISABLES PRESS FEED PUMPS.

I94 — HIGH CONDITIONING TANK LEVEL SHUTS DOWN SLUDGE PUMP P-1601.

I95 — DISABLE OXYGEN FLOW TO EFFLUENT WHEN BOOSTER PUMP SPEED IS BELOW AN OPERATOR ADJUSTABLE SET POINT.

I96 — LOW LEVEL IN UV EFFLUENT TANK CAUSES SHUTDOWN OF OPERATING EFFLUENT BOOSTER PUMP.

I97 — HIGH LEVEL IN UV EFFLUENT TANK CAUSES A SYSTEM FEED SHUT DOWN.

408 — HIGH HIGH PRESSURE IN THE CONTINUOUS SAND FILTER CAUSES A SYSTEM SHUTDOWN.

413 — OXYGEN FEED TO THE SLUDGE STORAGE TANK IS ENABLED WHEN THE SLUDGE PUMP IS RUNNING.

414 — A LOW FILTER BASIN LEVEL SIGNAL IS GENERATED WHEN LSL-1702 IS DE-ENERGIZED. A LOW FILTER BASIN LEVEL CAUSES FILTER AIR FLOW TO STOP.

415 — LOW LEVEL IN THE FILTER REJECT SUMP CAUSES SHUTDOWN OF P-1701 A/B.

416 — HIGH LEVEL IN THE FILTER REJECT SUMP CAUSES A SYSTEM FEED SHUTDOWN.

419 — LOW PHOSPHORIC ACID FLOW ALARM SIGNAL CAUSES AN FBR FEED SHUTDOWN, WHEN TREATING WATER FROM AP-5.

421 — A HIGH FILTER FEED PRESSURE IS AN INDICATION THAT THE FILTER IS DIRTY. WHEN PS-1702 IS ACTIVATED, THE FILTER AIR BURST LINES WILL OPEN TO INCREASE THE FILTER CLEANING OPERATION.

422 — A LOW-LOW LEVEL IN THE SLUDGE STORAGE TANK CAUSES SHUTDOWN OF THE SLUDGE PUMP P-1601.

423 — A HIGH FLOW ALARM IS CAUSED WHEN THE OUTPUT TO THE pH FEED PUMP P-71A IS GREATER THAN THE OPERATOR ADJUSTABLE HIGH FLOW SET POINT FOR A LONGER DURATION THEN THE OPERATOR ADJUSTABLE TIME SET POINT.

424 — A LOW LEVEL IN THE SLUDGE STORAGE TANK CLOSES THE OXYGEN FEED VALVE, FV-1602.

425 — A HIGH LEVEL IN THE SLUDGE STORAGE TANK CAUSES THE THICKNER UNDERFLOW PUMP SHUTDOWN.

426 — A FLOW DISCORDANCE ALARM IS CAUSED BY A FLOW OR NON-FLOW CONDITION THAT IS INCORRECT FOR THE APPLICABLE OPERATING MODE.

NOTES:

1. INTERLOCKS SHOWN IN GREY ARE NO LONGER USED BUT ARE PHYSICALLY IN PLACE.
2. A REVISION CLOUD INDICATES NEW/NON-EXISTENT EQUIPMENT.
3. PID SHEETS 10A, 10B & 10C HAVE ADDITIONAL INTERLOCK NOTES LISTED ON THEM.

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REVISION: 3
SHEET 1 OF 1
DRAWING # 1373-PID-N1
FILE # 1373-PID-N1-3

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HENDERSON, NV

PIPING & INSTRUMENTATION DIAGRAM, NOTES
FLUIDIZED BED PERCHLORATE
TREATMENT SYSTEM

LAST EDITED: 11/14/13 BY: DLEECH NETWORK PATH: G:\ENGRING\1373-101 THONOX SERVICE\V4.0 TECHNICAL\V4.4 DRAWINGS\PID\2013 RECORD DRAWINGS

U.S. PATENTS 5750028, 5788842, 6706521 AND PATENTS PENDING.

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FLUIDIZATION PUMP SKID 1-2

P-1011

P-101A

P-1012

P-1021

P-1022

FBR-1

FBR-2

SEE NOTE #2B FOR PUMP SEAL WATER PIPING

BIOMASS SEPARATOR CONTROL ASSY

BIOMASS SEPARATOR CONTROL ASSY

FBR-1, 2 FIRST STAGE FLUIDIZED BED REACTORS	P-1011,1012,101A FIRST STAGE FBR FLUIDIZATION PUMPS	P-1021,22 BED HEIGHT CONTROL PUMPS
SIZE: 14' DIA. X 30' STR. MAT'LS: FRP CAPACITY: 33,000 GAL MEDIA TYPE: SAND MEDIA VOLUME: 2,010 CU. FT.	TYPE: CENTRIFUGAL CAPACITY: 2,000 GPM @ 40'TDH WETTED MAT'L: FRP MOTOR: 30 HP,460 VAC, 3PH MODEL:	TYPE: ELECTRIC DIAPHRAGM CAPACITY: 40 GPM @ 40'TDH WETTED MAT'L: PVC, NEOPRENE MOTOR: 2 HP,460 VAC, 3 PH MODEL: PENN VALLEY 3" DOUBLE DISC.

REV	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
4	11-15-13	RECORD DRAWING – REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
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DRAWING # 1373-PID01A
FILE # 1373-PID01A-3

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PIPING & INSTRUMENTATION DIAGRAM
FLUIDIZED BED PERCHLORATE
TREATMENT SYSTEM

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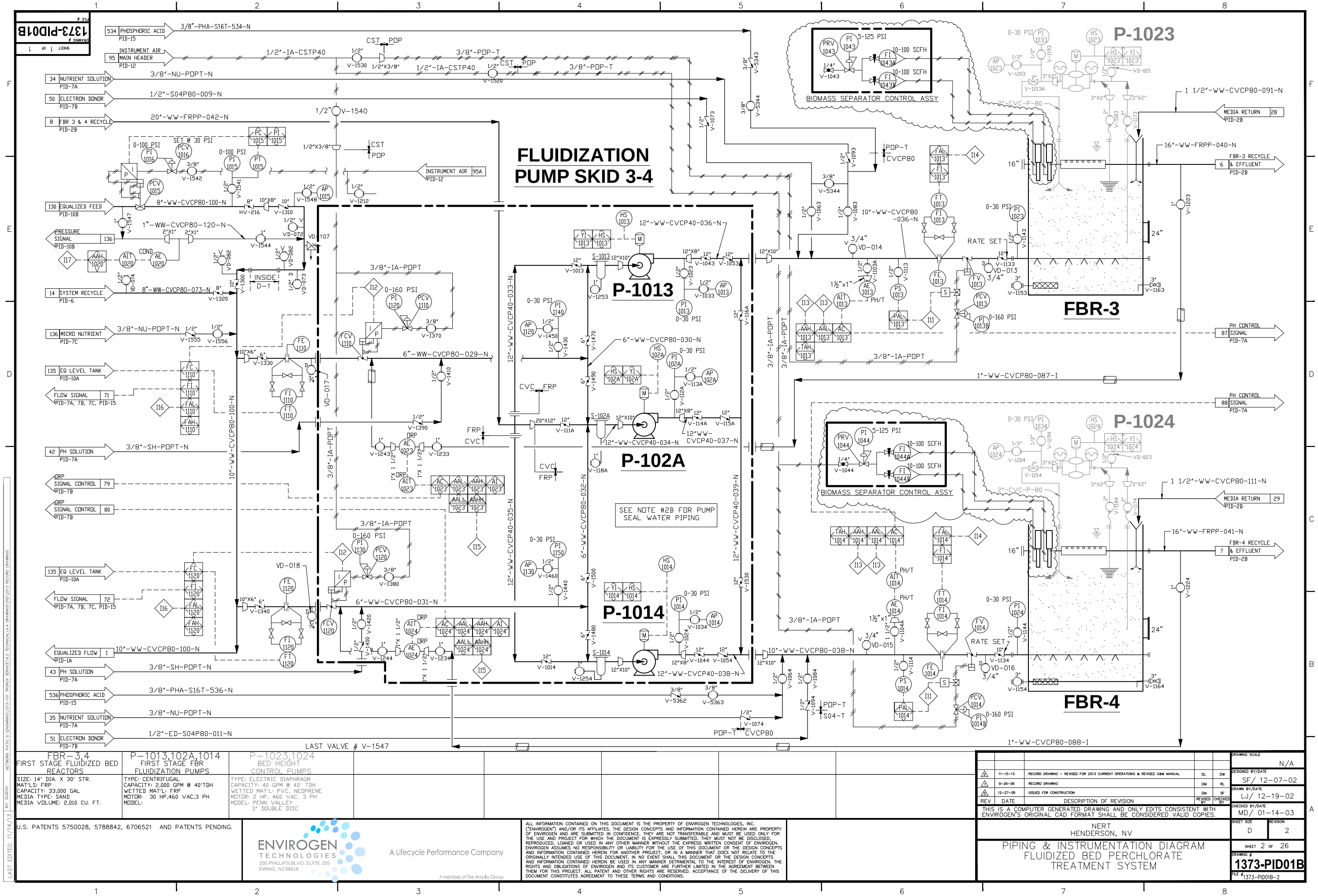

FBR-3,4 FIRST STAGE FLUIDIZED BED REACTORS	P-1013,102A,1014 FIRST STAGE FBR FLUIDIZATION PUMPS	P-1023,1024 BED HEIGHT CONTROL PUMPS
SIZE: 14' DIA. X 30' STR. MAT'LS: FRP CAPACITY: 33,000 GAL. MEDIA TYPE: SAND MEDIA VOLUME: 2,010 CU. FT.	TYPE: CENTRIFUGAL CAPACITY: 2,000 GPM @ 40'TDH WETTED MAT'L: FRP MOTOR: 30 HP,460 VAC,3 PH MODEL:	TYPE: ELECTRIC DIAPHRAGM CAPACITY: 40 GPM @ 40' TDH WETTED MAT'L: PVC, NEOPRENE MOTOR: 2 HP, 460 VAC, 3 PH MODEL: PENN VALLEY 3" DOUBLE DISC

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DRAWING # 1373-PID01B
FILE # 1373-PID01B-2

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PIPING & INSTRUMENTATION DIAGRAM
FLUIDIZED BED PERCHLORATE
TREATMENT SYSTEM

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1373-PID02A

SHEET 1 OF 1

INSTRUMENT AIR 97 MAIN HEADER PID-12
1/2"-IA-CSTP40-100-N
CST POP
1/2" V-2121
3/8"-IA-POPT
3/8" V-2121
FI 2011 0-1 SCFH
LIT 2011
LE 2011
1/2" V-2091
1/2"X3/8"
CST POP
1/2" V-2081
CST POP
1/2"X3/8"
3/8"-IA-POPT
I21
LAH 2011
LAL 2011
LI 2011
LC 2011
0-160 PSI
PI 2011
I23
3/8"-IA-POPT
PCV 2011
I P
LCV 2011
20"x10"
FBR 1 & 2 EFFLUENT 5 PID-3A
10"-WW-CVCP80-014-N
20"-WW-FRPP-013-N
4 FBR 1 & 2 RECYCLE PID-1A
MEDIA RETURN FBR-1 24 PID-1A
1 1/2"-WW-CVCP80-081-N
MEDIA RETURN FBR-2 25 PID-1A
1 1/2"-WW-CVCP80-110-N
1/2" VD-009
1 1/2" V-2071
1 1/2" V-2061
16"-WW-FRPP-011-N
FBR-1 RECYCLE & EFFLUENT 2 PID-1A
108 SERVICE WATER PID-11
1 1/2"-SW-CVCP80-001-N
1 1/2" V-2041
1 1/2" V-2051
1 1/2"X1"
1"-SW-CVCP80-001-N
0-160 PSI
PCV 2021
PI 2021
3/8" V-2131
16"-WW-FRPP-012-N
FBR-2 RECYCLE & EFFLUENT 3 PID-1A
HS 2011
M
FV 2021
S
1"
1 1/2" V-5404
FBR HOSE STATION CATWALK
1" V-5405
1 1/2"X 1"
1 1/2"-SW-CVCP80-545-N
1 1/2"X 1/2"
1/2" V-5406
1 1/2"-WW-CVCP80-080-N
1/2" VD-025
2"X1 1/2"
D
1 1/2"
1 1/2" V-2031
1 1/2"-WW-CVCP80-079-N
FV 2031
FV 2011
1 1/2" V-2011
24"
4" V-2021
Y1 2011
HS 2011
P-2011
0-160 PSI
PI 2031
HS 2031
3/8" V-2181
PCV 2031
0-160 PSI
PI 2011A
PCV 2011A
3/8" V-2151
HS 2021
HS 2011A
KC 2011
I22
T-2011
I24
S
FV-2211
1/2" V-2211
0.1-1 GPM
FI 2211
1/2"X3/8"
TO PUMP P-1011
1/2"-SW-CVCP80
3/8"-SW-POPT
I24
S
FV-2201
1/2" V-2201
0.1-1 GPM
FI 2201
1/2"X3/8"
TO PUMP P-101A
I24
S
FV-2212
1/2" V-2212
0.1-1 GPM
FI 2212
1/2"X3/8"
TO PUMP P-1012
SERVICE WATER 440 PID-14
1 1/2"-SW-CVCP80-440-N
1-1/2" V-4403
1 1/2"-SW-CVCP80-001-N
1 1/2"X1/2"
1/2" V-2200
1/2"-SW-POPT

T-2011 FIRST STAGE SEPARATOR TANK	P-2011 MEDIA RETURN PUMP
SIZE: 14' DIA. X 30' HT. MAT'LS: FRP CAPACITY: 21,500 GAL	TYPE: ELECTRIC DIAPHRAGM CAPACITY: 30 GPM @ 40'TDH WETTED MAT'LS: PVC, NEOPRENE MOTOR: 1.0 HP,460 VAC,3 PH MODEL: PENN VALLEY 2" DOUBLE DISC

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FLUIDIZED BED PERCHLORATE
TREATMENT SYSTEM

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DESIGNED BY/DATE: SF/ 01-13-03
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SHEET SIZE: D
REVISION: 3
SHEET 3 OF 26
DRAWING # 1373-PID02A
FILE # 1373-PID02A-3

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1373-PID02B

SHEET 1 OF 1

INSRTUMENT AIR
96 HEADER
PID-12

1/2"-IA-CSTP40-100

CST PDP

1/2" V-2122

1/2"X3/8"

3/8"-IA-PDPT

FI 2012 0-1 SCFH

LIT 2012

LE 2012

1/2" V-2092

CST PDP

1/2" V-2082

CST PDP

1/2"X3/8"

3/8"-IA-PDPT

I21

LAH 2012 LAL 2012 LI 2012 LC 2012

0-160 PSI PI 2012

I23

3/8"-IA-PDPT

I P

V VD-020 20"x10"

PCV 2012

LCV 2012

FBR 3 & 4 EFFLUENT 9
PID-3A

10"-WW-CVCP80-043-N

20"-WW-FRPP-042-N

8 FBR 3 & 4 RECYCLE
PID-1B

MEDIA RETURN
FBR-3 28
PID-1B

1 1/2"-WW-CVCP80-091-N

MEDIA RETURN
FBR-4 29
PID-1B

1 1/2"-WW-CVCP80-111-N

V 1/2" VD-022

1 1/2" V-2062

1 1/2" V-2072

16"-WW-FRPP-040-N

FBR-3 RECYCLE & EFFLUENT 6
PID-1B

16"-WW-FRPP-041-N

FBR-4 RECYCLE & EFFLUENT 7
PID-1B

107 SERVICE WATER
PID-11

1 1/2"-SW-CVCP80-001-N

1 1/2" V-2042

1 1/2" V-2052

1 1/2"X1"

1"-SW-CVCP80-001-N

PCV 2022

PI 2022 0-160 PSI

3/8" V-2132

HS 2012

M

S

FV 2022 1"

1½"-WW-CVCP80-116-N

2"X1 1/2"

1/2" VD-026

D

2"X1 1/2"

1" V-2112

1 1/2"

1½"-WW-CVCP80-090-N

1 1/2" 1 1/2" 2032

FV 2032

FV 2012

1 1/2" V-2012

24"

4" V-2022

0-160 PSI PI 2032

0-160 PSI PI 2012A

S

HS 2032

PCV 2032

PCV 2012A

3/8" V-2142

3/8" V-2152

YI 2012

HS 2012

HS 2022

HS 2012A

KC 2012

I22

P-2012

T-2012

1 1/2"-SW-CVCP80-001-N

1 1/2" V-2300

1 1/2"X1/2"

1/2"-SW-PDPT

I24

S

FV-2213

1/2" V-2213

0.1-1 GPM FI 2213 1/2"X3/8"

TO PUMP P-1013

1/2"-SW-CVCP80

3/8"-SW-PDPT

FV-2202

1/2" V-2202

0.1-1 GPM FI 2202 1/2"X3/8"

TO PUMP P-102A

FV-2214

1/2" V-2214

0.1-1 GPM FI 2214 1/2"X3/8"

TO PUMP P-1014

T-2012 FIRST STAGE SEPARATOR TANK	P-2012 MEDIA RETURN PUMP						
SIZE: 14' DIA. X 30' HT. MAT'LS: FRP CAPACITY: 21,500 GAL	TYPE: ELECTRIC DIAPHRAGM CAPACITY: 30 GPM @ 40'TDH WETTED MAT'LS: PVC, NEOPRENE MOTOR: 1.0 HP,460 VAC,3 PH MODEL: PENN VALLEY 2" DOUBLE DISC						

REV	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
3	11-15-13	RECORD DRAWING – REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
2	9-26-06	RECORD DRAWING	DM	RL
1	12-27-05	ISSUED FOR CONSTRUCTION (NO CHANGE TO EXISTING)	DM	SF

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NERT
HENDERSON, NV

PIPING & INSTRUMENTATION DIAGRAM
FLUIDIZED BED PERCHLORATE
TREAMENT SYSTEM

DRAWING SCALE	N/A
DESIGNED BY/DATE	SF/ 01-13-03
DRAWN BY/DATE	LJ/ 01-13-03
CHECKED BY/DATE	MD/ 01-14-03
SHEET SIZE	D
REVISION	2
SHEET	4 OF 26
DRAWING #	1373-PID02B
FILE #	1373-PID02B-2

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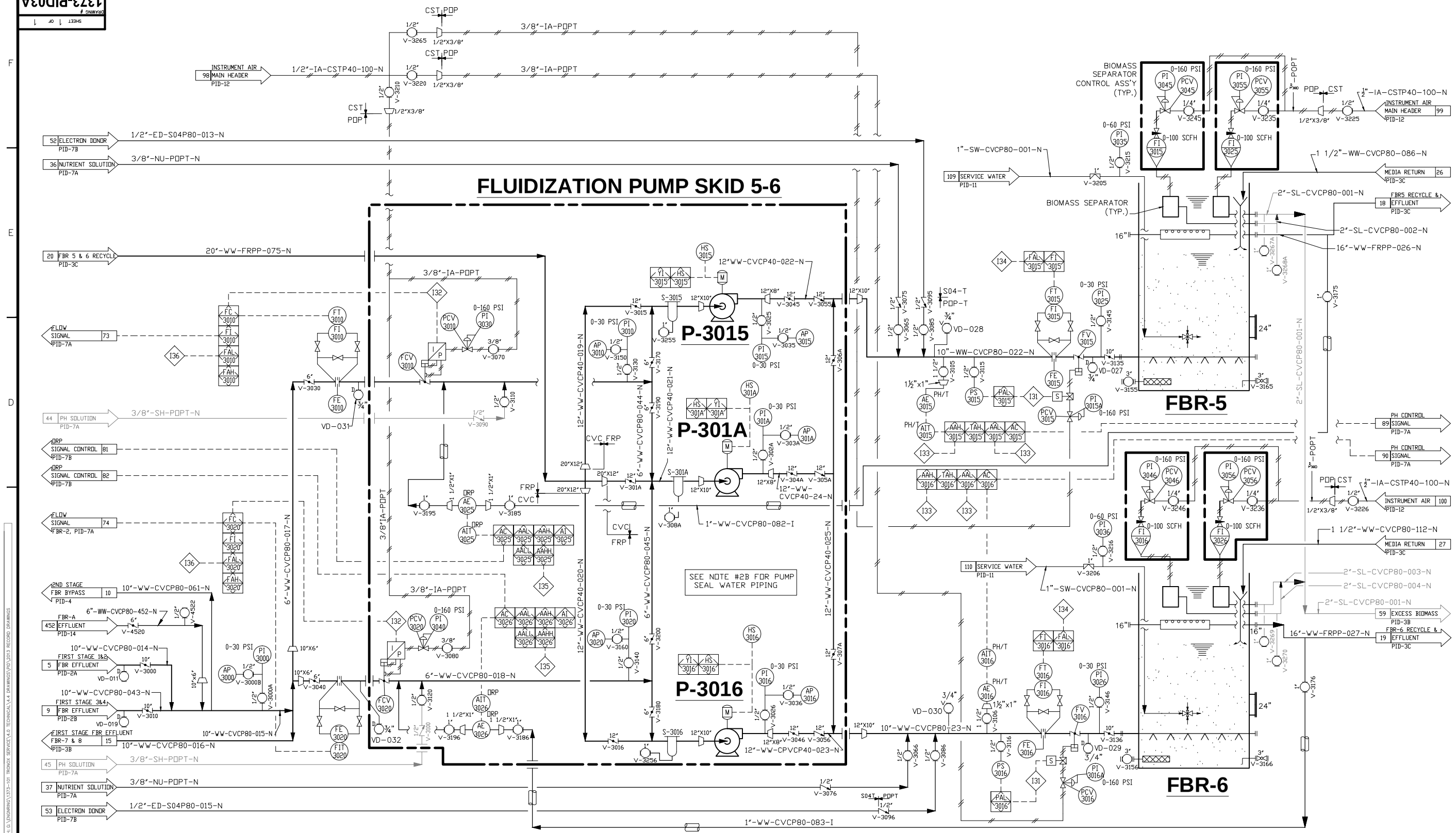

FBR-5,6 SECOND STAGE FLUIDIZED BED REACTORS	P-3015,301A,3016 SECOND STAGE FLUIDIZATION PUMPS
SIZE: 14'DIA X 26'STR MAT'LS: FRP CAPACITY: 28,800 GAL. MEDIA TYPE: CARBON MEDIA VOLUME: 1,730 CU. FT.	TYPE: CENTRIFUGAL CAPACITY: 2,000 GPM @ 40'TDH WETTED MAT'L: FRP MOTOR: 30 HP,460 VAC,3 PH MODEL:

REV	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
3	11-15-13	RECORD DRAWING – REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
2	9-26-06	RECORD DRAWING	DM	RL
1	4-26-06	ISSUED FOR CONSTRUCTION	JEK	RL
0	12-27-05	ISSUED FOR CONSTRUCTION	DM	SF

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PIPING INSTRUMENTATION DIAGRAM
FLUIDIZED BED PERCHLORATE
TREATMENT SYSTEM

DRAWING SCALE	N/A
DESIGNED BY/DATE	SF/ 01-02-03
DRAWN BY/DATE	LJ/ 01-02-03
CHECKED BY/DATE	MD/ 01-14-03
SHEET SIZE	D
REVISION	3
SHEET	5 OF 26
DRAWING #	1373-PID03A
FILE #	1373-PID03A-3

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1373-PID03A
SHEET 1 OF 1

FLUIDIZATION PUMP SKID 7-8

FBR-7

FBR-8

P-3017

P-302A

P-3018

SEE NOTE #2B FOR PUMP SEAL WATER PIPING

FBR-7,8	P-3017,302A,3018						
SECOND STAGE FLUIDIZED BED REACTORS	SECOND STAGE FLUIDIZATION PUMPS						
SIZE: 14'DIA X 26'STR MAT'LS: FRP CAPACITY: 28,800 GAL. MEDIA TYPE: CARBON MEDIA VOLUME: 1,730 CU. FT.	TYPE: CENTRIFUGAL CAPACITY: 2,000 GPM @ 40'TDH WETTED MAT'L: FRP MOTOR: 30 HP,460 VAC,3 PH MODEL:						

REV	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
3	11-15-13	RECORD DRAWING - REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
2	9-26-06	RECORD DRAWING	DM	RL
1	12-27-05	ISSUED FOR CONSTRUCTION (NO CHANGE TO EXISTING)	DM	SF

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PIPING & INSTRUMENTATION DIAGRAM
FLUIDIZED BED PERCHLORATE
TREATMENT SYSTEM

SHEET SIZE: D
REVISION: 2
SHEET 6 OF 26
DRAWING # 1373-PID03B
FILE # 1373-PID03B-2

DRAWING # 1373-PID03B
SHEET 1 OF 1
FILE #

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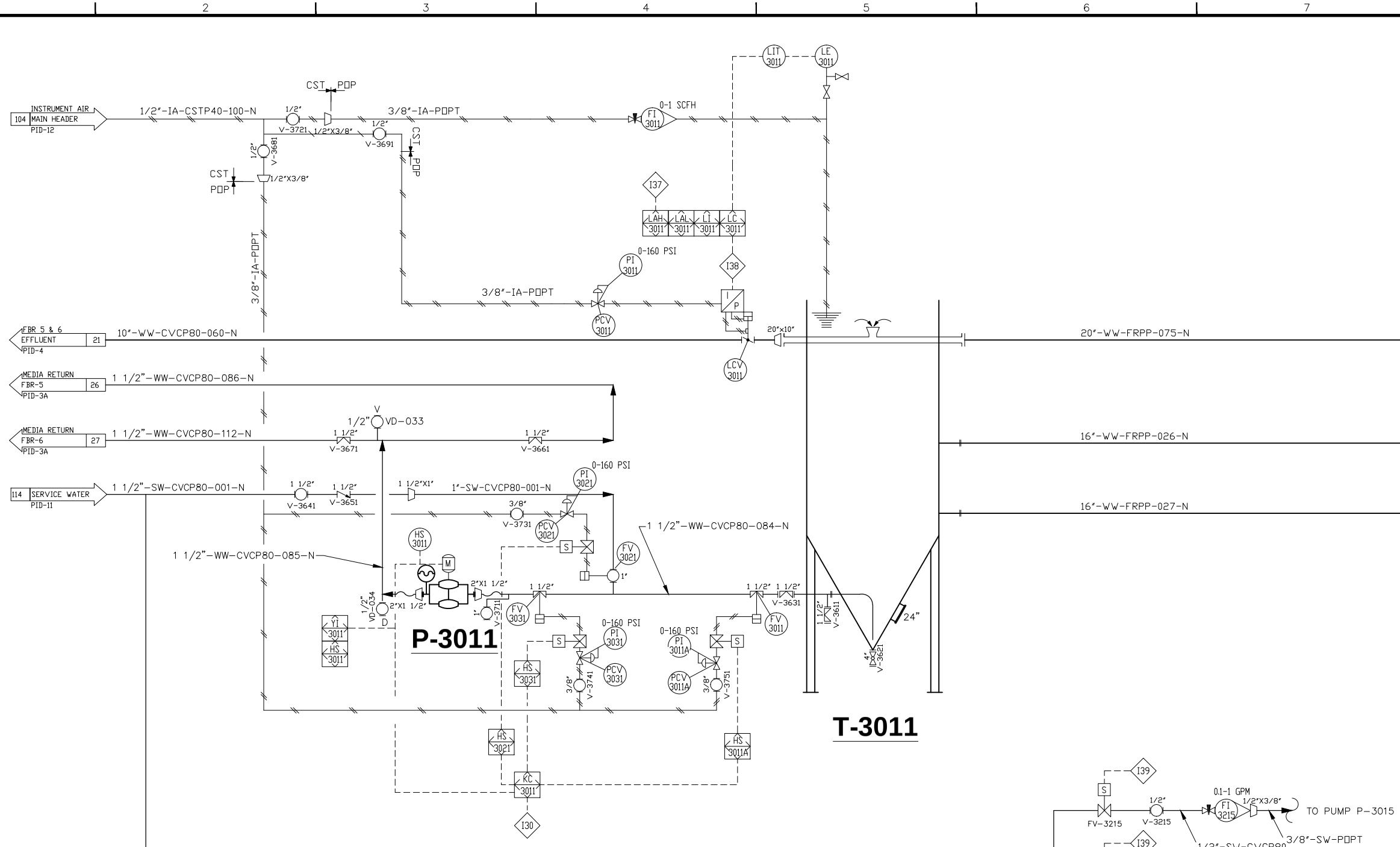
LAST EDITED: 11/14/13



T-3011 2ND STAGE SEPARATOR TANK	P-3011 MEDIA RETURN PUMP						
SIZE: 14' DIA. X 26' HT. MAT'LS: FRP CAPACITY: 18,400 GAL	TYPE: ELECTRIC DIAPHRAGM CAPACITY: 30 GPM @ 40'TDH WETTED MAT'LS: PVC, NEOPRENE MOTOR: 1.0 HP,460 VAC,3 PH MODEL: PENN VALLEY 2" DOUBLE DISC						

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3	11-15-13	RECORD DRAWING - REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
2	9-26-06	RECORD DRAWING	DM	RL
1	12-27-05	ISSUED FOR CONSTRUCTION (NO CHANGE TO EXISTING)	DM	SF

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PIPING & INSTRUMENTATION DIAGRAM
FLUIDIZED BED PERCHLORATE
TREATMENT SYSTEM

DRAWING SCALE: N/A
DESIGNED BY/DATE: SF/ 01-13-03
DRAWN BY/DATE: LJ/ 01-13-13
CHECKED BY/DATE: MD/ 01-14-03
SHEET SIZE: D
REVISION: 2
SHEET 7 OF 26
DRAWING # 1373-PID03C
FILE # 1373-PID03C-2

DRAWING # 1373-PID03C
SHEET 1 OF 1
FILE #

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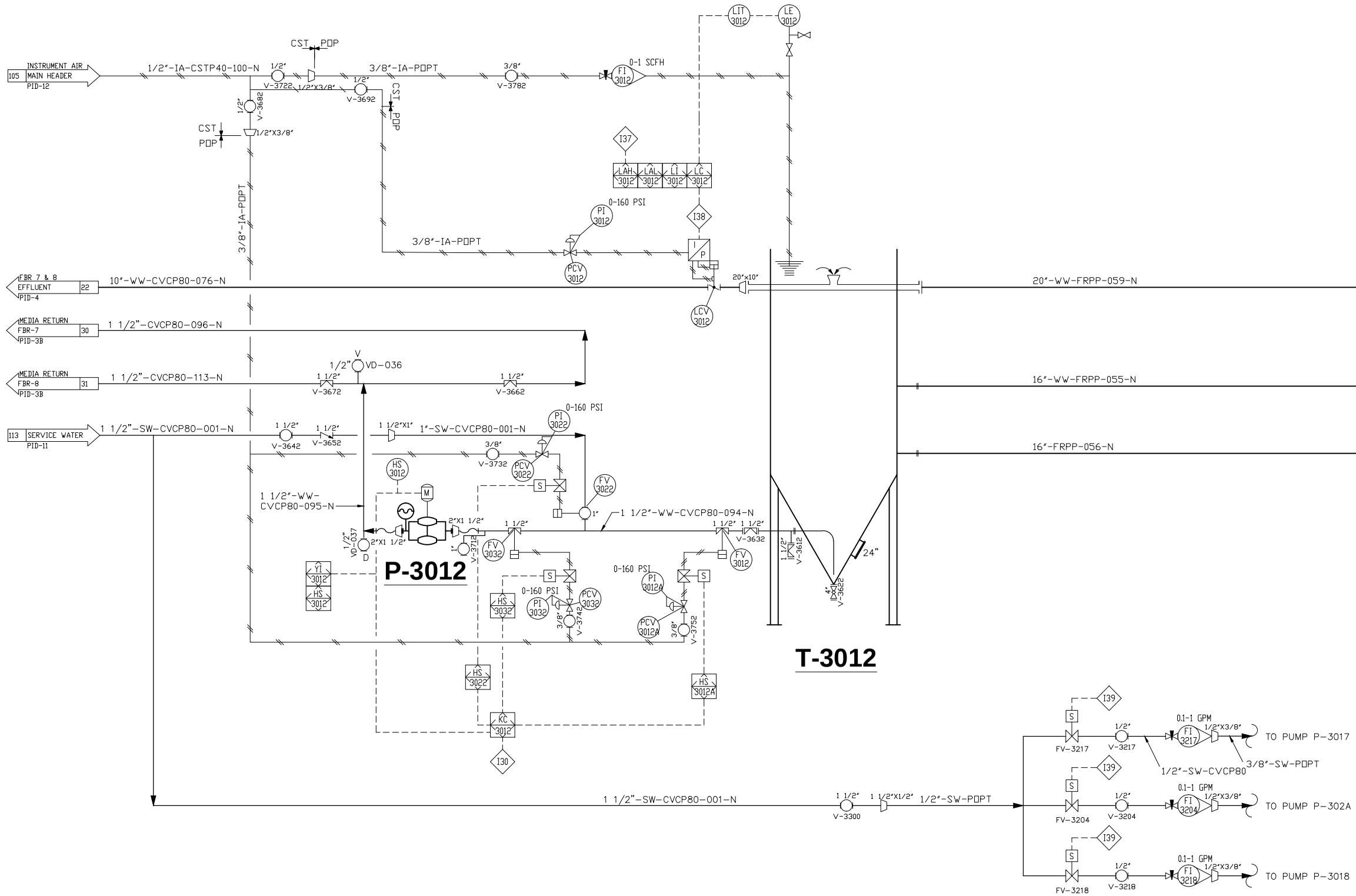

T-3012 2ND STAGE SEPARATOR TANK	P-3012 MEDIA RETURN PUMP
SIZE: 14' DIA. X 26' HT. MAT'LS: FRP CAPACITY: 18,400 GAL	TYPE: ELECTRIC DIAPHRAGM CAPACITY: 30 GPM @ 40'TDH WETTED MAT'LS: PVC, NEOPRENE MOTOR: 1.0 HP,460 VAC,3 PH MODEL: PENN VALLEY 2" DOUBLE DISC

U.S. PATENTS 5750028, 5788842, 6706521 AND PATENTS PENDING.

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1	9-26-06	RECORD DRAWING	DM	RL
0	12-27-05	ISSUED FOR CONSTRUCTION (NO CHANGE TO EXISTING)	DM	SF

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PIPING & INSTRUMENTATION DIAGRAM
FLUIDIZED BED PERCHLORATE
TREATMENT SYSTEM

DRAWING SCALE: N/A
DESIGNED BY/DATE: SF/ 01-13-03
DRAWN BY/DATE: LJ/ 01-13-03
CHECKED BY/DATE: MD/ 01-14-03
SHEET SIZE: D
REVISION: 2
SHEET 8 OF 26
DRAWING # 1373-PID03D
FILE # 1373-PID03D-2

DRAWING # 1373-PID03D
SHEET 1 OF 1
FILE #

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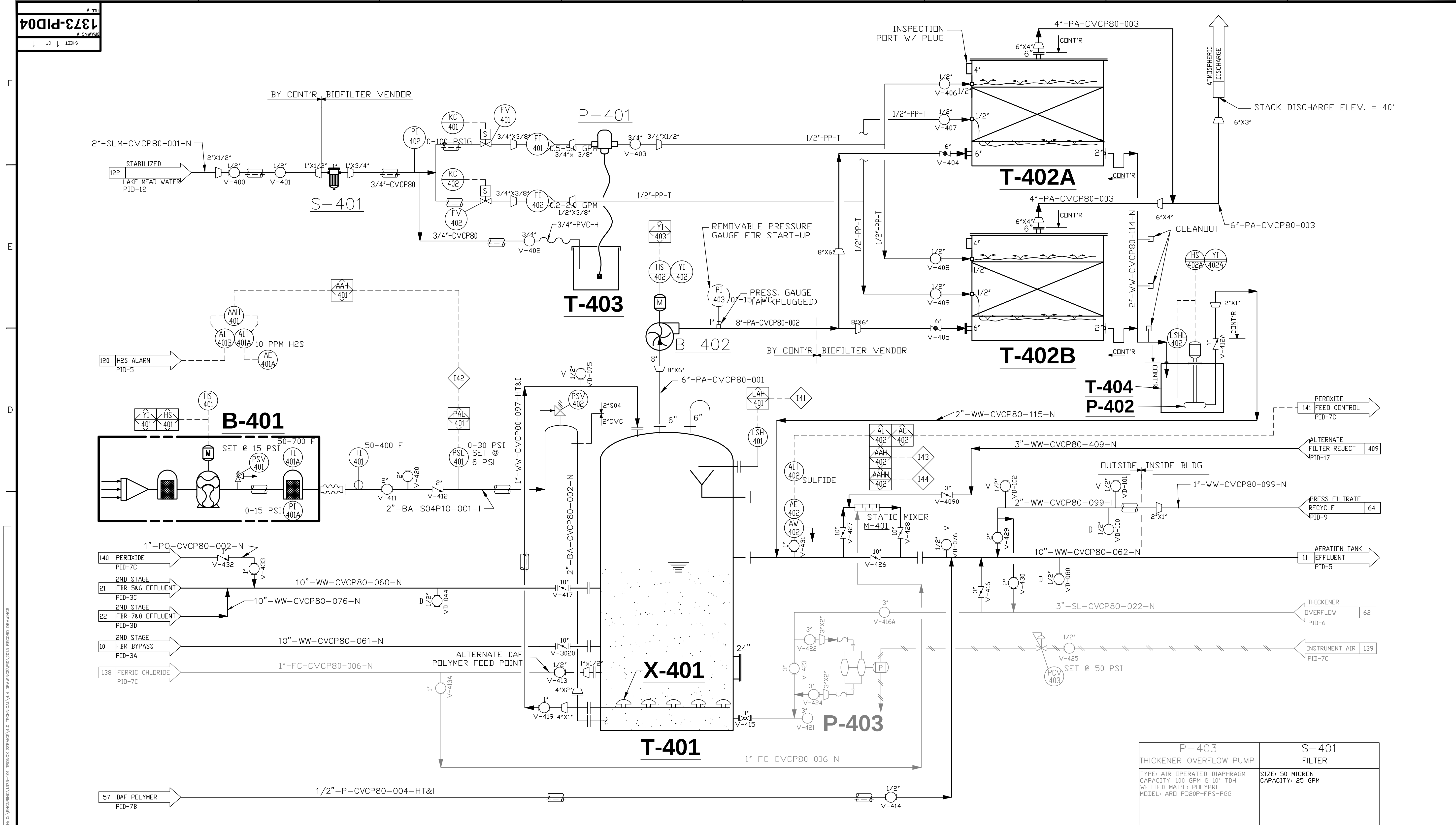

P-403	S-401
THICKENER OVERFLOW PUMP	FILTER
TYPE: AIR OPERATED DIAPHRAGM CAPACITY: 100 GPM @ 10' TDH WETTED MAT'L: POLYPRO MODEL: ARO PD20P-FPS-PGG	SIZE: 50 MICRON CAPACITY: 25 GPM

T-401	T-402 A/B	T-403	T-404	P-401	P-402	B-401	B-402	X-401
AERATION TANK	BIOFILTER	NUTRIENT SOLUTION	BIOFILTER SUMP	NUTRIENT PUMP	BIOFILTER SUMP PUMP	AERATION BLOWER	BIOFILTER BLOWER	AERATION DIFFUSERS
TYPE: 14' DIA. X 24'-6" STR MAT'L: FRP CAPACITY: 28,000 GAL.	DIMENSION: 6' DIA. X 6'-6" HG MAT'L: FRP CAPACITY: 120 CU. FT.	TYPE: 22" DIA. X 36" HG MAT'L: POLYETHYLENE CAPACITY: 55 GAL.	MAT'L: POLYPROPYLENE CAPACITY: 50 GAL.	MODEL: DOSATRON DI-16HG MAT'L: POLYPROPTLENE/SS CAPACITY: WATER FLOW 0.05, 11 GPM	MOTOR: 1 HP, 460/3/60 CAPACITY: 10 GPM @ 32'TDH.	TYPE: ROTARY LOBE CAPACITY: 50 SCFM @ 13 PSIG MOTOR: 5HP, 460VAC, 3Ø	MODEL: NEW YORK BLOWER RFE-200 MAT'L:FRP CAPACITY: 200 CFM @ 5"WC MOTOR: 1HP, 460/3/60	SIZE: 9" DIA. MAT'L: PVC PIPE & DIFFUSER BODY, EPDM DIFFUSER MEMBRANE CAPACITY: 1.4 SCFM PER DIFFUSER

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2	9-26-06	RECORD DRAWING	DM	RL
1	4-26-06	ISSUED FOR CONSTRUCTION	JEK	RL
0	12-27-05	ISSUED FOR CONSTRUCTION	DM	SF

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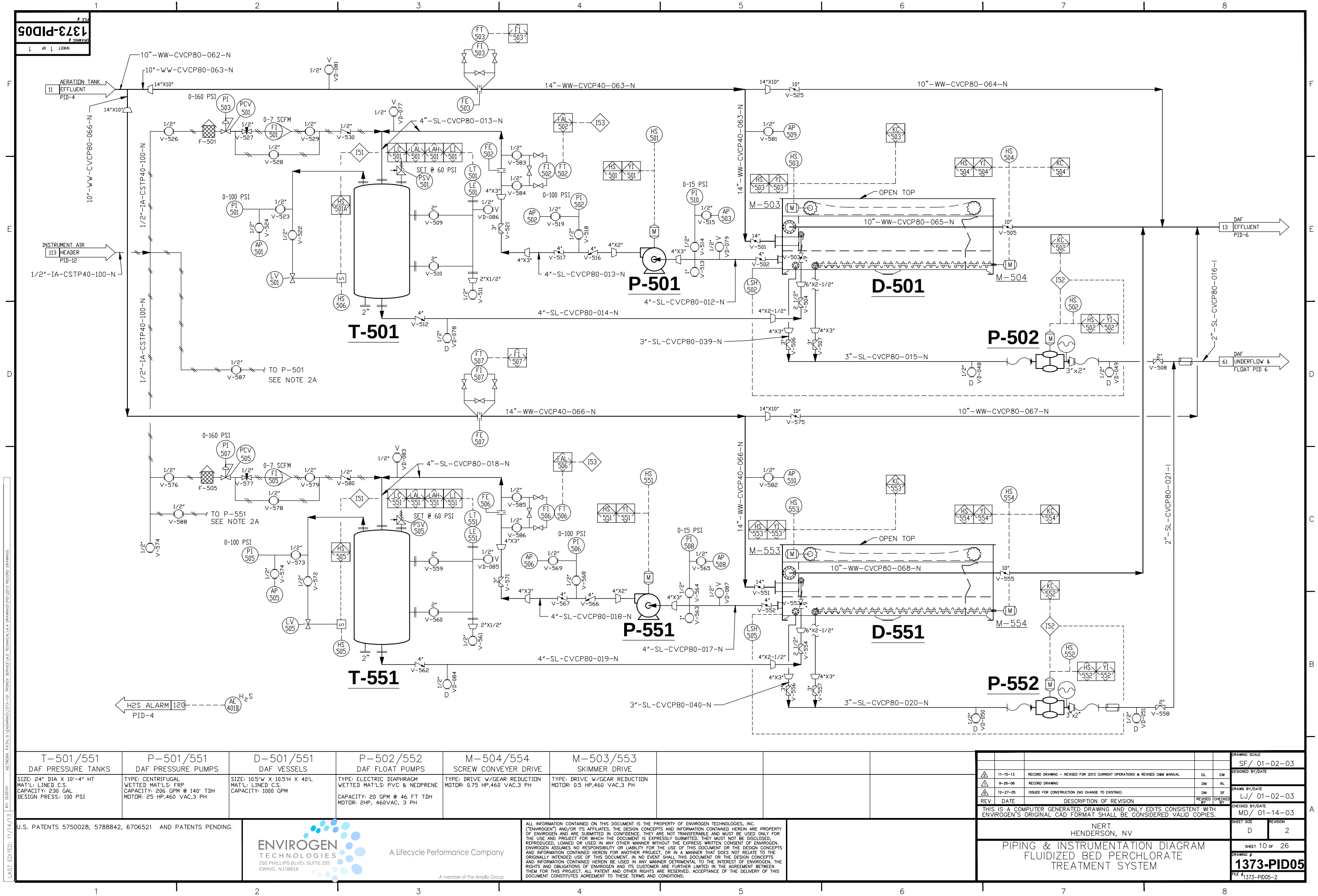
PIPING & INSTRUMENTATION DIAGRAM FLUIDIZED BED PERCHLORATE TREATMENT SYSTEM

DRAWING SCALE: N/A
DESIGNED BY/DATE: SF/ 01-13-03
DRAWN BY/DATE: LJ/ 01-13-03
CHECKED BY/DATE: MD/ 01-14-03
SHEET SIZE: D
REVISION: 3
SHEET 9 OF 26
DRAWING # 1373-PID04
FILE # 1373-PID04-3



T-501/551 DAF PRESSURE TANKS	P-501/551 DAF PRESSURE PUMPS	D-501/551 DAF VESSELS	P-502/552 DAF FLOAT PUMPS	M-504/554 SCREW CONVEYER DRIVE	M-503/553 SKIMMER DRIVE
SIZE: 24' DIA X 10'-4" HT MAT'L: LINED C.S. CAPACITY: 230 GAL DESIGN PRESS.: 100 PSI	TYPE: CENTRIFUGAL WETTED MAT'LS: FRP CAPACITY: 206 GPM @ 140' TDH MOTOR: 25 HP,460 VAC,3 PH	SIZE: 10.5'W X 10.5'H X 40'L MAT'L: LINED C.S. CAPACITY: 1000 GPM	TYPE: ELECTRIC DIAPHRAGM WETTED MAT'LS: PVC & NEOPRENE CAPACITY: 20 GPM @ 46 FT TDH MOTOR: 2HP, 460VAC, 3 PH	TYPE: DRIVE W/GEAR REDUCTION MOTOR: 0.75 HP,460 VAC,3 PH	TYPE: DRIVE W/GEAR REDUCTION MOTOR: 0.5 HP,460 VAC,3 PH

REV	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
3	11-15-13	RECORD DRAWING - REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
2	9-26-06	RECORD DRAWING	DM	RL
1	12-27-05	ISSUED FOR CONSTRUCTION (NO CHANGE TO EXISTING)	DM	SF

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DESIGNED BY/DATE:
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CHECKED BY/DATE: MD/ 01-14-03
SHEET SIZE: D
REVISION: 2
SHEET 10 OF 26
DRAWING # 1373-PID05
FILE # 1373-PID05-2

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PIPING & INSTRUMENTATION DIAGRAM
FLUIDIZED BED PERCHLORATE
TREATMENT SYSTEM

LAST EDITED: 11/14/13 BY: DLEECH NETWORK PATH: G:\ENGRNG\1373-101 IRONOX SERVICE\4.0 TECHNICAL\4.4 DRAWINGS\PID\2013 RECORD DRAWINGS

EFFLUENT PUMP SKID

INSTRUMENT AIR 114 MAIN HEADER PID-12
1/2"-IA-CSTP40-100-N
1/2" V-617
1/2"X3/8"
CST POP
(SEE NOTE #2A)
3/8" V-633
0-1 SCFH FI 601
3/8"-IA-POPT
LC 601 LI 601 LAH 601 LAL 601 I61
0 TO 120" W.C. I62
LIT 601
3/8"-POP-T
3/8" V-634
PCV 601
PI 601
I/P
LCV 601
2"-WW-CVCP80-117-N
2" V-616
2"-CVC-P-80
HS 601 YI 601 HS 601
M
8"X6"
8" V-605
8"X4"
8" V-606
8"-WW-CVCP80-072-N
8" V-608
8"-WW-CVCP80-070-N
P-601
HS 602 YI 602 HS 602
8"-WW-CVCP80-071-N
8"X6"
8" V-603
8"X4"
8" V-604
10"X8"
P-602
2" V-609
1/2" V-610
2"-SW-CVCP80-001-N
1/2" V-607
0 TO 50 PSIG
PI 602
8"-WW-CVCP80-069-N
TURBIDITY AE 601 AIT 601 AI 601 AAH 601
10"-WW-CVCP80-121-N
10"
24"
2"
10" V-601
1/2" D VD-055
10"-WW-CVCP80-069-N
T-601
13 DAF EFFLUENT PID-5
10"-WW-CVCP80-065-N
10" V-4891
1/2" VD-068
1/2" V-651
1/2" V-650
48 PH SOLUTION PID-7A
3/8"-SH-POPT-N
1/2"-WW-CVCP80-118-N
2" V-602
1/2" D VD-067
8"-WW-CVCP80-072-N
8" V-611
8" V-612
3" V-637
8"X3"
1/2" VD-054
8"-WW-CVCP80-073-N
14 SYSTEM RECYCLE PID-1B
REMOVED FLOW ELEMENT FE-602
AND ASSOCIATED INSTRUMENTATION
1/2" VD-066
8"-TW-CVCP80-001-N
1/2" D VD-054
8" V-626
8" V-613
8" V-627
2" V-6047
1/2" VD-065
1/2" V-631
123 TREATED EFFLUENT PID-10C
502 TREATED EFFLUENT PID-17
8"-WW-CVCP80-502-N
1/2" V-632
PI 603 0-60 PSI
1" V-642
DE-FOAM 143 PID-7C
1"-DF-CVCP80-002-N

1"-SW-CVCP80-540-N
M-611
M-612
M-613
HS 611 YI 611
HS 612 YI 612
HS 613 YI 613
SC 612
SC 613
HS 612
HS 611
HS 613
XAH 611
M M M
XSH 611 XSHH 611
TORQUE I63
1" V-5400
1"X2"
1" V-5390
1"X2"
1"-SW-CVCP80-003-N
3/4"-FC-CVCP80-005-N
3/4" V-638
137 FERRIC CHLORIDE PID-7C
THICKENER
56 POLYMER PID-7B
FBR 5, 6, 7 & 8:
60 EXCESS BIOMASS PID-3B
142 PEROXIDE PID-7C
1/2"-P-CVCP80-002-HT&I
2"-SL-CVCP80-001-N
1/2" V-618
AP 602
2" V-639
1" V-640
1" V-641
1"-PO-CVCP80-003-N
2"-SL-CVCP80-016-N
DAF
61 UNDERFLOW & FLOAT PID-5
2"-SL-CVCP80-016-I
1/2" V-621
AP 601
2" V-619
2" V-4280
DAF UNDERFLOW & FLOAT DISCHARGE
2"-SL-CVCP80-428-N
T-602
4"-SL-CVCP80-023-N
KC 603 YI 603 HS 603
HS 603
M
2" V-622
4"X3"
3" V-623
3" V-4910
4"X3"
1" V-624
P-603
3"-SL-CVCP80-022-N
1/2" VD-103
2" V-6046
2"-SW-CVCP80-001-N
V VD-069
1/2" V VD-062
2" V-635
V VD-060
1/2" V
V VD-061
1/2" V
2"-SW-CVCP80-001-N
SERVICE WATER 121 MAIN HEADER PID-11
2"-SW-CVCP80-001-N
68 SERVICE WATER PID-9
2"-SW-CVCP80-002-N
2"-SLM-CVCP80-001-N
2" V-629
STABILIZED LAKE MEAD WATER 106 PID-12
SW SLM
1/2"-SW-CVCP80-001-N
117 SERVICE WATER PID-7B
2"-TW-CVCP80-001-N
NOT USED
3"-WW-CVCP80-490-N
3" V-4903
FILTER REJECT 490 PID-17
3" V-6042
THICKENER 62 OVERFLOW PID-4
3" V-6041
3" V-6043
2" V-4281
4"-SL-CVCP80-491-N
491 THICKENED SLUDGE PID-16
3"-SL-CVCP80-024-N
63 THICKENED SLUDGE PID-9
3" V-625
TANKER TRUCK FILL
3"-SL-CVCP80-025-N
2" V-6044
2" V-6045
LSHH 604 LSH 604 LSL 604
M M
P-604 A/B
T-604

T-601 EFFLUENT TANK	T-602 THICKENER	P-601/602 EFFLUENT PUMPS	P-603 THICKENER UNDERFLOW PUMP	M-611 SCRAPER/RAKE	M-612/613 FLOCCULATION MIXERS	P-604A/B SUMP PUMP	
SIZE: 14' DIA x 13' STR. MAT'L: FRP CAPACITY: 15,200 GAL	SIZE: 20' DIAX18' STR MAT'L: LINED C.S. CAPACITY: 42,000 GAL.	TYPE: HORIZONTAL CENTRIFUGAL MAT'L: FRP CAPACITY: 1000 GPM @ 93 FT MOTOR: 30 HP, 460 VAC, 3 PH MODEL:	TYPE: ELECTRIC DIAPHRAGM MAT'L: PVC & NEOPRENE CAPACITY: 150 GPM @ 15 FT. TDH MOTOR: 7.5 HP, 460 VAC, 3 PH MODEL: PENN VALLEY 3" DOUBLE DISC	WETTED MAT'L: NEOPRENE, AND LINED C.S. MOTOR: 1/2 HP, 460 VAC, 3 PH MODEL:	WETTED MAT'L: RUBBER LINED MOTOR: 1 HP, 460 VAC, 3 PH MODEL:	TYPE: SUBMERSIBLE MAT'L: STAINLESS STL. CAPACITY: 150 GPM @ 100 FT MOTOR: 460 VAC, 3 PH MANUF: GRUNDFOSS	

REV	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
1	11-15-13	RECORD DRAWING - REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	RL	DW
3	9-26-06	RECORD DRAWING	DM	RL
2	6-22-06	ADDED NOTE TO DISABLE FT-602	DM	RL
1	4-26-06	REISSUED FOR CONSTRUCTION	JEK	RL
0	12-27-05	ISSUED FOR CONSTRUCTION	DM	SF

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SHEET SIZE: D
REVISION: 4
SHEET 11 OF 26
DRAWING # 1373-PID06
FILE # 1373-PID06-4

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PIPING & INSTRUMENTATION DIAGRAM
FLUIDIZIED BED PERCHLORATE
TREATMENT SYSTEM

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DRAWING # 1373-PID07A
SHEET 1 OF 1
FILE #

pH FEED ASSEMBLY

CALIBRATION COLUMNS (TYP.)

P-71A
P-711
P-712
P-713
P-714
P-715
P-716
P-717
P-718
P-720

pH CONTROLLER 446 FBR-A, PID-14 — 445 pH SOLUTION FBR-A, PID-14
pH CONTROLLER 85 FBR-1, PID-1A — 40 pH SOLUTION FBR-1, PID-1A
pH CONTROLLER 86 FBR-2, PID-1A — 41 pH SOLUTION FBR-2, PID-1A
pH CONTROLLER 87 FBR-3, PID-1B — 42 pH SOLUTION FBR-3, PID-1B
pH CONTROLLER 88 FBR-4, PID-1B — 43 pH SOLUTION FBR-4, PID-1B
pH CONTROLLER 89 FBR-5, PID-3A — 44 pH SOLUTION FBR-5, PID-3A
pH CONTROLLER 90 FBR-6, PID-3A — 45 pH SOLUTION FBR-6, PID-3A
pH CONTROLLER 91 FBR-7, PID-3B — 46 pH SOLUTION FBR-7, PID-3B
pH CONTROLLER 92 FBR-8, PID-3B — 47 pH SOLUTION FBR-8, PID-3B
198 FT-622 PID-10C — 48 pH SOLUTION T-601 PID-6

1"-SH--CVCP80-002-N
2"-SH-CVCP80-002-N
3"-SH-CVCP80-515-N

T-701
LEAK CONTAINMENT
TRUCK FILL
LEAK DETECT
VENT
SPARE

NUTRIENT FEED ASSEMBLY

T-702
3"-NU-CVCP80-001-N
2"-NU-CVCP80-002-N
1"-NU-CVCP80-002-N
2"-SLM-CVCP80-544-N

P-72A
P-721
P-722
P-723
P-724
P-725
P-726
P-727
P-728

FLOW SIGNAL 420 PID-14
LAKE MEAD WATER 544 PID-12
NUTRIENT FBR-A, PID-14 — 448
NUTRIENT FBR-1, PID-1A — 32
NUTRIENT FBR-2, PID-1A — 33
NUTRIENT FBR-3, PID-1B — 34
NUTRIENT FBR-4, PID-1B — 35
NUTRIENT FBR-5, PID-3A — 36
NUTRIENT FBR-6, PID-3A — 37
NUTRIENT FBR-7, PID-3B — 38
NUTRIENT FBR-8, PID-3B — 39
FEED FLOWMETER 69 FBR-1, PID-1A
FEED FLOWMETER 70 FBR-2
FEED FLOWMETER 71 FBR-3, PID-1B
FEED FLOWMETER 72 FBR-4, PID-1B
FEED FLOWMETER 73 FBR-5, PID-3A
FEED FLOWMETER 74 FBR-6, PID-3A
FEED FLOWMETER 75 FBR-7, PID-3B
FEED FLOWMETER 76 FBR-8, PID-3B

P-711-714, P71A pH FEED PUMP	P-720 pH FEED PUMP
TYPE: PERISTALIC CAPACITY: 0.12-7.6 GPH WETTED MAT'L: MOTOR: MODEL: VA-975-3000 L/S 16 MFR: MASTER FLEX	TYPE: ELECTRIC PERISTALTIC WETTED MAT'LS: SANTOPRENE, CERAMIC, PVC CAPACITY: 1.67 GAL/HR MOTOR: 120 VOLT, 1/30 HP MODEL: SVP4L3A4S MFR: STENNER
T-702 NUTRIENT TANK	**P-721-728, P72A NUTRIENT FEED PUMP**
SIZE: 8' DIA. X 12' STR. MAT'LS: FRP CAPACITY: 4,300 GAL.	TYPE: ELECTRIC PERISTALTIC WETTED MAT'LS: SANTOPRENE, CERAMIC, PVC CAPACITY: 1.67 GAL/HR MOTOR: 120 VOLT, 1/30 HP MODEL: SVP4L3A4S MFR: STENNER
T-701 pH TANK	**P-715-718, pH FEED PUMP**
SIZE: 10'-2" DIA. X 13' STR. MAT'LS: XLHDPE CAPACITY: 6,650 GAL. (INNER) TYPE: DBL WALL CONTAINMENT w/LEAK DETECTION MFG: POLYPROCESSING	TYPE: ELECTRIC PERISTALTIC WETTED MAT'LS: SANTOPRENE, CERAMIC, PVC CAPACITY: 1.67 GAL/HR MOTOR: 120 VOLT, 1/30 HP MODEL: SVP4L3A4S MFR: STENNER

U.S. PATENTS 5750028, 5788842, 6706521 AND PATENTS PENDING.

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4	11-15-13	RECORD DRAWING - REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
3	9-26-06	RECORD DRAWING	DM	RL
2	3/8/06	REVISED PER CUSTOMER COMMENTS	JEK	SF
1	12-27-05	ISSUED FOR CONSTRUCTION	DM	SF

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PIPING & INSTRUMENTATION DIAGRAM
FLUIDIZED BED PERCHLORATE TREATMENT SYSTEM

DRAWING SCALE: N/A
DESIGNED BY/DATE: SF/ 01-05-03
DRAWN BY/DATE: LJ/ 01-13-03
CHECKED BY/DATE: MD/ 01-14-03
SHEET SIZE: D
REVISION: 3
SHEET 12 OF 26
DRAWING # 1373-PID07A
FILE # 1373-PID07A-3

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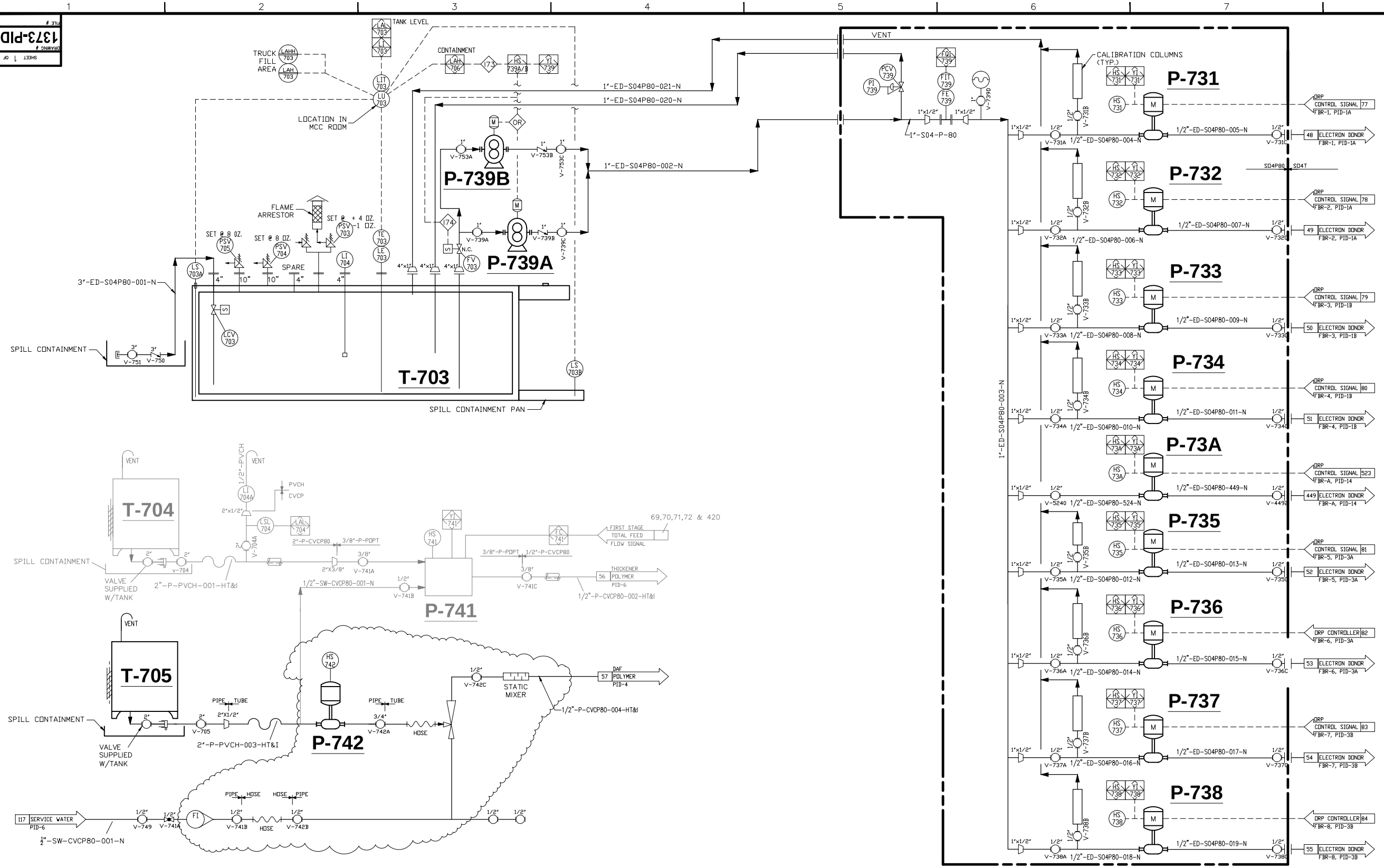

T-704 & T-705 POLYMER FEED TANKS	T-703 ELECTRON DONOR TANK	P-741 & P-742 FEED SYSTEMS	P-731 – 734, P-73A ELECTRON DONOR METERING PUMPS	P-735 – 738 ELECTRON DONOR METERING PUMPS	P-739A/B ELECTRON DONOR BOOSTER PUMP
TYPE: TOTE MAT'LS: POLETHELENE CAPACITY: 550 GAL.	SIZE:10'-1"DIA×38'-8" STR (OUTER) MAT'LS: C.S., DOUBLE WALL CAPACITY: 20,000 GAL. TYPE: UL 2085	TYPE: ELECTRONIC METERING CAPACITY: 1.0 GAL/HR WETTED MAT'L: ACRYLIC/PP 316 SS FLUROFILM, HYPALON MOTOR: 22W, 120 VAC MODEL: LMI A151.86PB	TYPE: ELECTRIC DIAPHRAGM CAPACITY: 20 GALS/HR WETTED MAT'L: 316 S.S./PTFE MOTOR: 44 WATTS,120 VAC MODEL: LMI E74-1-37	TYPE: ELECTRIC DIAPHRAGM CAPACITY: 8 GALS/HR WETTED MAT'L: 316 S.S./PTFE MOTOR: 44 WATTS,120 VAC MODEL: LMI E73-1-27	TYPE: PDS. DISP. GEAR CAPACITY: 10 GPM @10 PSI WETTED MAT'L: D.I. MOTOR: 1/2 HP,460 VAC,3 PH MODEL: VIKING GG-895-MD4 MAG DRIVE

REV	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
3	11-15-13	RECORD DRAWING – REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
2	9-26-06	RECORD DRAWING	DM	RL
1	12-27-05	ISSUED FOR CONSTRUCTION	DM	SF

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PIPING & INSTRUMENTATION DIAGRAM
FLUIDIZED BED PERCHLORATE
TREATMENT SYSTEM

SHEET SIZE: D
REVISION: 2
SHEET 13 OF 26
DRAWING #: 1373-PID07B
FILE #1373-PID07B-2

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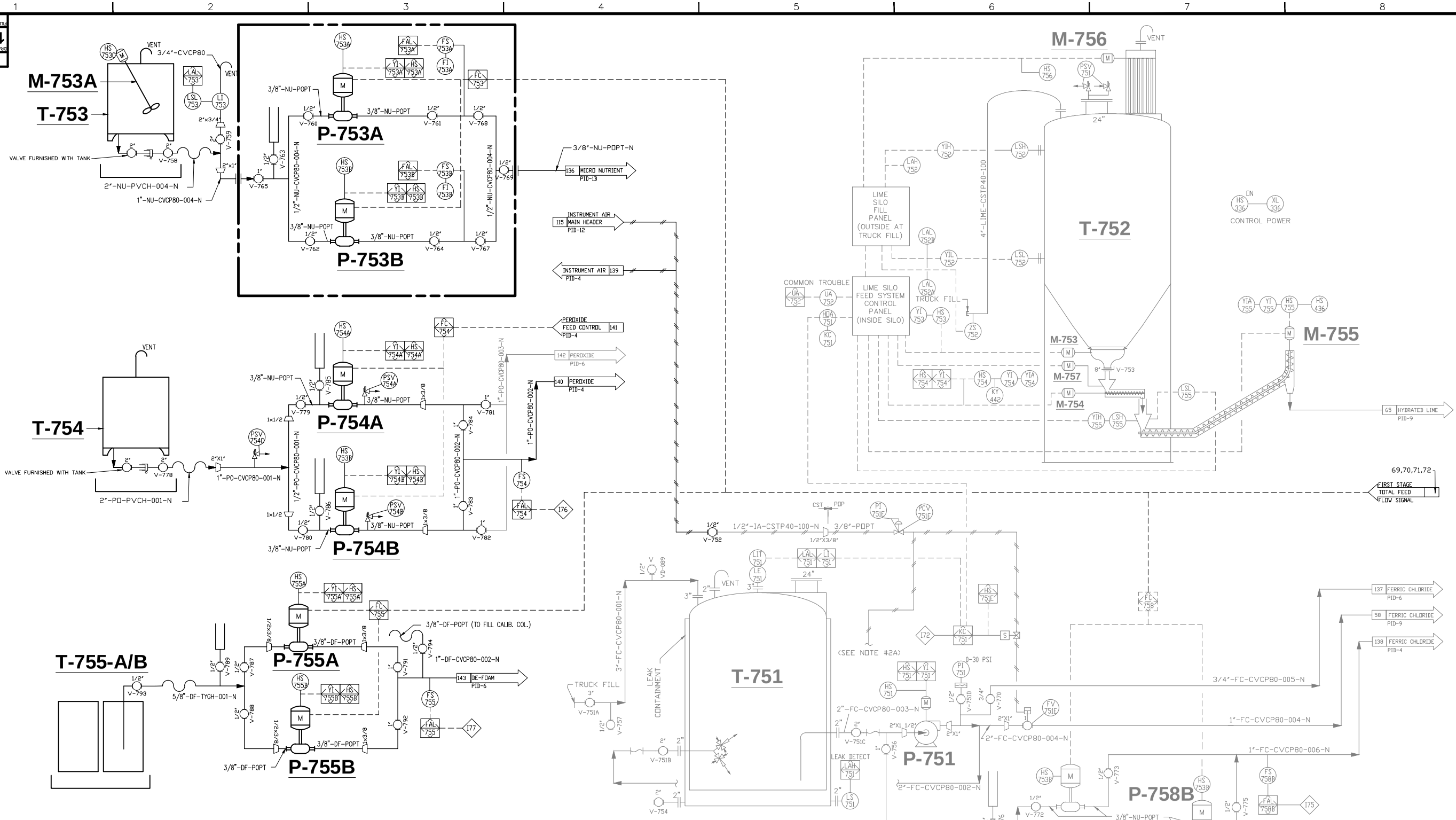

M-753A MICRONUTRIENT TANK AGITATOR	M-757 AGITATOR MOTOR	P-758A/B FERRIC CHLORIDE PUMP	T-754 PEROXIDE TANK	P-754A/B PEROXIDE PUMP	T-755 A/B DE-FOAM TANK	P-755A/B DE-FOAM PUMP
MAT'L: 316 S.S. PROP MOTOR: 1/3 HP, 120V	TYPE: VIBRATOR MOTOR: 1/5 HP, 0.5 AMP	TYPE: PERISTALTIC PUMP WETTED MAT'L: PTFE, PVDF, CERAMIC, PVC CAPACITY: 3-65 GPD @ 25 PSI MOTOR: 115 VOLT, 1/60 MODEL: 779914-00 MFR: MASTERFLEX	TYPE: TDTE CAPACITY: 300 GAL. (35% PEROXIDE) MAT'LS: S.S. EST. USE: 25 GPD AVG, 68 GPD MAX	TYPE: PERISTALTIC PUMP WETTED MAT'L: PTFE, PVDF, CERAMIC, PVC CAPACITY: 3-65 GPD @ 25 PSI MOTOR: 115 VOLT, 1/60 MODEL: 779914-00 MFR: MASTERFLEX	TYPE: DRUM CAPACITY: 55 GAL. EST. USE: 6 GPD AVG.	TYPE: PERISTALTIC PUMP WETTED MAT'L: PTFE, PVDF, CERAMIC, PVC CAPACITY: 3-65 GPD @ 25 PSI MOTOR: 115 VOLT, 1/60 MODEL: 779914-00 MFR: MASTERFLEX

T-751 FERRIC CHLORIDE STORAGE TANK	T-752 HYDRATED LIME STORAGE SILO	T-753 MICRO NUTRIENT TANK	P-751 FERRIC CHLORIDE FEED/MIX PUMP	P-753A/B PUMP	M-756 DUST FILTER	M-753 BIN ACTIVATOR	M-754 VOLUMETRIC FEEDER	M-755 SCREW CONVEYOR
SIZE: 10'-2" DIA. X 9'-10" STR. MAT'LS: CROSS LINKED POLYETHYLENE CAPACITY: 4400 GAL (INNER) TYPE: DBL WALL CONTAINMENT MODEL: POLYPROCESSING	SIZE: 12' DIA X 28' H CAPACITY: 1500 CU. FT. MAT'L: PAINTED STEEL	TYPE: TDTE CAPACITY: 400 GAL. MAT'LS: S.S. MIXER: 110 V	TYPE: HORIZONTAL CENTRIFUGAL CAPACITY: 40 GPM @ 40FT TDH WETTED MAT'L: FRP MOTOR: 1.5 HP, 460V, 3 PH MODEL: FYBROC 1500 SERIES	TYPE: ELECTRIC PERISTALTIC WETTED MAT'L: SANTOPRENE, CERAMIC, PVC CAPACITY: 1.67 GAL/HR MOTOR: 120 VOLT, 1/30 HP MODEL: SVP4L3A4S MFR: STENNER	TYPE: MECHANICAL SHAKER MOTOR: 1/3 HP, 460V, 3 PH	MAT'L: STEEL MOTOR: 1.5 HP, 460V, 3 PH	CAPACITY: 48 CU. FT./HR. MAT'L: SS, TEFLON MOTOR: 1.0 HP, 90V MFR: FLEXICON HOPPER CAPACITY: 32 CU. FT.	TYPE: FLEXIBLE SCREW CAPACITY: 40-50 CU. FT./HR. MOTOR: 3.0 HP, 460V, 3 PH

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3	11-15-13	RECORD DRAWING – REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
2	9-26-06	RECORD DRAWING	DM	RL
1	12-27-05	ISSUED FOR CONSTRUCTION (NO CHANGE TO EXISTING)	DM	SF

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PIPING & INSTRUMENTATION DIAGRAM
FLUIDIZED BED PERCHLORATE
TREATMENT SYSTEM

DRAWING SCALE	N/A
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SHEET SIZE	D
REVISION	2
SHEET	14 OF 26
DRAWING #	1373-PID07C
FILE #	1373-PID07C-2

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COMPRESSOR 801

COMPRESSOR 802

P-801

P-802

VENT

HS 801

HS 801R

M

T

2"-CA-CSTP40-001-N

2"-CA-CSTP40-002-N

2"-CA-CSTP40-003-N

2"-CA-CSTP40-470-N

1"-CA-CSTP40-003-N

1 1/2"-WW-CSTP40-101-N

1 1/2"-WW-CSTP40-102-N

1/2"-WW-CSTP40-104-N

1 1/2"-CA-CSTP40-105-N

1 1/2"-WW-CSTP40-106-N

1 1/2"-IA-CSTP-100-N

2"-WW-CVCP80-104-N

V-802

V-803

V-4702

V-4703

V-805

V-809

V-806

V-807

V-808

V-810

V-811

V-812

V-813

SET @ 150 PSI

PSV 803

TIE IN #13

T-801

T-802

F-802

F-803

F-804

PI 801

PI 802

PI 803

0-160 PSI

PCV 802

PCV 803

SET @ 110 PSI

SET @ 100 PSI

SET @ 80 PSIG

PSL 802

PAL 802

181

SERVICE AIR 470 PID-16

SERVICE AIR 93 PID-9

SERVICE AIR 66 PID-9

INSIDE BLDG

OUTSIDE BLDG

INSTRUMENT AIR 67 MAIN HEADER PID-12

FLOOR DRAIN

COMPRESSED AIR ASSEMBLY

T-801 COMPRESSED AIR RECEIVER TANK	T-802 INSTRUMENT AIR DRYER	P-801 -802 AIR COMPRESSORS	F-802 & F-803 OIL REMOVAL FILTER	F-804 PARTICULATE FILTER
SIZE: 36"OD X 120"HT MAT'LS: PAINTED STEEL CAPACITY: 430 GAL MAX. PRESS.: 137 PSIG	TYPE: REGEN. DESICCANT DRYER INLET FLOW: 160 SCFM (100 PSIG) PURGE RATE: 23.8 SCFM POWER: 115VAC, 1ø	CAPACITY: 215 ICFM @ 125 PSIG TYPE: ROTARY SCREW MOTOR: 50HP, 460VAC, 3ø MODEL: INGERSOLL RAND	LIQUID REMOVAL: 99.99% OIL MAX. LIQ. LOAD: 100 PPM W/W SOLID PARTICLE: .01 MICRONS OIL CARRY-OVER: .001 PPM W/W PRESS. DROP: 6 PSI (WET) CAPACITY: 275 CFM @ 100 PSIG MODEL: IR6P275	LIQUID REMOVAL: 100% WATER MAX. LIQ. LOAD: 2,000 PPM W/W SOLID PARTICLE: 1 MICRONS OIL CARRY-OVER: 1 PPM W/W PRESS. DROP: 2 PSI (WET) CAPACITY: 275 CFM @ 100 PSIG MODEL: IR6P275

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2	9-26-06	RECORD DRAWING	DM	RL
1	4-26-06	REISSUED FOR CONSTRUCTION	JEK	RL
0	12-27-05	ISSUED FOR CONSTRUCTION	DL	SF

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SHEET 15 OF 26
DRAWING #: 1373-PID08
FILE #: 1373-PID08-3

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PIPING & INSTRUMENTATION DIAGRAM
FLUIDIZED BED PERCHLORATE
TREATMENT SYSTEM

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FILE # 1373-PID09
DRAWING # 1
SHEET 1 OF 1

INSTRUMENT AIR
119 MAIN HEADER PID-12
1/2"-IA-CSTP40-100-N

66 SERVICE AIR PID-8
1"-CA-CSTP40-003-N

THICKENED
63 SLUDGE PID-6
3"-SL-CVCP80-024-N

EQUALIZED
478 SLUDGE PID-16
4"-SL-CVCP80-478-N

65 HYDRATED LIME PID-7C

58 FERRIC CHLORIDE PID-7C
1"-FC-CVCP80-004-N

2"-P-CVCP80-530-N

HS 901 / YI 901

LIT 901 / LE 901 / LI 901

M-901

T-901

OVERFLOW 4"

4"-WW-CVCP80-122-N

REMOVED BIOXIDE TANK T-903

LSH 901 / LAH 901 / I94
LSL 901 / LAL 901 / I91
LSLL 901 / LALL 901

1/2" V VD-097

SLOPE SELF DRAINING (FROM HIGH POINT)

3"-SL-CVCP80-029-N

OUTSIDE INSIDE BLDG

3"-SL-CVCP80-026-N

3/4"-CA-CSTP40-N

FS 901 — TO X-901 CONTROL PANEL

3"-SL-CVCP80-027-N

P-901

V-904 V-905 V-903 V-902A V-902 V-906

1/2" V VD-098
1/2" V VD-095
1/2" D VD-096

3-15 PSI FCV 901 — AIR SIGNAL FROM FILTER PRESS 901
SET @ 100 PSI PCV 901
PI 901 0-160 PSI

3/4" V-925
3/4" V-924
3/4"-CA-CSTP40-N

SET @ 100 PSI PCV 902
PI 902 0-160 PSI
FCV 902 3-15 PSI — AIR SIGNAL FROM FILTER PRESS 902
FS 902 — TO X-902 CONTROL PANEL

V-907
1/2" V VD-099
1/2" D VD-093

P-902

V-928 V-927 V-931

1"-WW-CVCP80-099-N
64 RECYCLE PID-4 — PRESS FILTRATE

P-903

(SEE NOTE #2A)

2"-WW-CVCP80-098-N

T-902

OVERFLOW 3" 24"

3"-SL-CVCP80-041-N

3"-SL-CVCP80-030-N

1/2" D VD-090

1/2" V VD-092
1/2" V VD-088

3"-SL-CVCP80-032-N

2"-SL-CVCP80-035-N

V-912 V-913 V-910 V-911

V-916 (916A)

X-901 (WEST)

DRIP TRAYS

V-917 (917A)

TO FCV-901

1/2"-IA-CSTP40-100-N

AIR BLOW 1/2" V-922

1/2"-CA-CSTP40

3/4X1/2

CLAMPED YI 901A / FILLING YI 901B

PRESS 901 CONTROL PANEL

PI 901A / PCV 901A

1/2" V-940

SEMI-AUTOMATIC PLATE SHIFTER

1/2"x3/8" 1/2" V-920

PCV 905 / PI 905 SERVICE AIR FOR CORE BLOW

1"x3/4" 1" V-928

1"-CA-CSTP40

1/2" V-938

LSHH 902 / LAHH 902 / I93
LSH 902 / LAH 902
LSL 902 / I92 / YI 903 / HS 903

1/2" D VD-091

1/2" V-929 FLUSH

1/2" V-937

AIR BLOW 1/2" V-922A

1/2"-CA-CSTP40

3/4X1/2

CLAMPED YI 902K / FILLING YI 902B

PRESS 902 CONTROL PANEL

PI 901B / PCV 901B

SEMI-AUTOMATIC PLATE SHIFTER

PCV 907 / PI 907

PCV 908 / PI 908 SERVICE AIR FOR CORE BLOW

1/2"x3/8" 1"x3/4" 1" V-923

1"-CA-CSTP40

1/2" V-939

X-902 (EAST)

DRIP TRAYS

TO FCV-902

1/2"-IA-CSTP40-100-N

3"-SL-CVCP80-028-N

3"-SL-CVCP80-031-N

2"-SL-CVCP80-038-N

3"-SL-CVCP80-035-N

V-935 V-932 V-933 V-934

V-918 (918A)

V-919 (919A)

V-921

1/2" V VD-094

68 SERVICE WATER PID-6
2"-SW-CVCP80-001-N

93 SERVICE AIR PID-8
1"-CA-CSTP40-003-N

1/2" V-936 LOW POINT DRAIN

527 LAKE MEAD WATER PID-12
1"-SLM-CVCP80-527-N

OUTSIDE INSIDE BLDG

DRY POLYMER FEED ASSEMBLY

H-920

FC 920 / FQI 920 / FE 920 / E / FV 920

1" V-5270

1/2" V-902

2"-P-CVCP80-530-N

2"-P-CVCP80-529-N

2"-P-H-528-N

LSH 930 / LSL 930

LSH 920 / LSL 920

1" V-4572

M-920

T-930

T-920

2"xX V-5290

V-5300

2" V-5280

P-930 (KC 930)

P-920

REMOVED T-903 BIOXIDE TANK DESCRIPTION

P-920 POLYMER TRANSFER PUMP	M-920 MIX TANK AGITATOR	H-920 VOLUMETRIC FEEDER w/HOPPER
TYPE: PROGRESSIVE CAVITY CAPACITY: 22 GPM MOTOR: 1.5 HP, 1/60/220 VAC	MAT'L: 304 S.S., SHAFT & IMPELLER SPEED: 350 RPM MOTOR: 1.0 HP/60HZ/230VAC, SINGLE PHASE MODEL: CHEMINEER 20DTD-1	FEEDER OUTPUT: 0.00017-3.69 FT3/HR HOPPER VOLUME: 1.0 FT3 MAT'L: 304 S.S. MODEL: SCHERICK ACCURATE 302

T-901 CONDITIONING TANK	M-901 CONDITIONING TANK AGITATOR	P-901, 902 PRESS FEED PUMPS	T-902 FILTRATE TANK	P-903 FILTRATE RECYCLE PUMP	X-901, 902 FILTER PRESS	T-920 POLYMER MIX TANK	T-930 POLYMER APPLICATION TANK	P-930 POLYMER FEED PUMP
SIZE: 14' DIA. X 9.5' STR. MAT'LS: FRP CAPACITY: 13,500 GAL	AXIAL FLOW IMPELLER SPEED: 45 RPM MANUFACTURER: PHILADELPHIA MOTOR: 3 HP, 480VAC, 3ø	TYPE: AIR OPERATED DIAPHRAGM CAPACITY: 150 GPM @ 40 PSI SIZE: 3" AIR REQ'D: 150 SCFM, 100 PSIG MODEL: WARREN RUPP, S30B2	SIZE: 14' DIA. X 8' STR. MAT'LS: FRP CAPACITY: 8,000 GAL	TYPE: CENTRIFUGAL CAPACITY: 20 GPM @ 46'TDH WETTED MAT'L: FRP MOTOR: 1.5 HP, 460VAC, 3ø MODEL: FYBROC 1500 SERIES	TYPE: PLATE & FRAME CAPACITY: 80 CU. FT. MODEL: JWI 1200 MM PRESS	SIZE: MAT'LS: POLYETHYLENE CAPACITY: 275 GAL	SIZE: MAT'LS: POLYETHYLENE CAPACITY: 275 GAL	TYPE: PROGRESSIVE CAVITY CAPACITY: 0.5-5 GPM MOTOR: 1 HP, 90 VDC

REV.	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
1	11-15-13	RECORD DRAWING – REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
2	9-26-06	RECORD DRAWING	DM	RL
3	6-14-06	ADDED PUMP INFORMATION	DM	RL
4	4-26-06	REDISUED FOR CONSTRUCTION	JEK	SF
5	12-27-05	ISSUED FOR CONSTRUCTION	DM	SF

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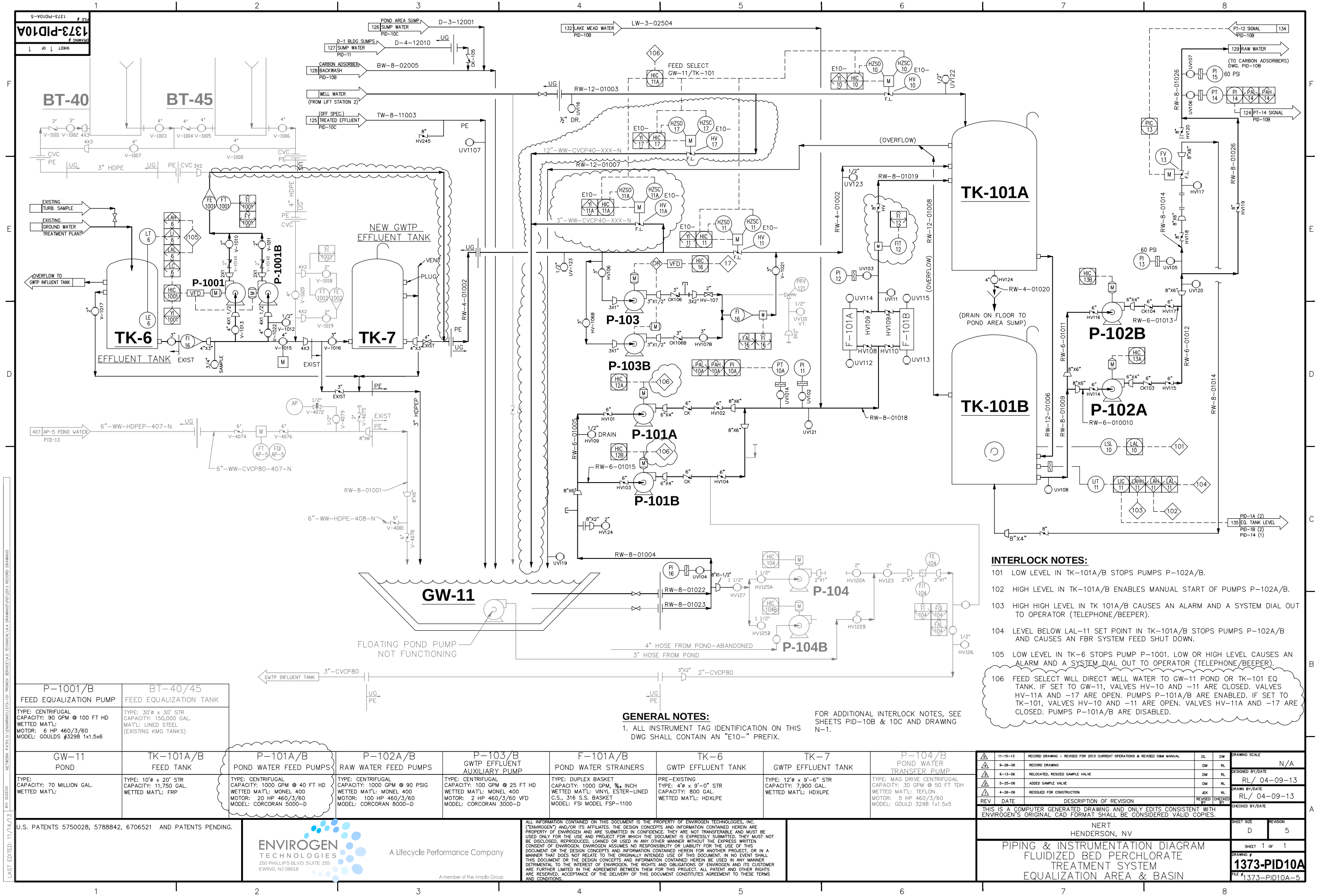
PIPING & INSTRUMENTATION DIAGRAM
FLUIDIZED BED PERCHLORATE
TREATMENT SYSTEM

DRAWING SCALE: N/A
DESIGNED BY/DATE: SF/ 01-02-03
DRAWN BY/DATE: LJ/ 01-02-03
CHECKED BY/DATE: MD/ 01-14-03
SHEET SIZE: D
REVISION: 4
SHEET 16 OF 26
DRAWING # 1373-PID09
FILE # 1373-PID09-4

LAST EDITED: 11/14/13 BY: RLOUDIN NETWORK PATH: G:\ENGINEER\1373-101 RENOX SERVICE\V4.0 TECHNICAL\V4.4 DRAWINGS\PID\2013 RECORD DRAWINGS



INTERLOCK NOTES:

101 LOW LEVEL IN TK-101A/B STOPS PUMPS P-102A/B.

102 HIGH LEVEL IN TK-101A/B ENABLES MANUAL START OF PUMPS P-102A/B.

103 HIGH HIGH LEVEL IN TK 101A/B CAUSES AN ALARM AND A SYSTEM DIAL OUT TO OPERATOR (TELEPHONE/BEEPER).

104 LEVEL BELOW LAL-11 SET POINT IN TK-101A/B STOPS PUMPS P-102A/B AND CAUSES AN FBR SYSTEM FEED SHUT DOWN.

105 LOW LEVEL IN TK-6 STOPS PUMP P-1001. LOW OR HIGH LEVEL CAUSES AN ALARM AND A SYSTEM DIAL OUT TO OPERATOR (TELEPHONE/BEEPER).

106 FEED SELECT WILL DIRECT WELL WATER TO GW-11 POND OR TK-101 EQ TANK. IF SET TO GW-11, VALVES HV-10 AND -11 ARE CLOSED. VALVES HV-11A AND -17 ARE OPEN. PUMPS P-101A/B ARE ENABLED. IF SET TO TK-101, VALVES HV-10 AND -11 ARE OPEN. VALVES HV-11A AND -17 ARE CLOSED. PUMPS P-101A/B ARE DISABLED.

GENERAL NOTES:

1. ALL INSTRUMENT TAG IDENTIFICATION ON THIS DWG SHALL CONTAIN AN "E10-" PREFIX.

FOR ADDITIONAL INTERLOCK NOTES, SEE SHEETS PID-10B & 10C AND DRAWING N-1.

P-1001/B FEED EQUALIZATION PUMP	BT-40/45 FEED EQUALIZATION TANK
TYPE: CENTRIFUGAL CAPACITY: 90 GPM @ 100 FT HD WETTED MAT'L: MOTOR: 6 HP 460/3/60 MODEL: GOULDS #3298 1x1.5x6	TYPE: 30'ø x 30' STR CAPACITY: 150,000 GAL. MAT'L: LINED STEEL (EXISTING KMG TANKS)

GW-11 POND	TK-101A/B FEED TANK	P-101A/B POND WATER FEED PUMPS	P-102A/B RAW WATER FEED PUMPS	P-103/B GWTP EFFLUENT AUXILIARY PUMP	F-101A/B POND WATER STRAINERS	TK-6 GWTP EFFLUENT TANK	TK-7 GWTP EFFLUENT TANK	P-104/B POND WATER TRANSFER PUMP
TYPE: CAPACITY: 70 MILLION GAL. WETTED MAT'L:	TYPE: 10'ø x 20' STR CAPACITY: 11,750 GAL. WETTED MAT'L: FRP	TYPE: CENTRIFUGAL CAPACITY: 1000 GPM @ 40 FT HD WETTED MAT'L: MONEL 400 MOTOR: 20 HP 460/3/60 MODEL: CORCORAN 5000-D	TYPE: CENTRIFUGAL CAPACITY: 1000 GPM @ 90 PSIG WETTED MAT'L: MONEL 400 MOTOR: 100 HP 460/3/60 VFD MODEL: CORCORAN 8000-D	TYPE: CENTRIFUGAL CAPACITY: 100 GPM @ 25 FT HD WETTED MAT'L: MONEL 400 MOTOR: 2 HP 460/3/60 VFD MODEL: CORCORAN 3000-D	TYPE: DUPLEX BASKET CAPACITY: 1000 GPM, ⅜" INCH WETTED MAT'L: VINYL ESTER-LINED C.S., 316 S.S. BASKET MODEL: FSI MODEL FSP-1100	PRE-EXISTING TYPE: 4'ø x 9'-0" STR CAPACITY: 800 GAL. WETTED MAT'L: HDXLPE	TYPE: 12'ø x 9'-6" STR CAPACITY: 7,900 GAL. WETTED MAT'L: HDXLPE	TYPE: MAG DRIVE CENTRIFUGAL CAPACITY: 30 GPM @ 50 FT TDH WETTED MAT'L: TEFLON MOTOR: 5 HP 460/3/60 MODEL: GOULD 3298 1x1.5x5

REV	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
1	11-15-13	RECORD DRAWING - REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
2	9-26-06	RECORD DRAWING	DM	RL
3	6-13-06	RELOCATED, RESIZED SAMPLE VALVE	DM	RL
4	5-25-06	ADDED SAMPLE VALVE	DM	RL
5	4-26-06	REISSUED FOR CONSTRUCTION	JEK	RL

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DESIGNED BY/DATE: RL/ 04-09-13
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REVISION: 5

PIPING & INSTRUMENTATION DIAGRAM
FLUIDIZED BED PERCHLORATE TREATMENT SYSTEM
EQUALIZATION AREA & BASIN

SHEET 1 OF 1
DRAWING # 1373-PID10A
FILE # 1373-PID10A-5

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DRAWING # 1373-PID10B
SHEET 1 OF 1
FILE # 1373-PID10B-3

INTERLOCK NOTES:

109 OVERFLOWING SUMP LEVEL (E49-LAH-11 OR E19-LAH-11) CAUSES A SYSTEM DIAL OUT TO OPERATOR (TELEPHONE/BEEPER)

FOR ADDITIONAL INTERLOCK NOTES, SEE SHEETS PID-10A & 10C AND DRAWING N-1.

NOTES:

1. CARBON REMOVAL AND REPLACEMENT BY CARBON TRUCK VIA HOSE CARRIED ON TRUCK.
2. CAMLOCK FITTING FOR WATER SUPPLY TO CARBON TRUCK.
3. ALL INSTRUMENT TAG IDENTIFICATION ON THIS DWG SHALL CONTAIN AN "E13- " PREFIX.

GC-201C
GC-201A
GC-201B
P-1204
F-201A
F-201B
CARBON FILL
SPENT CARBON
CARBON DRAIN
UTILITY AIR/WATER
(NOTE 1)
EXISTING SKID
SET PRESS. 125 PSI
4" VENT (RUPTURE DISK OUTLET) DRAIN ON FLOOR TO POND AREA SUMP
3" VENT (RUPTURE DISK OUTLET) DRAIN ON FLOOR TO POND AREA SUMP
SET @ 150 PSI
SET @ 25 PSI
0-160 PSI
REMOVED F-202 BAG FILTER
REMOVED F-202 BAG FILTER DESCRIPTION
WASHDOWN STATION AT POND SITE
HOSE BIB
SHOWER/EYEWASH
(UNDERGROUND)
ON/OFF
POND SITE
D-1 BLDG.

RAW WATER FILTER SUMP AT D-1
INSTRUMENT & EQUIP. PREFIX: E49-

F-201 A/B
RAW WATER FILTERS (10 MICRON)

GC-201A/B EXISTING CARBON FILTERS	GC-201C NEW CARBON FILTER	F-201A/B RAW WATER FILTERS
TYPE: 10'ø CAPACITY: 20,000 LB. GAC WETTED MAT'L: CS WITH PLASITE LINING MODEL: CALGON MODEL 10	TYPE: GAC CAPACITY: 1,500 GPM @ 125 PSIG WETTED MAT'L: PLASITE LINED C.S., POLYPROPYLENE LINED DRAIN MODEL: US FILTER/WESTATES HP1020	TYPE: DUPLEX CAPACITY: 1,000 GPM WETTED MAT'L: 316SS W/ POLYPROPYLENE CARTRIDGES MODEL: PARKER MODEL 6S52-3-8 FK1-D4

REV	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
3	11-15-13	RECORD DRAWING - REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
2	9-26-06	RECORD DRAWING	DM	RL
1	4-21-06	ISSUED FOR CONSTRUCTION; LINE 3"-SLM-540 MOVED FROM PID-10A	JEK	RL
0	12-27-05	ISSUED FOR CONSTRUCTION (NO CHANGE FROM EXISTING)	DM	SF

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THIS DRAWING IS A VISUAL REPRESENTATION OF THE EQUIPMENT AND/OR SYSTEM PROPOSED. IT IS NOT INTENDED FOR CONSTRUCTION PURPOSES.

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DESIGNED BY/DATE: RL/ 06-02-03
DRAWN BY/DATE: LJ/ 06-02-03
CHECKED BY/DATE: MD/ 06-02-03
SHEET SIZE: D
REVISION: 3
SHEET 1 OF 1
DRAWING #: 1373-PID10B
FILE #: 1373-PID10B-3

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PIPING & INSTRUMENTATION DIAGRAM EQUALIZATION AREA PIPING REVISIONS INCORPORATING GW-11 AS EQUALIZATION BASIN

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GENERAL NOTES:

1. ALL EXISTING INSTRUMENT TAG IDENTIFICATION ON THIS ON THIS DWG SHALL CONTAIN AN "E17-" PREFIX UNLESS OTHERWISE NOTED.

INTERLOCK NOTES:

110 HIGH pH ALARM FROM ONE OR BOTH TRANSMITTERS CAUSES A SYSTEM DIAL OUT TO OPERATOR (TELEPHONE/BEEPER)

111 LOW pH ALARM FROM ONE OR BOTH TRANSMITTERS CAUSES A SYSTEM DIAL OUT TO OPERATOR (TELEPHONE/BEEPER)

REMOVED INTERLOCK 112

113 pH FEED PUMP, P-720 WILL OPERATE WHEN THE UV EFFLUENT TANK DISCHARGE FLOW EXCEEDS 50 GPM.

FOR ADDITIONAL INTERLOCK NOTES, SEE SHEETS PID-10A & 10C AND DRAWING N-1.

198 pH FEED PUMP, P-720, WILL OPERATE WITHIN THE UV EFFLUENT TANK DISCHARGE FLOW EXCEEDS 50 GPM.

P-1302A

P-1302B

X-621

UV DISINFECTION

T-621

UV EFFLUENT TANK

P-1201

EQUALIZATION AREA SUMP

INSTRUMENT & EQUIP. PREFIX: E19-

P-1201	P-1302A/B	X-621	T-621
EQUAL. AREA SUMP PUMP	EFFLUENT BOOSTER PUMP	UV DISINFECTION SYSTEM	UV EFFLUENT TANK
TYPE: SUBMERSIBLE CAPACITY: 150 GPM @ 20 PSIG WETTED MAT'L: 316 SS/VITON MOTOR: 7.5 HP 460/3/60 MODEL: CORCORAN 4000-VE-1	TYPE: CENTRIFUGAL CAPACITY: 1000 GPM @ 90 PSIG WETTED MAT'L: 316 MONEL 400 MOTOR: 100 HP 460/3/60 MODEL: CORCORAN 8000-D (EXISTING KMG PUMPS; TAG P-302A/B)	CAPACITY: 1000 gpm@150 psig DUTY: 99.9% BACTERIAL REDUCTION UV TRANSMITTANCE: 95% UV DOSAGE: 30,000 MWS/sq. cm WETTED MAT'L: 316L POWER: 3.8kW	SIZE: 10'-2" DIAx 16'-3" STR. MATERIAL: HDXLPE CAPACITY: 9,200 GAL.

REV	DATE	DESCRIPTION OF REVISION	DL	DW
5	11-15-13	RECORD DRAWING - REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
4	10-16-06	RECORD DRAWING - AS NOTED	JEK	RL
3	9-26-06	RECORD DRAWING	DM	RL
2	6-22-06	ADDED FLOW TRANSMITTER FT-622	DM	RL
1	4-26-06	REISSUED FOR CONSTRUCTION	JEK	RL

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DESIGNED BY/DATE: RL/ 06-02-03
DRAWN BY/DATE: LJ/ 06-02-03
CHECKED BY/DATE: MD/ 06-02-03

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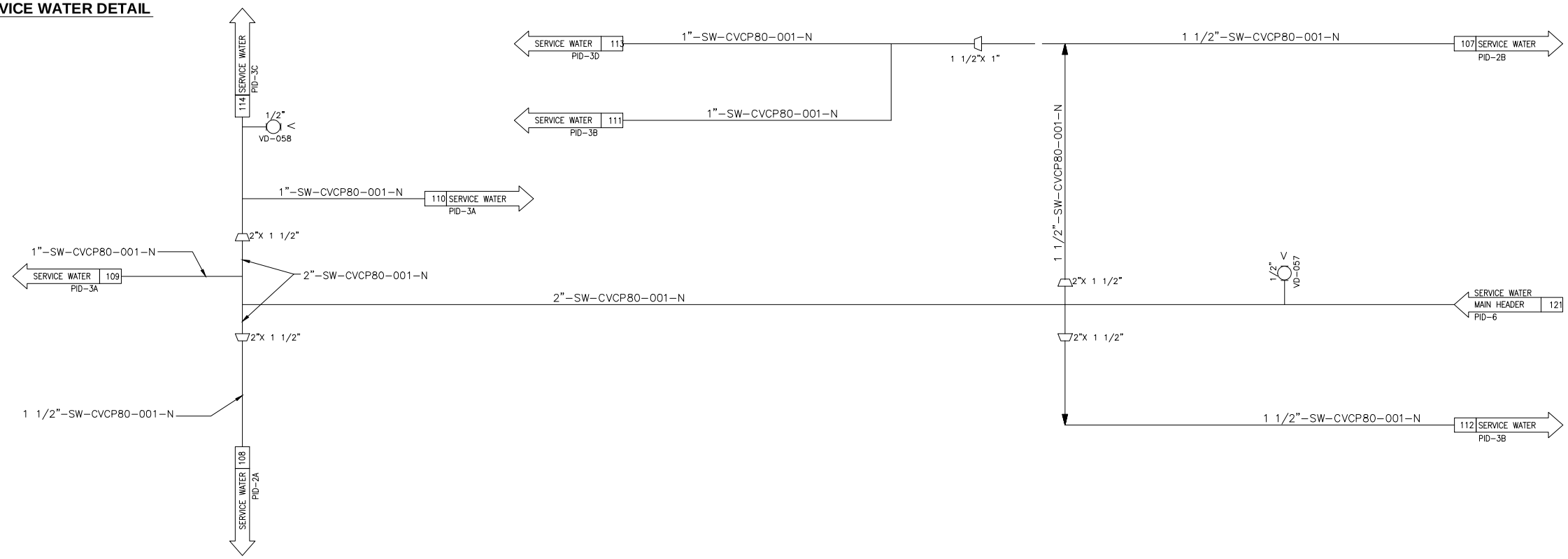
PIPING & INSTRUMENTATION DIAGRAM
EQUALIZATION AREA PIPING REVISIONS
INCORPORATING GW-11
AS EQUALIZATION BASIN

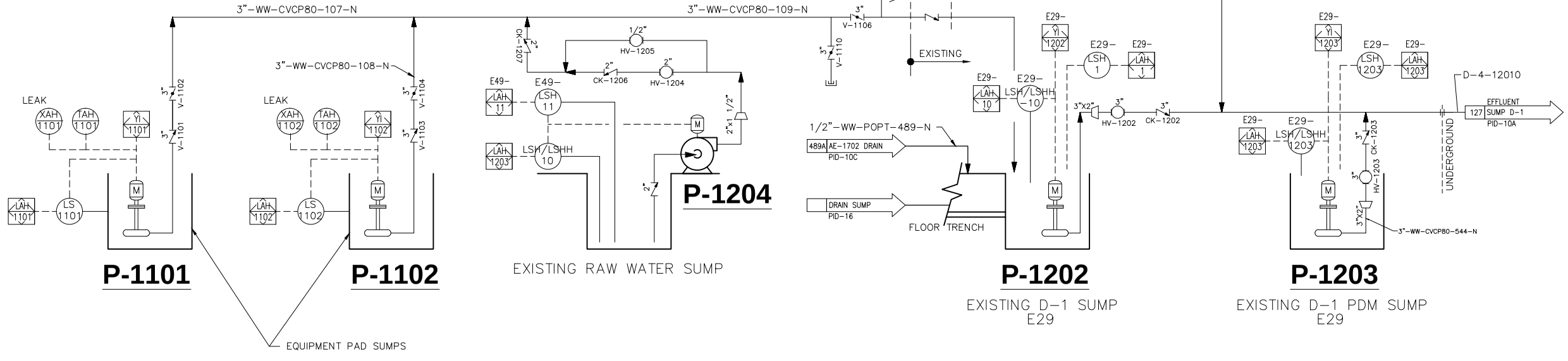
SHEET SIZE: D
REVISION: 5
SHEET 1 OF 1
DRAWING # 1373-PID10C
FILE # 1373-PID10C-5

LAST EDITED: 11/14/13 BY: DLEICH NETWORK PATH: G:\ENGINRNG\1373-101 TRONOX SERVICE\V4.0 TECHNICAL\V4.4 DRAWINGS\PID\2013 RECORD DRAWINGS

SERVICE WATER DETAIL



SUMP PUMP DETAIL



P-1101/1102 PAD SUMP PUMPS	P-1202/1203 EXISTING D-1 SUMP PUMPS	P-1204 RAW WATER SUMP PUMP
TYPE: SUBMERSIBLE CENTRIFUGAL CAPACITY: 85 GPM @ 27' TDH MOTOR: 1 HP, 460/3/60 MODEL: BARNES 3SEV-DS	TYPE: SUBMERSIBLE CENTRIFUGAL CAPACITY: 85 GPM @ 27' TDH MOTOR: 1 HP, 460/3/60 MODEL: BARNES 3SEV-DS	TYPE: CENTRIFUGAL CAPACITY: MOTOR: 3HP, 460/3/60 1750RPM MODEL:

REV	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
1	11-15-13	RECORD DRAWING – REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
2	9-26-06	RECORD DRAWING	DM	RL
3	5-30-06	LINE 489A REFERENCED PID-17 INSTEAD OF PID-10C	DM	RL
4	02-28-06	REVISED PER CUSTOMER COMMENTS	JEK	SF
5	12-27-05	ISSUED FOR CONSTRUCTION	DM	SF

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PIPING & INSTRUMENTATION DIAGRAM

UTILITY SYSTEMS

DRAWING SCALE	N/A
DESIGNED BY/DATE	RL/ 06-02-03
DRAWN BY/DATE	LJ/ 06-02-03
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SHEET SIZE	D
REVISION	4
SHEET 20 OF 26	
DRAWING #	1373-PID11
FILE #	1373-PID11-4

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INSTRUMENT AIR SYSTEM

DRAWING # 1373-PID12 SHEET 1 OF 1 FILE #

1 1/2"-IA-CSTP40-100-N (PIPED AS LOOP AROUND EQUIPMENT PAD)

INSTRUMENT AIR MAIN HEADER 67 PID-8

1/2"-IA-CSTP40-100-N

94 INSTRUMENT AIR PID-1A

95 INSTRUMENT AIR PID-1B

CENTERED AIR HOSE STATION FBR AREA 1/2" V-1208

98 INSTRUMENT AIR PID-3A

99 INSTRUMENT AIR PID-3A

100 INSTRUMENT AIR PID-3A

96 INSTRUMENT AIR PID-2B

97 INSTRUMENT AIR PID-2A

3/4"-IA-CSTP40-486-N

1/2" V-1009

3/4" V-4866

114 INSTRUMENT AIR PID-6

113 INSTRUMENT AIR PID-5

486 INSTRUMENT AIR PID-17

95A INSTRUMENT AIR PID-1B

105 INSTRUMENT AIR PID-3D

104 INSTRUMENT AIR MAIN HEADER PID-3C

101 INSTRUMENT AIR PID-3B

102 INSTRUMENT AIR PID-3B

103 INSTRUMENT AIR PID-3B

CENTERED AIR HOSE STATION DAF AREA

1/2" V-1209 1/2" V-1209A

1/2"-IA-CSTP40-443-N 1/2" V-4435

INSTRUMENT AIR MAIN HEADER 67 PID-8

1/2" V-1212 LOW POINT DRAIN

119 INSTRUMENT AIR PID-9

1/2" V-1211 CENTERED AIR HOSE STATION FILTER PRESSES

1/2"-IA-CSTP40-100-N

519 INSTRUMENT AIR PID-10C

443 INSTRUMENT AIR PID-14

1/2" V-1210 CENTERED AIR HOSE STATION SOLIDS CONDITION AREA

115 INSTRUMENT AIR PID-7C

1 1/2"-SLM-CVCP80-001-HT&I

1 1/2" 1 1/2"X1 1/4" V-1205

YA 1205 YA 1205 FS 1205 TV 1205

SS-1205
(SOUTH OF FBR-3)

2"-SLM-CVCP80-001-N

2"X1/2" 1/2" V-1109 NEAR HOSE STATION THICKNER TANK

SEAL FLUSH 402 PID-16 1"-SLM-CVCP80-402A-N

LAKE MEAD WATER 527 PID-9 1"-SLM-CVCP80-527-N 1" V-5271

EXISTING NEW

SEAL FLUSH 487 PID-17 1 1/2"-SLM-CVCP80-487-N

BLDG OUT IN

2"-SLM-CVCP80-001-N

3"X2" 2" V-1207

BLDG OUT IN 1/2" VD-063

2"-SLM-CVCP80-001-HT&I

1 1/2" V-1211

2"-SLM-CVCP80-546-N

2"X1 1/2" 1 1/2" 1 1/2"X1 1/4" V-4000

YA 1208 FS 1208 TV 1208

SS-1208
(NEAR FBR A)

2" VD-012

2" V-5397

2"-SLM-CVCP80-544-N

NUTRIENT FEED ASSY 544 PID-7A

PHOS ACID SKID 539 PID-15

2"-SLM-CVCP80-539-N

122 BIOFILTER PID-4

2"X1/2" 1/2" V-1107 CENTERED HOSE STATION FBR AREA

1 1/2"-SLM-CVCP80-001-HT&I 1 1/2" V-1206

1 1/2"X1 1/4" YA 1206 FS 1206 TV 1206

SS-1206
(NORTH OF FBR-7)

1 1/2"-SLM-CVCP80-546-HT&I

1 1/2"-SLM-CVCP80-001-N

1 1/2" V-1203

1 1/2"X1 1/4" YA 1203 FS 1203 TV 1203

SS-1203
(SOLID COND. TANK)

1 1/2" V-1210

1 1/2"X1 1/4" YA 1210 FS 1210 TV 1210

SS-1210
(D-1 POLYMER FEED)

1 1/2"X1 1/4" YA 1211 FS 1211 TV 1211

SS-1211
(NORTH END OF D1 BUILDING)

2"X1/2" 1/2" V-1108

CENTERED HOSE STATION DAF AREA

1 1/2" V-1202

1 1/2"X1 1/4" YA 1202 FS 1202 TV 1202

SS-1202
(FERRIC TANK)

2"X1/2" 1/2" V-1207A

STABILIZED 106 LAKE WATER PID-6

NEAR HOSE STATION FILTER PRESSES

EXISTING NEAR F-201A/B

SS-1207

F-1302A F-1302B

PI 11 1/2" 1312

BLDG OUT IN 3" 1301 STABILIZED LAKE MEAD WATER

1/2" UV1323 3" HV1319 1/2" UV1325 3" HV1320

1/2" UV1324 3" HV1321 PI 12 1/2" UV1326 3" HV1322

1/2" UV1313

3/4" V-1232

TV 1207

3" HV1304 PI 13 1/2" V-574 3" HV1303

1/2" V-610A 3"X2" PCV 10

3" HV1302 3"X2"

BLDG OUT IN 1 1/4"

OPERATIONS TRLR WATER SUPPLY

NEAR HOSE STATION FILTER F-201A/B 3/4" UV1310

STABILIZED LAKE WATER

1 1/4" HV1314

YA 1201 FS 1201 TV 1201

EXISTING SS-1201
(NEAR AIR COMPR.)

F-201A/B EXISTING CARTRIDGE FILTERS		
TYPE: 10 MICRON CARTRIDGE CAPACITY:		

NOTE:
ALL SAFETY SHOWERS HAVE LOCAL LIGHTS AND HORNS

REV	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
5	11-15-13	RECORD DRAWING – REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
4	9-26-06	RECORD DRAWING	DM	RL
3	6-14-06	REV. TIE-IN #16, SEAL FLUSH LINE NUMBER	DM	RL
2	4-26-06	ADDED CONNECTION TO PID-07A, PID-9	JEK	SF
1	12-27-05	ISSUED FOR CONSTRUCTION	DM	SF

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SHEET SIZE: D
REVISION: 4
SHEET 21 OF 26
DRAWING # 1373-PID12
FILE # 1373-PID12-4

NERT
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PIPING & INSTRUMENTATION DIAGRAM

UTILITY SYSTEMS

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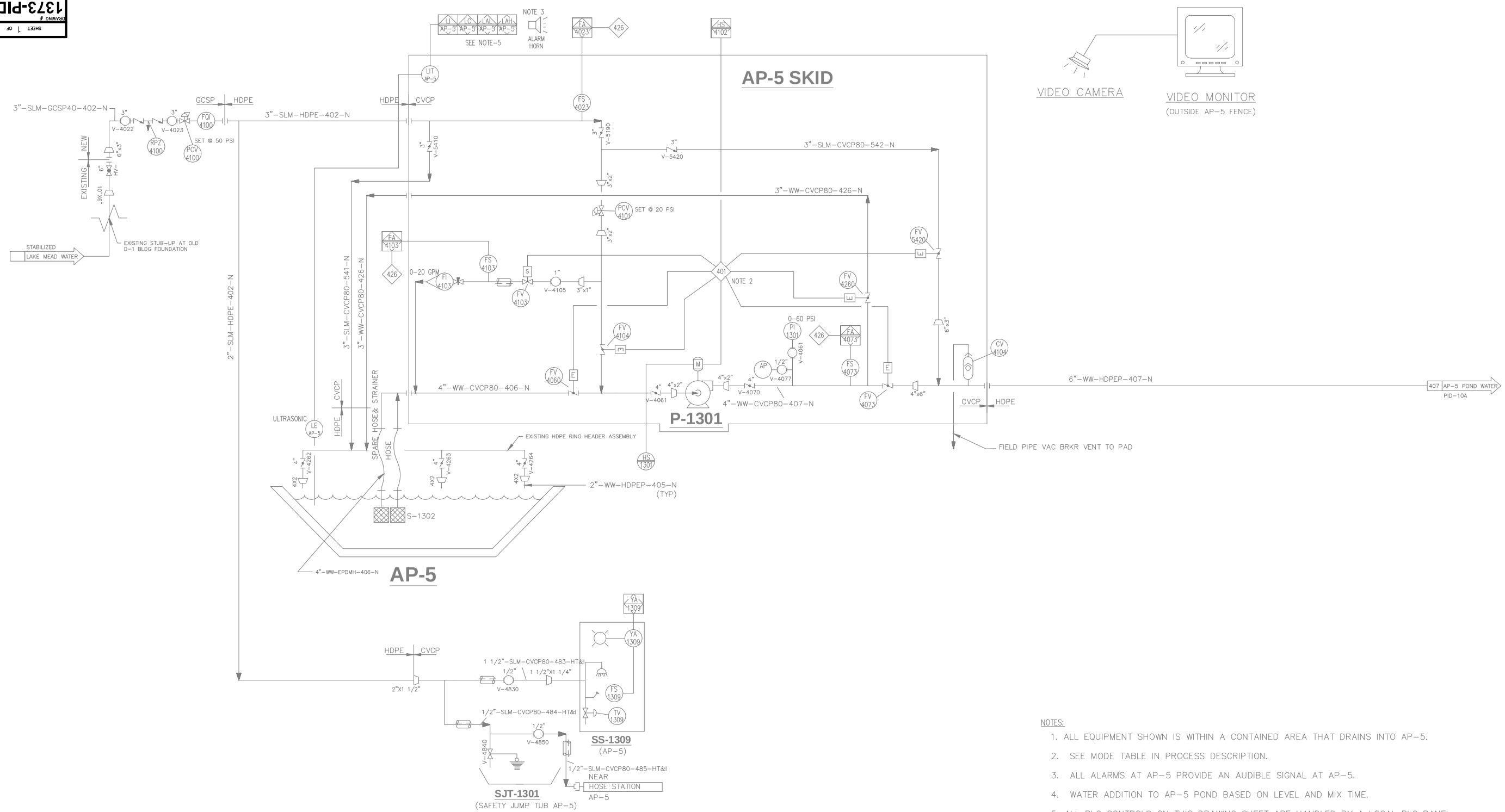

NOTES:

1. ALL EQUIPMENT SHOWN IS WITHIN A CONTAINED AREA THAT DRAINS INTO AP-5.
2. SEE MODE TABLE IN PROCESS DESCRIPTION.
3. ALL ALARMS AT AP-5 PROVIDE AN AUDIBLE SIGNAL AT AP-5.
4. WATER ADDITION TO AP-5 POND BASED ON LEVEL AND MIX TIME.
5. ALL PLC CONTROLS ON THIS DRAWING SHEET ARE HANDLED BY A LOCAL PLC PANEL.

NOTE:
THIS DRAWING CONTAINS ALL NEW/NON-EXISTENT EQUIPMENT EXCEPT AS NOTED.

AP-5 POND	P-1301 AP-5 SUCTION PUMP						
TYPE: CAPACITY: 1.5 MILLION GAL.	TYPE: CENTRIFUGAL WETTED MAT'LS: POLYESTER/EPDM STAINLESS CAPACITY: 150 gpm@ 55' TDH MOTOR: 5 HP, 460VAC, 3PH MODEL: SE2ILND5.0C MFR: PACER						

REV	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
4	11-15-13	RECORD DRAWING – REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
3	9-26-06	RECORD DRAWING	DM	RL
2	4-26-06	REVISE LAKE MEAD WATER SUPPLY	JEK	RL
1	12-27-05	ISSUED FOR CONSTRUCTION	DM	SF

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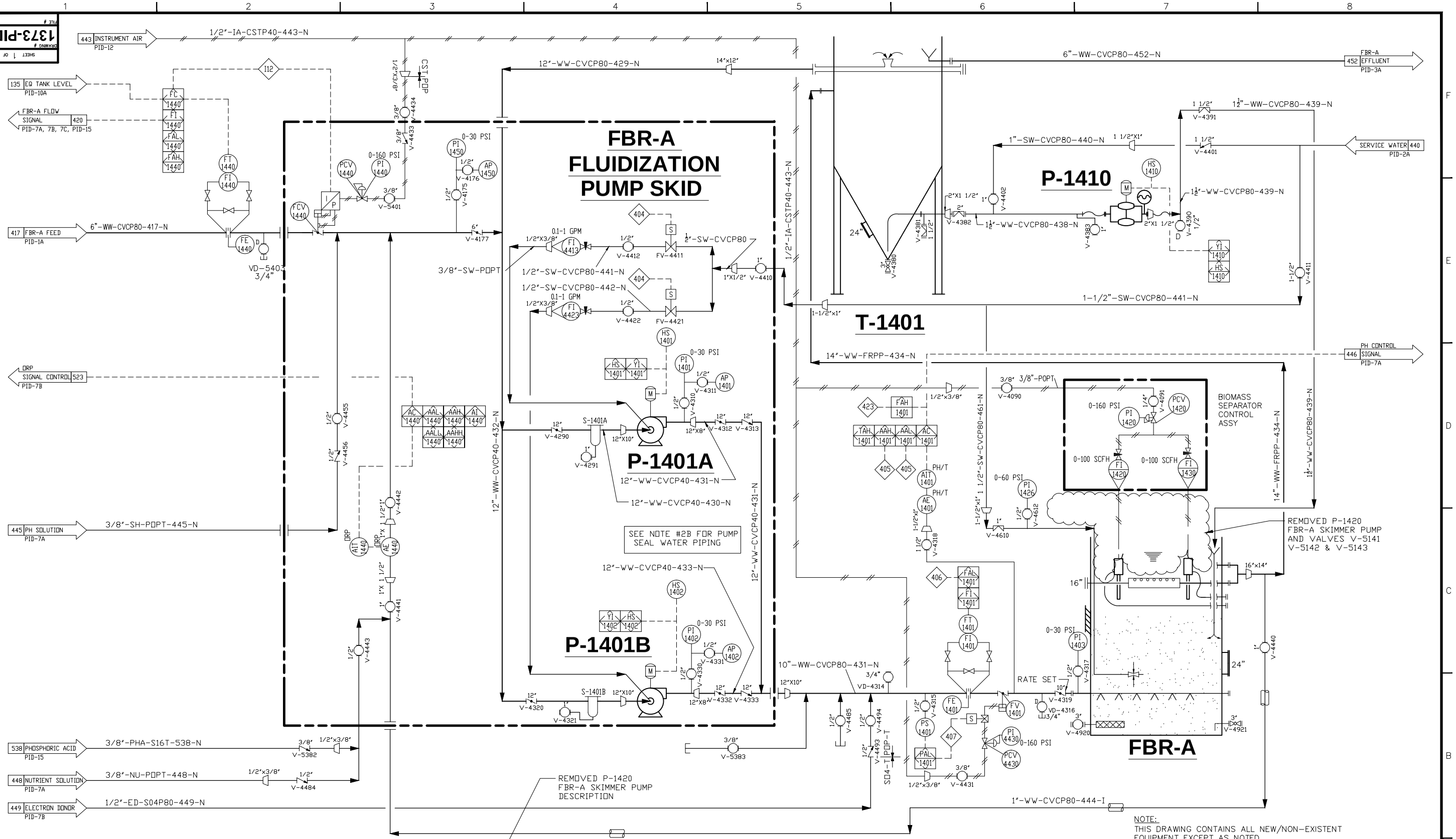
DRAWING SCALE: N/A
DESIGNED BY/DATE: MD/ 03-15-05
DRAWN BY/DATE: DM/ 03-18-05
CHECKED BY/DATE: SF/ 03-18-05
SHEET SIZE: D
REVISION: 3
SHEET 22 OF 26
DRAWING #: 1373-PID13
FILE #: 1373-PID13-3

NERT
HENDERSON, NV

PIPING & INSTRUMENTATION DIAGRAM

AP-5 POND EQUIPMENT



FBR-A FLUIDIZED BED REACTOR	P-1401A, 1401B FBR-A FLUIDIZATION PUMPS	T-1401 SEPARATOR TANK	P-1410 MEDIA RETURN PUMP
SIZE: 14' DIA. X 30' STR. MAT'LS: FRP CAPACITY: 33,000 GAL MEDIA TYPE: SAND MEDIA VOLUME: 2,010 CU. FT.	TYPE: CENTRIFUGAL CAPACITY: 2,000 GPM @ 40'TDH WETTED MAT'L: FRP MOTOR: 30 HP,460 VAC, 3PH MODEL: FYBROC SERIES 1500, 10x8x15	SIZE: 10' DIA. X 30' HT. MAT'LS: FRP CAPACITY: 8,500 GAL	TYPE: ELECTRIC DIAPHRAGM CAPACITY: 30 GPM @ 40'TDH WETTED MAT'LS: PVC, NEOPRENE MOTOR: 1.0 HP,460 VAC,3 PH MODEL: PENN VALLEY 2" DOUBLE DISC

U.S. PATENTS 5750028, 5788842, 6706521 AND PATENTS PENDING.

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3	11-15-13	RECORD DRAWING – REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
2	9-26-06	RECORD DRAWING	DM	RL
1	4-26-06	REVISED PER CUSTOMER COMMENTS	JEK	RL
0	12-27-05	ISSUED FOR CONSTRUCTION	DM	SF

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FBR-A SYSTEM

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SHEET SIZE	D
REVISION	3
SHEET 23 OF 26	
DRAWING #	1373-PID14
FILE #	1373-PID14-3

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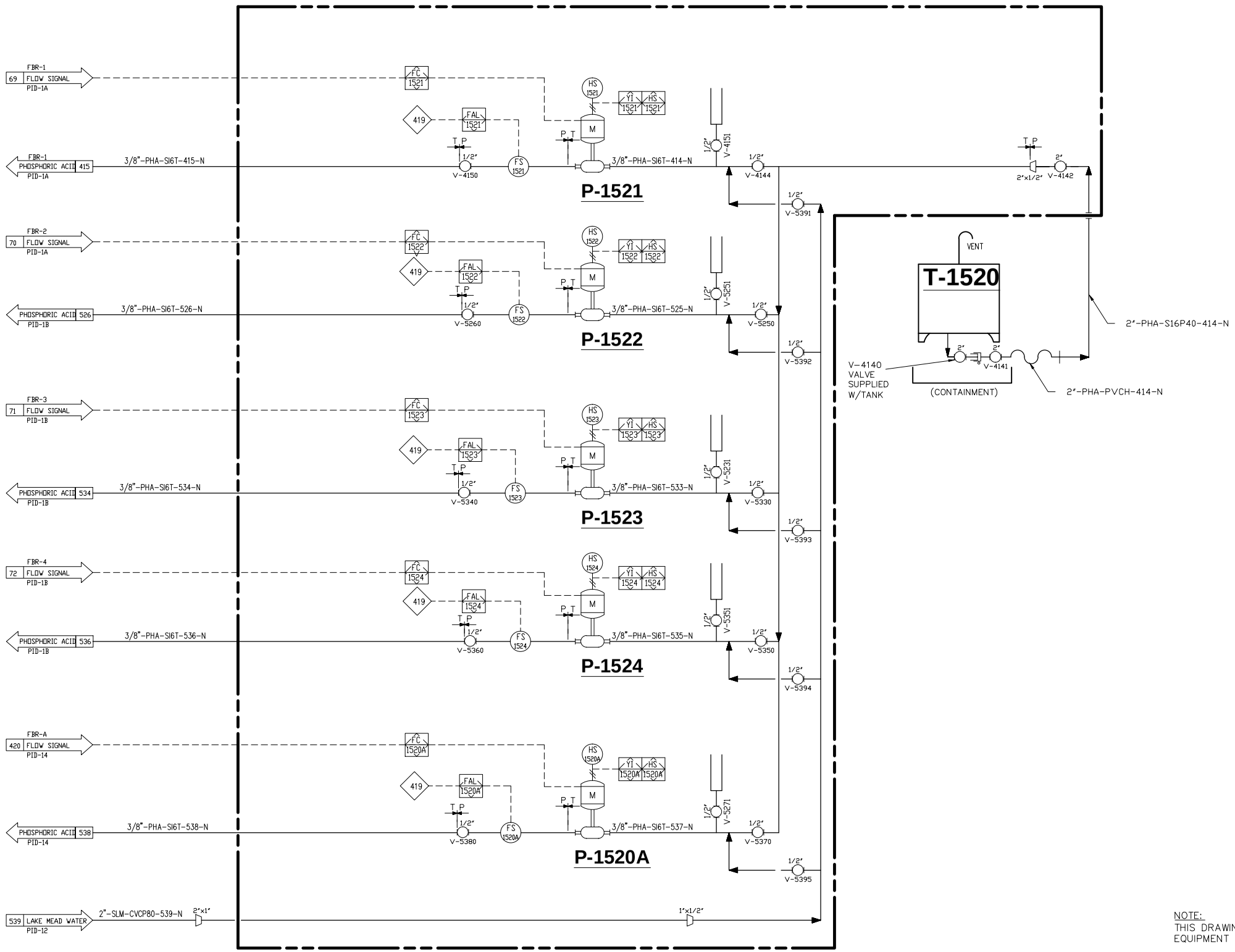
DRAWING # 1373-PID14 FILE # SHEET 1 OF 1

PHOSPHORIC ACID ASSEMBLY



NOTE:
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T-1520 PHOSPHORIC ACID TOTE	P-1520A/1521/1522 /1523/1524 PHOSPHORIC ACID PUMP
TYPE: TOTE MAT'LS: POLY CAPACITY: 320 GAL.	TYPE: PERISTALTIC WETTED MAT'LS: CAPACITY: 0.08-0.54 GPH MOTOR: MODEL: VA-975-3000 L/S 13 MFR: MASTER FLEX

REV	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
1	11-15-13	RECORD DRAWING - REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
0	9-26-06	RECORD DRAWING	DM	RL
2	5-10-06	DELETED DUPLICATE VALVES	DM	RL
1	4-26-06	REISSUED FOR CONSTRUCTION	JEK	RL
0	12-27-05	ISSUED FOR CONSTRUCTION	DM	SF

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SHEET SIZE: D
REVISION: 4
SHEET 24 OF 26
DRAWING # 1373-PID15
FILE # 1373-PID15-4

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PIPING & INSTRUMENTATION DIAGRAM

PHOSPHORIC ACID FEED

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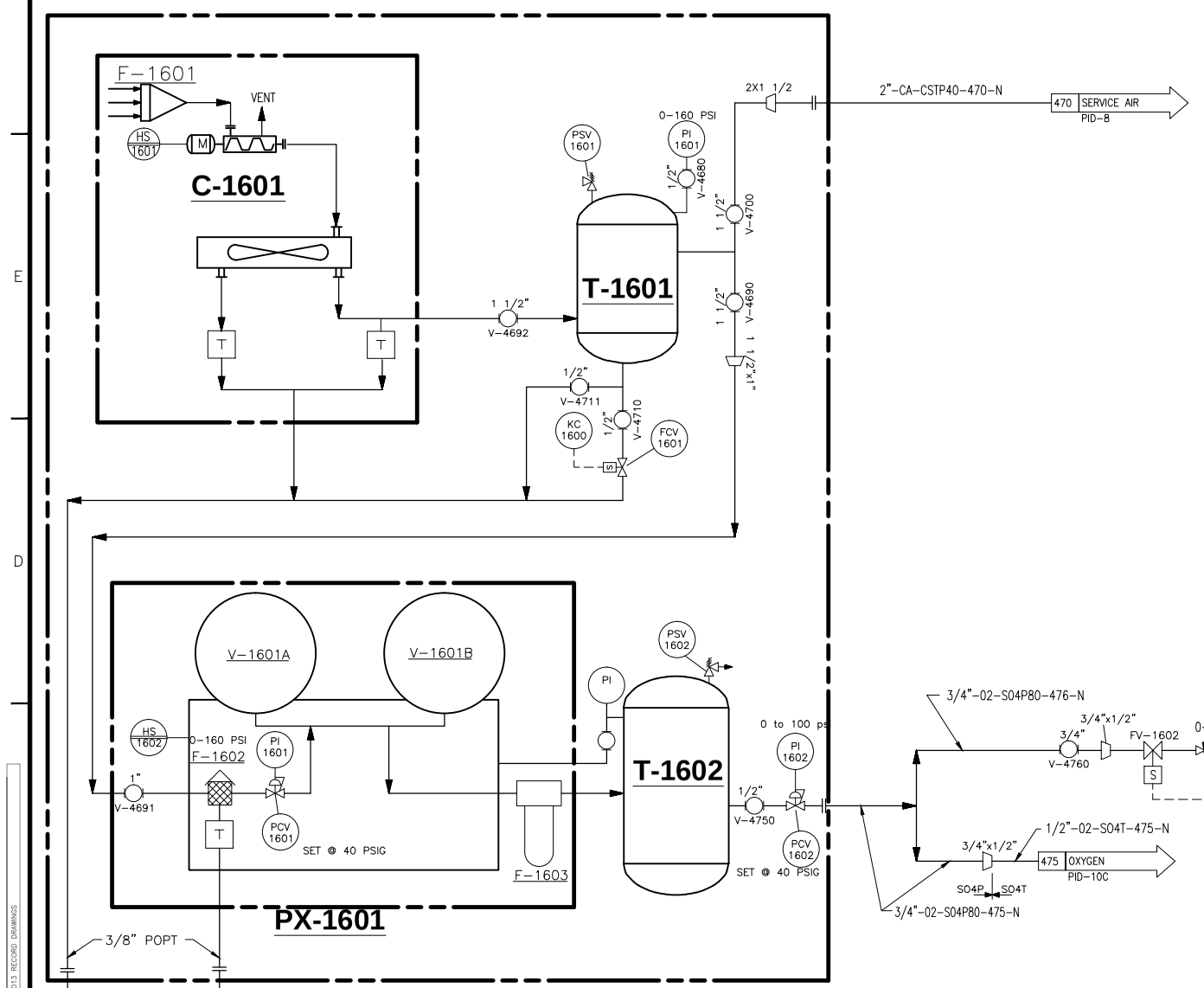
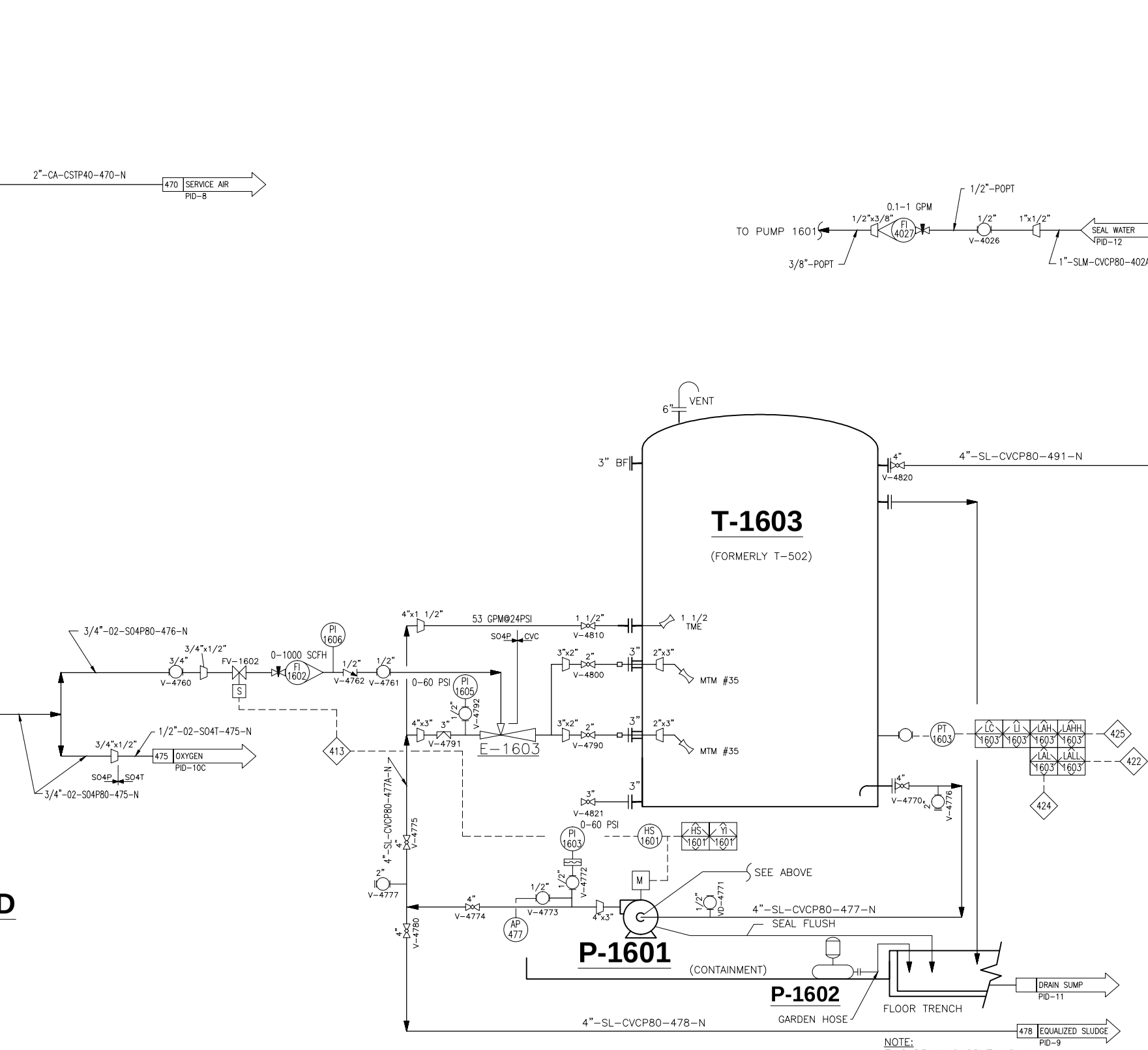


OXYGEN / AIR TREATMENT SKID



NOTE:
THIS DRAWING CONTAINS ALL NEW/NON-EXISTENT EQUIPMENT EXCEPT AS NOTED.

P-1602
CONTAINMENT PUMP

TYPE: UTILITY
CAPACITY: 16.7 gpm @ 5' TDH
MOTOR: 1/6 HP, 115 VAC, 1 PH
MODEL: 3YU54
MFR: DAYTON

T-1601 AIR RECEIVER	T-1602 OXYGEN RECEIVER	F-1601 AIR FILTER	F-1602 AIR FILTER	F-1603 AIR FILTER	PX-1601 PSA OXYGEN GENERATOR	C-1601 COMPRESSOR	P-1601 SLUDGE PUMP	T-1603 SLUDGE STORAGE TANK
SIZE: 240 GAL. DIMENSIONS: 30" X 92"	CAPACITY: 240 GAL SIZE: 30"X92"	TYPE: PREFILTER MODEL:		TYPE: COALESCING MODEL: WILKERSON F35/M35	CAPACITY: 750 SCFH @ 45 PSIG O2 PURITY: 95% POWER: 110 VAC/60 HZ/ 1 PH MODEL: ON-SITE MODEL O-75	TYPE: ROTARY SCREW, DIRECT DRIVE CAPACITY: 166 SCFM @ 125 PSIG MOTOR: 40HP 230/460V/60HZ/1PH MODEL: KAESER ASD-40ST	TYPE: DISCFLO WETTED MAT'L: CO-4MCU CAPACITY: 213 gpm @ 58' TDH MOTOR: 10 HP, 460 VAC, 3 PH MODEL: 403-12-2HHD MFR: DISCFLO	SIZE: 10'-0" DIA. X 16'-3" STR. MAT'LS: FRP CAPACITY: 8,200 GAL.

REV	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
5	11-15-13	RECORD DRAWING - REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
3	9-26-06	RECORD DRAWING	DM	RL
2	6-14-06	REV. SEAL WATER LINE NUMBER	DM	RL
1	4-26-06	REISSUED FOR CONSTRUCTION	JEK	SF
0	12-27-05	ISSUED FOR CONSTRUCTION	DM	SF

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SLUDGE STORAGE & OXYGEN SKID

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REVISION	4
SHEET	25 OF 26
DRAWING #	1373-PID16
FILE #	1373-PID16-4

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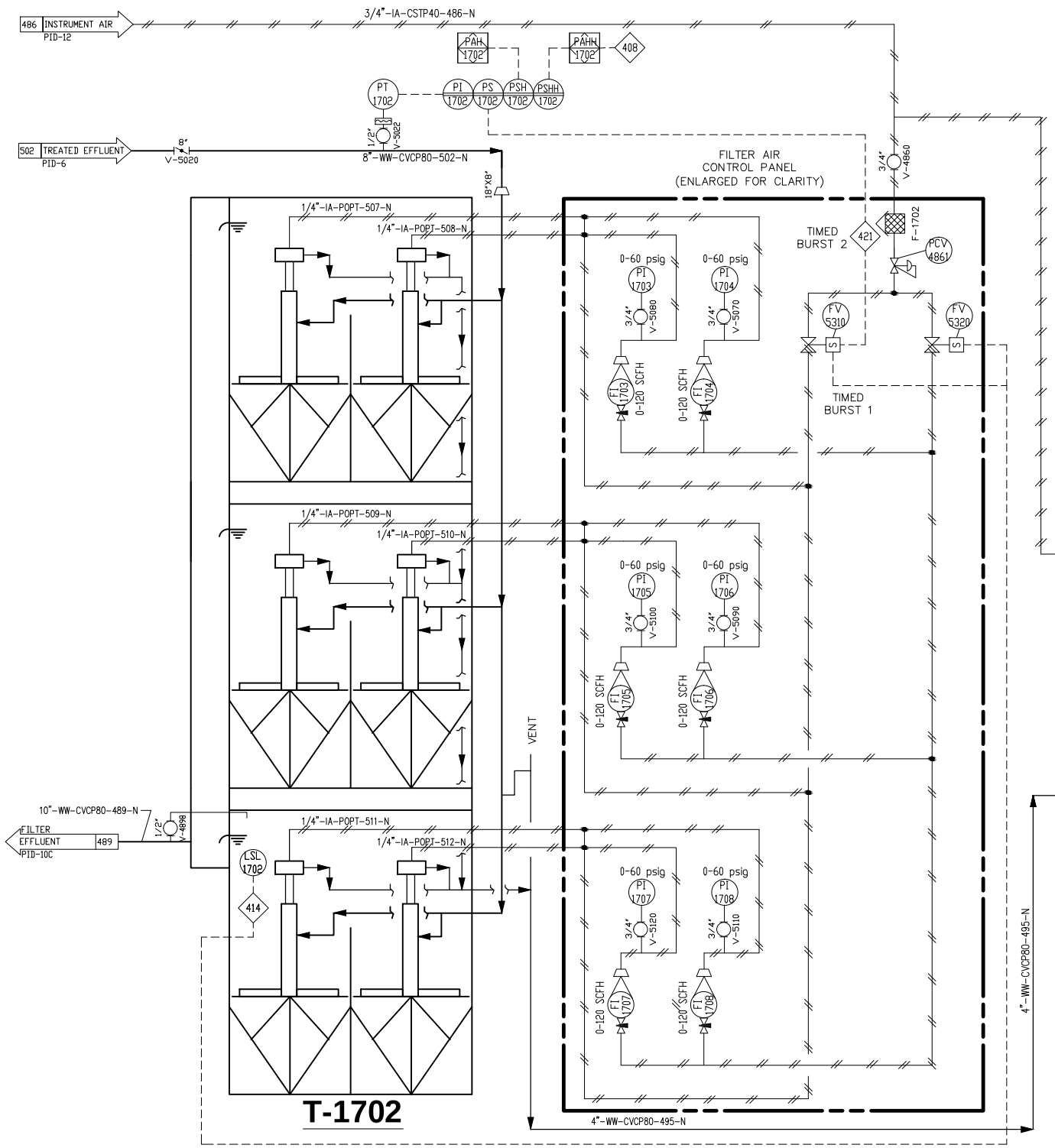
DRAWING # 1373-PID17
SHEET 1 OF 1
FILE #



T-1701 FILTER REJECT TANK	P-1701A, 1701B FILTER REJECT PUMPS	T-1702 CONTINUOUS SAND FILTER	F-1702 AIR FILTER		
SIZE: 6'-2" DIA. x 4'-9" STR. MAT'L: HDPE CAPACITY: 1,000 GAL.	TYPE: HORIZONTAL CENTRIFUGAL MAT'L: FRP CAPACITY: 150 GPM @ 50 FT MOTOR: 5 HP, 460 VAC, 3 PH MODEL: FYBROC 1500 (2X3X8)	TYPE: PARKSON DYNASAND MAT'L: CONCRETE BASIN, FRP, CPVC, TITANIUM HARDWARE MEDIA: SAND SURFACE AREA: 300 ft² NO. OF CELLS: 6	LIQUID REMOVAL: MAX. LIQ. LOAD: SOLID PARTICLE: OIL CARRY-OVER: PRESS. DROP: CAPACITY: MODEL:		

NOTE:
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REV	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
3	11-15-13	RECORD DRAWING - REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
2	9-26-06	RECORD DRAWING	DM	RL
1	4-26-06	ISSUED FOR CONSTRUCTION (MINOR MODIFICATIONS)	JK	RL
0	12-27-05	ISSUED FOR CONSTRUCTION	DM	SF

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CHECKED BY/DATE: SF/ 03-18-05
SHEET SIZE: D
REVISION: 3
SHEET 26 OF 26
DRAWING # 1373-PID17
FILE # 1373-PID17-3

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PIPING & INSTRUMENTATION DIAGRAM

SAND FILTER

U.S. PATENTS 5750028, 5788842, 6706521 AND PATENTS PENDING.

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REV	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
A	11-15-13	RECORD DRAWING – REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
A	10-16-06	RECORD DRAWING – AS NOTED	CM	RL
A	9-26-06	RECORD DRAWING	CM	RL
A	6-12-06	ISSUED FOR CONSTRUCTION, REVISE ELEVATIONS, SHEET 2	RL	RL
A	12-27-05	ISSUED FOR CONSTRUCTION	CM	RL

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N/A	RL/ 1-7-03	LJ/ 1-7-03	RL/ 12-20-05

SHEET SIZE	REVISION
D	4

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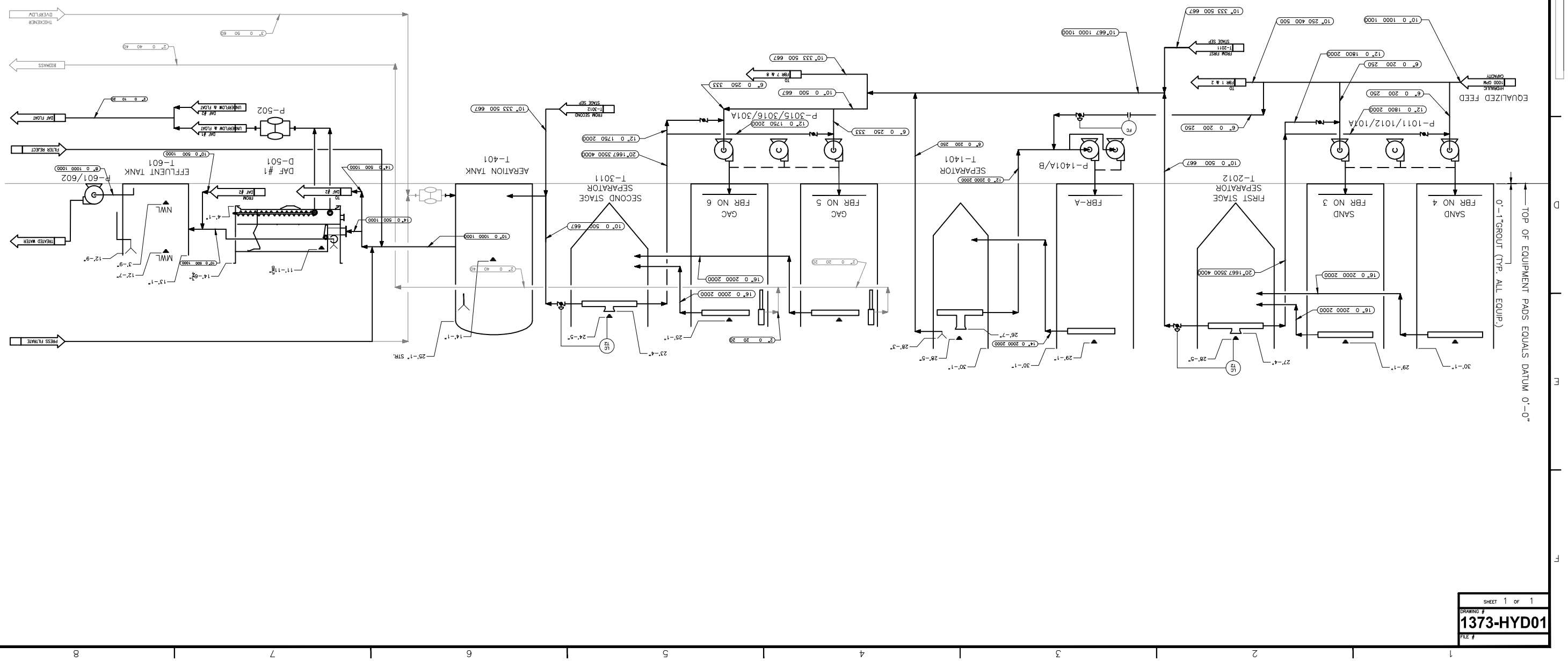
HYDRAULIC PROFILE
FLUIDIZED BED PERCHLORATE
TREATMENT SYSTEM
SHEET 1 OF 2

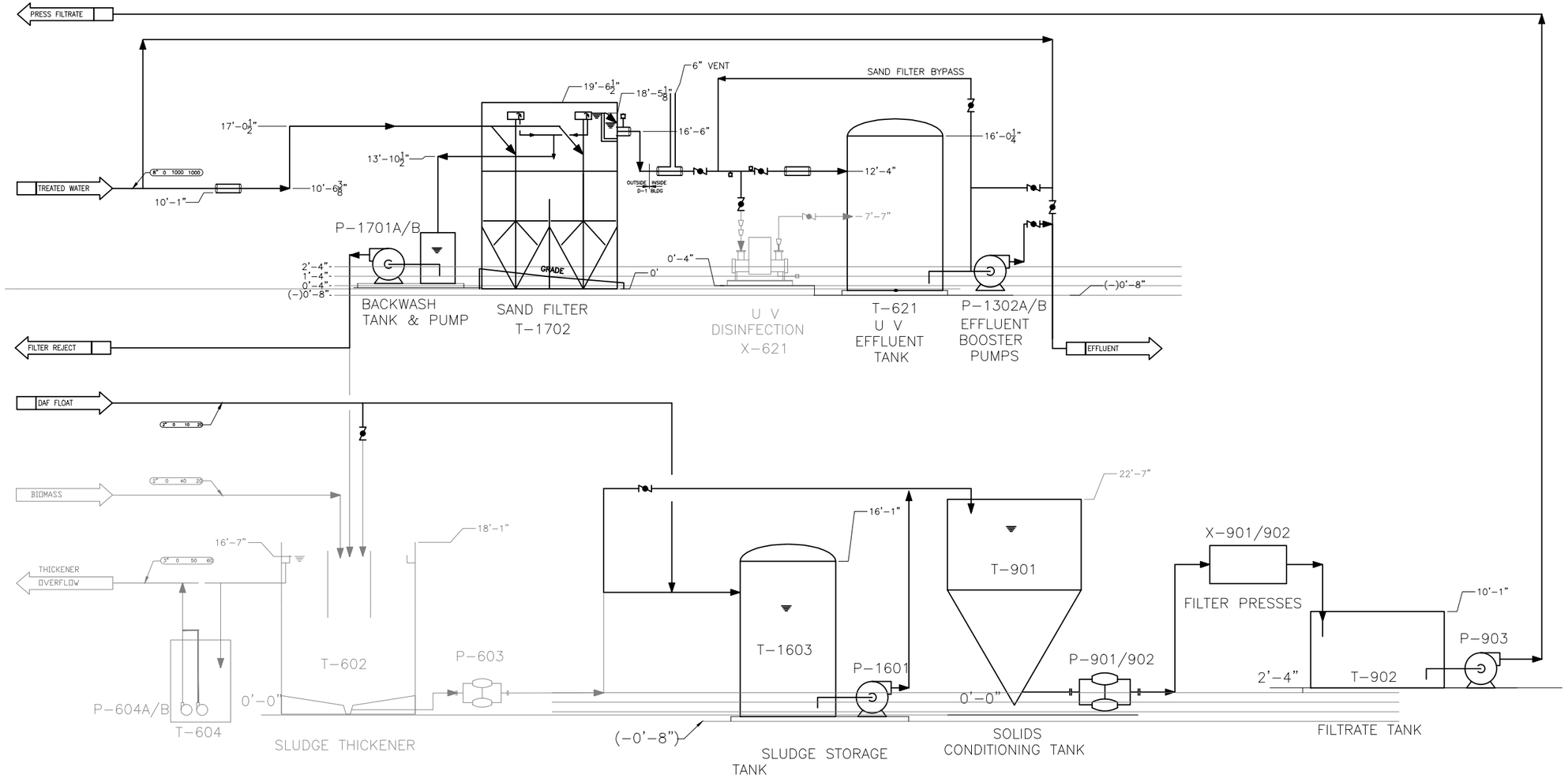
DRAWING #	SHEET 1 OF 2
1373-HYD01	
FILE # 1373-HYD01-4	

GENERAL NOTE:

1. 10" 0 500 1000

PIPE SIZE
MIN FLOW
DESIGN FLOW
MAX FLOW





REV	DATE	DESCRIPTION OF REVISION	REVISED BY	CHECKED BY
5	11-15-13	RECORD DRAWING – REVISED FOR 2013 CURRENT OPERATIONS & REVISED O&M MANUAL	DL	DW
3	10-16-06	RECORD DRAWING – AS NOTED	DM	RL
2	9-26-06	RECORD DRAWING	DM	RL
1	4-12-06	ISSUED FOR CONSTRUCTION, REVISE ELEVATIONS, SHEET 2	RL	RL
0	12-27-05	ISSUED FOR CONSTRUCTION	DM	RL

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DRAWN BY/DATE: LJ/ 1-7-03
CHECKED BY/DATE: RL/ 12-20-05
SHEET SIZE: D
REVISION: 4
SHEET 2 OF 2
DRAWING # 1373-HYD01
FILE # 1373-HYD01-4

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HYDRAULIC PROFILE FLUIDIZED BED PERCHLORATE TREATMENT SYSTEM SHEET 2 OF 2

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SHEET 1 OF 1
DRAWING # 1373-HYD01
FILE #

APPENDIX I
ENGINEERING LISTS

- Valve List
- Line List
- Instrument List

Nevada Environmental Response Trust (NERT)
Perchlorate Treatment System
Henderson, NV

	Valve No.	Valve size (in.)	Valve Type	Valve Spec.	Comment
1A	V-LATER	6"	BUTTERFLY	BUV1	FEED LINE B
1A	V-1020	6"	BUTTERFLY	BUV1	FEED LINE A
1A	V-1050	1/4"	BALL		COPLANAR, FE-1010
1A	V-1060	1/4"	BALL		COPLANAR, FE-1020
1A	FCV-1010	6"	ACTUATED	BUV1	FEED LINE A
1A	PCV-1010	1/4"	REGULATOR		FCV-1010
1A	V-1070	3/8"	BALL	BAV2	AIR FEED TO PCV-1010
1A	FCV-1020	6"	ACTUATED	BUV1	FEED LINE B
1A	PCV-1020	1"	REGULATOR		FCV-1020
1A	V-1080	3/8"	BALL	BAV2	AIR FEED TO PCV-1020
1A	V-1090	1/2"	CHECK	CHV3	PH FEED TO FEED LINE A
1A	V-1100	1/2"	CHECK	CHV3	PH FEED TO FEED LINE B
1A	V-1110	1/2"	BALL	BAV1	PH FEED TO FEED LINE A
1A	V-1120	1/2"	BALL	BAV1	PH FEED TO FEED LINE B
1A	V-1130	1/2"	BALL	BAV1	PI-1040
1A	V-1140	1/2"	BALL	BAV1	PI-1050
1A	V-1150	1/2"	BALL	BAV1	AP-1020
1A	V-1160	1/2"	BALL	BAV1	AP-1030
1A	V-1170	6"	BUTTERFLY	BUV1	FEED PUMP P-1011
1A	V-1180	6"	BUTTERFLY	BUV1	FEED PUMP P-1012
1A	V-1190	6"	BUTTERFLY	BUV1	FEED PUMP P-101A (ALT)
1A	V-1200	6"	BUTTERFLY	BUV1	FEED PUMP P-101A (ALT)
1A	V-1210	1/2"	BALL	BAV2	AIR FEED TO PUMP SKID
1A	V-1220	1/2"	BALL	BAV2	AIR FEED TO FBR-1 & 2
1A	V-1251	1"	BALL	BAV1	S-1011
1A	V-108A	1"	BALL	BAV1	S-101A
1A	V-1252	1"	BALL	BAV1	S-1012
P-101A	V-101A	12"	BUTTERFLY	BUV2	FEED TO PUMP P-101A(ALT)
P-101A	V-102A	1/2"	BALL	BAV1	PI-101A
P-101A	V-103A	1/2"	BALL	BAV1	AP-101A
P-101A	V-104A	12"	BUTTERFLY	BUV2	DISCH PUMP P-101A(ALT)
P-101A	V-105A	12"	CHECK	CHV1	DISCH PUMP P-101A(ALT)
P-101A	V-106A	12"	BUTTERFLY	BUV2	DISCH PUMP P-101A(ALT) TO FBR-1
P-101A	V-107A	12"	BUTTERFLY	BUV2	DISCH PUMP P-101A (ALT) TO FBR-2
P-1011	V-1011	12"	BUTTERFLY	BUV2	FEED TO PUMP P-1011
P-1011	V-1021	1/2"	BALL	BAV2	PI-1011
P-1011	V-1031	1/2"	BALL	BAV2	AP-1011
P-1011	V-1041	12"	BUTTERFLY	BUV2	DISCH PUMP P-1011
P-1011	V-1051	12"	CHECK	CHV1	DISCH PUMP P-1011
P-1011	V-1061	1/2"	BALL	BAV2	NUTRIENT FEED TO FBR-1
P-1011	V-1071	1/2"	CHECK	CHV3	NUTRIENT FEED TO FBR-1
P-1011	V-1081	1/2"	BALL	BAV2	ELECT DONOR FEED TO FBR-1
P-1011	V-1091	1/2"	CHECK	CHV3	ELECT DONOR FEED TO FBR-1
P-1011	V-1101	1/2"	BALL	BAV2	AE-1011
P-1011	V-1111	1/2"	BALL	BAV2	PS-1011
P-1011	V-1121	1/4"	BALL		COPLANAR
P-1011	FV-1011	10"	ACTUATED	BUV2	FBR-1 INLET
P-1011	V-1131	10"	BUTTERFLY	BUV2	RATE SET FOR FBR-1
P-1011	V-1141	1/2"	BALL	BAV2	PI-1021
P-1011	V-1230	3/8"	BALL	BAV2	FC-1011
FBR-1	V-1151	3"	BALL	BAV1	FBR-1 NOZZLE W/STRAINER
FBR-1	V-1161	3"	PLUG	PGV2	FBR-1 DRAIN
FBR-1	V-1171	2"	BALL	BAV1	P-1021 INTAKE
FBR-1	V-1181	2"	BALL	BAV1	P-1021 INTAKE
FBR-1	V-1191	1/2"	BALL	BAV1	PI-1031
FBR-1	V-1201	1/2"	BALL	BAV1	AP-1021
FBR-1	V-1211	2"	PINCH	PIV1	P-1021 DISCH
FBR-1	V-1221	1"	BALL	BAV1	FBR-1 DISCH TO ORP FEED
FBR-1	V-1231	1"	BALL	BAV1	INLET TO AE-1021
FBR-1	V-1241	1"	BALL	BAV1	OUTLET FROM AE-1021
P-1012	V-1012	12"	BUTTERFLY	BUV2	FEED TO PUMP P-1012
P-1012	V-1022	1/2"	BALL	BAV1	PI-1012
P-1012	V-1032	1/2"	BALL	BAV1	AP-1012
P-1012	V-1042	12"	BUTTERFLY	BUV2	DISCH PUMP P-1012
P-1012	V-1052	12"	CHECK	CHV1	DISCH PUMP P-1012
P-1012	V-1062	1/2"	BALL	BAV1	NUTRIENT FEED TO FBR-2

Nevada Environmental Response Trust (NERT)
Perchlorate Treatment System
Henderson, NV

	Valve No.	Valve size (in.)	Valve Type	Valve Spec.	Comment
P-1012	V-1072	1/2"	CHECK	CHV3	NUTRIENT FEED TO FBR-2
P-1012	V-1082	1/2"	BALL	BAV1	ELECT DONOR FEED TO FBR-2
P-1012	V-1092	1/2"	CHECK	CHV3	ELECT DONOR FEED TO FBR-2
P-1012	V-1102	1/2"	BALL	BAV1	AE-1012
P-1012	V-1112	1/2"	BALL	BAV1	PS-1012
P-1012	V-1122	1/4"	BALL		COPLANAR
P-1012	FV-1012	10"	ACTUATED	BUV2	FBR-2 INLET
P-1012	V-1132	10"	BUTTERFLY	BUV2	RATE SET FOR FBR-2
P-1012	V-1142	1/2"	BALL	BAV1	PI-1022
P-1012	V-1240	3/8"	BALL	BAV2	FC-1012
FBR-2	V-1152	3"	BALL	BAV1	FBR-2 NOZZLE W/STRAINER
FBR-2	V-1162	3"	PLUG	PGV2	FBR-2 DRAIN
FBR-2	V-1172	2"	BALL	BAV1	P-1022 INTAKE
FBR-2	V-1182	2"	BALL	BAV1	P-1022 INTAKE
FBR-2	V-1192	1/2"	BALL	BAV1	PI-1032
FBR-2	V-1202	1/2"	BALL	BAV1	AP-1022
FBR-2	V-1212	2"	PINCH	PIV1	P-1022 DISCH
FBR-2	V-1222	1"	BALL	BAV1	FBR-2 DISCH TO ORP FEED
FBR-2	V-1232	1"	BALL	BAV1	INLET TO AE-1022
FBR-2	V-1242	1"	BALL	BAV1	OUTLET FROM AE-1022
1B	V-1340	6"	BUTTERFLY	BUV1	FEED LINE D
1B	V-1330	6"	BUTTERFLY	BUV1	FEED LINE C
1B	V-1350	1/4"	BALL		COPLANAR
1B	V-1360	1/4"	BALL		COPLANAR
1B	FCV-1110	6"	ACTUATED	BUV1	FEED LINE C
1B	PCV-1110	1/4"	REGULATOR		FCV-1110
1B	V-1370	3/8"	BALL	BAV2	AIR FEED TO PCV-1110
1B	FCV-1120	6"	ACTUATED	BUV1	FEED LINE D
1B	PCV-1120	1/4"	REGULATOR		FCV-1120
1B	V-1370	3/8"	BALL	BAV2	AIR FEED TO PCV-1120
1B	V-1390	1/2"	CHECK	CHV3	PH FEED TO FEED LINE C
1B	V-1400	1/2"	CHECK	CHV3	PH FEED TO FEED LINE D
1B	V-1410	1/2"	BALL	BAV1	PH FEED TO FEED LINE C
1B	V-1420	1/2"	BALL	BAV1	PH FEED TO FEED LINE D
1B	V-1430	1/2"	BALL	BAV1	PI-1140
1B	V-1440	1/2"	BALL	BAV1	PI-1150
1B	V-1450	1/2"	BALL	BAV1	AP-1120
1B	V-1460	1/2"	BALL	BAV1	AP-1130
1B	V-1470	6"	BUTTERFLY	BUV1	FEED PUMP P-1013
1B	V-1480	6"	BUTTERFLY	BUV1	FEED PUMP P-1014
1B	V-1490	6"	BUTTERFLY	BUV1	FEED PUMP P-102A (ALT)
1B	V-1500	6"	BUTTERFLY	BUV1	FEED PUMP P-102A (ALT)
1B	V-1510	1/2"	BALL	BAV2	AIR FEED TO PUMP SKID
1B	V-1520	1/2"	BALL	BAV2	AIR FEED TO FBR-3 & 4
1B	V-1253	1"	BALL	BAV1	S-1013
1B	V-108A	1"	BALL	BAV1	S-102A
1B	V-1254	1"	BALL	BAV1	S-1014
P-102A	V-111A	12"	BUTTERFLY	BUV2	FEED TO PUMP P-102A (ALT)
P-102A	V-112A	1/2"	BALL	BAV1	PI-102A
P-102A	V-113A	1/2"	BALL	BAV1	AP-102A
P-102A	V-114A	12"	BUTTERFLY	BUV2	DISCH PUMP P-102A (ALT)
P-102A	V-115A	12"	CHECK	CHV1	DISCH PUMP P-102A (ALT)
P-102A	V-116A	12"	BUTTERFLY	BUV2	DISCH PUMP P-102A(ALT) TO FBR-3
P-102A	V-1530	12"	BUTTERFLY	BUV2	DISCH PUMP P-102A (ALT) TO FBR-4
P-1013	V-1013	12"	BUTTERFLY	BUV2	FEED TO PUMP P-1013
P-1013	V-1023	1/2"	BALL	BAV2	PI-1013
P-1013	V-1033	1/2"	BALL	BAV2	AP-1013
P-1013	V-1043	12"	BUTTERFLY	BUV2	DISCH PUMP P-1013
P-1013	V-1053	12"	CHECK	CHV1	DISCH PUMP P-1013
P-1013	V-1063	1/2"	BALL	BAV2	NUTRIENT FEED TO FBR-3
P-1013	V-1073	1/2"	CHECK	CHV3	NUTRIENT FEED TO FBR-3
P-1013	V-1083	1/2"	BALL	BAV2	ELECT DONOR FEED TO FBR-3
P-1013	V-1093	1/2"	CHECK	CHV3	ELECT DONOR FEED TO FBR-3
P-1013	V-1103	1/2"	BALL	BAV2	AE-1013
P-1013	V-1113	1/2"	BALL	BAV2	PS-1013
P-1013	V-1123	1/4"	BALL		COPLANAR

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	Valve No.	Valve size (in.)	Valve Type	Valve Spec.	Comment
P-1013	FV-1013	10"	ACTUATED	BUV2	FBR-3 INLET
P-1013	V-1133	10"	BUTTERFLY	BUV2	RATE SET FOR FBR-3
P-1013	V-1143	1/2"	BALL	BAV2	PI-1023
P-1013	V-1530	3/8"	BALL	BAV2	AIR FEED TO FV-1013
FBR-3	V-1153	3"	BALL	BAV1	FBR-3 NOZZLE W/STRAINER
FBR-3	V-1163	3"	PLUG	PGV2	FBR-3 DRAIN
FBR-3	V-1173	2"	BALL	BAV1	P-1023 INTAKE
FBR-3	V-1183	2"	BALL	BAV1	P-1023 INTAKE
FBR-3	V-1193	1/2"	BALL	BAV1	PI-1033
FBR-3	V-1203	1/2"	BALL	BAV1	AP-1023
FBR-3	V-1213	2"	PINCH	PIV1	P-1023 DISCH
FBR-3	V-1223	1"	BALL	BAV1	FBR-3 DISCH TO ORP FEED
FBR-3	V-1233	1"	BALL	BAV1	INLET TO AE-1023
FBR-3	V-1243	1"	BALL	BAV1	OUTLET FROM AE-1023
P-1014	V-1014	12"	BUTTERFLY	BUV2	FEED TO PUMP P-1014
P-1014	V-1024	1/2"	BALL	BAV2	PI-1014
P-1014	V-1034	1/2"	BALL	BAV2	AP-1014
P-1014	V-1044	12"	BUTTERFLY	BUV2	DISCH PUMP P-1014
P-1014	V-1054	12"	CHECK	CHV1	DISCH PUMP P-1014
P-1014	V-1064	1/2"	BALL	BAV2	NUTRIENT FEED TO FBR-4
P-1014	V-1074	1/2"	CHECK	CHV3	NUTRIENT FEED TO FBR-4
P-1014	V-1084	1/2"	BALL	BAV2	ELECT DONOR FEED TO FBR-4
P-1014	V-1094	1/2"	CHECK	CHV3	ELECT DONOR FEED TO FBR-4
P-1014	V-1104	1/2"	BALL	BAV2	AE-1014
P-1014	V-1114	1/2"	BALL	BAV2	PS-1014
P-1014	V-1124	1/4"	BALL		COPLANAR
P-1014	FV-1014	10"	ACTUATED	BUV2	FBR-4INLET
P-1014	V-1134	10"	BUTTERFLY	BUV2	RATE SET FOR FBR-4
P-1014	V-1144	1/2"	BALL	BAV2	PI-1024
P-1014	V-1540	3/8"	BALL	BAV2	AIR FEED TO FV-1014
FBR-4	V-1154	3"	BALL	BAV1	FBR-4 NOZZLE W/STRAINER
FBR-4	V-1164	3"	PLUG	PGV2	FBR-4 DRAIN
FBR-4	V-1174	2"	BALL	BAV1	P-1024 INTAKE
FBR-4	V-1184	2"	BALL	BAV1	P-1024INTAKE
FBR-4	V-1194	1/2"	BALL	BAV1	PI-1034
FBR-4	V-1204	1/2"	BALL	BAV1	AP-1024
FBR-4	V-1214	2"	PINCH	PIV1	P-1024 DISCH
FBR-4	V-1224	1"	BALL	BAV1	FBR-4 DISCH TO ORP FEED
FBR-4	V-1234	1"	BALL	BAV1	INLET TO AE-1024
FBR-4	V-1244	1"	BALL	BAV1	OUTLET FROM AE-1024
2A	V-2011	1 1/2"	DIAPHRAGM	DIV4	T-2011 SIDE DRAIN
2A	V-2021	4"	PLUG	PGV2	T-2011 CONE DRAIN
2A	V-2031	1 1/2"	DIAPHRAGM	DIV4	T-2011 DISCH
2A	FV-2011	1 1/2"	ACTUATED	DIV4	T-2011 DISCH
2A	FV-2021	1"	ACTUATED	BAV1	SERVICE WATER INLET
2A	FV-2031	1 1/2"	ACTUATED	DIV4	P-2011 INLET
2A	V-2041	1 1/2"	BALL	BAV1	SERVICE WATER INLET
2A	V-2051	1 1/2"	CHECK	CHV2	SERVICE WATER INLET
2A	V-2061	1 1/2"	DIAPHRAGM	DIV4	P-2011 DISCH TO FBR-1
2A	V-2071	1 1/2"	DIAPHRAGM	DIV4	P-2011 DISCH TO FBR-2
2A	LCV-2011	10"	ACTUATED	BUV2	T-2011 FBR EFFLUENT
2A	PCV-2011	3/8"	REGULATOR		AIR FEED TO LCV-2011
2A	V-2081	1/2"	BALL	BAV2	AIR FEED TO FV-2011
2A	V-2091	1/2"	BALL	BAV2	AIR FEED TO BUBLER & LCV-2011
2A	V-2101	3/8"	BALL	BAV2	AIR FEED TO LCV-2011
2A	V-2111	1"	BALL	BAV1	CPVC, P-2011 INLET DRAIN
2A	V-2151	3/8"	BALL	BAV2	AIR FEED TO FV-2011
2A	V-2131	3/8"	BALL	BAV2	AIR FEED TO FV-2021
2A	V-2141	3/8"	BALL	BAV2	AIR FEED TO FV-2031
2A	V-2121	3/8"	BALL	BAV2	AIR FEED TO FI-2011
2A	V-2161	3/8"	BALL	BAV2	FROM FI-2011
2A	V-2171	3/8"	BALL	BAV2	FROM FI-2011
2B	V-2012	1 1/2"	DIAPHRAGM	DIV4	T-2012 SIDE DRAIN
2B	V-2022	4"	PLUG	PGV2	T-2012 CONE DRAIN
2B	V-2032	1 1/2"	DIAPHRAGM	DIV4	T-2012 DISCH
2B	FV-2012	1 1/2"	ACTUATED	DIV4	T-2012 DISCH

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2B	FV-2022	1"	ACTUATED	BAV1	SERVICE WATER INLET
2B	FV-2032	1 1/2"	ACTUATED	DIV4	P-2012 INLET
2B	V-2042	1 1/2"	BALL	BAV1	SERVICE WATER INLET
2B	V-2052	1 1/2"	CHECK	CHV2	SERVICE WATER INLET
2B	V-2062	1 1/2"	DIAPHRAGM	DIV4	P-2012 DISCH TO FBR-3
2B	V-2072	1 1/2"	DIAPHRAGM	DIV4	P-2012 DISCH TO FBR-4
2B	LCV-2012	10"	ACTUATED	BUV2	T-2012 FBR EFFLUENT
2B	PCV-2012	3/8"	REGULATOR		AIR FEED TO LCV-2012
2B	V-2082	1/2"	BALL	BAV2	AIR FEED TO FV-2012
2B	V-2092	1/2"	BALL	BAV2	AIR FEED TO BUBLER & LCV-2012
2B	V-2102	3/8"	BALL	BAV2	AIR FEED TO LCV-2012
2B	V-2122	3/8"	BALL	BAV2	AIR FEED TO FI-2012
2B	V-2132	3/8"	BALL	BAV2	AIR FEED TO FV-2022
2B	V-2142	3/8"	BALL	BAV2	AIR FEED TO FV-2032
2B	V-2152	3/8"	BALL	BAV2	AIR FEED TO FV-2012
2B	V-2112	1"	BALL	BAV1	CPVC, P-2012 INLET DRAIN
2B	V-2162	3/8"	BALL	BAV2	FROM FI-2012
2B	V-2172	3/8"	BALL	BAV2	FROM FI-2012
3A	V-3000	10"	BUTTERFLY	BUV2	1 ST. STEAGE 1&2 EFFLUENY
3A	V-3020	10"	BUTTERFLY	BUV2	2 ND. STAGE BY-PASS
3A	V-3010	10"	BUTTERFLY	BUV2	1 ST. STAGE 3 & 4 EFFLUENT
3A	V-3030	1/2"	BALL	BAV1	PI-3000
3A	V-3050	1/4"	BALL		COPLANAR, FE3020
3A	V-3060	1/4"	BALL		COPLANAR, FE3010
3A	V-3040	1/2"	BALL	BAV1	AP-3000
3A	FCV-3010	6"	ACTUATED	BUV1	FEED LINE A
3A	FCV-3020	6"	ACTUATED	BUV1	FEED LINE B
3A	V-3090	1/2"	CHECK	CHV3	PH FEED
3A	V-3100	1/2"	CHECK	CHV3	PH FEED
3A	V-3110	1/2"	BALL	BAV1	PH FEED
3A	V-3120	1/2"	BALL	BAV1	PH FEED
3A	V-3130	1/2"	BALL	BAV1	PI-3010
3A	V-3140	1/2"	BALL	BAV1	PI-3020
3A	V-3150	1/2"	BALL	BAV1	AP-3010
3A	V-3160	1/2"	BALL	BAV1	AP-3020
3A	V-3170	6"	BUTTERFLY	BUV1	FEED PUMP P-3015
3A	V-3180	6"	BUTTERFLY	BUV1	FEED PUMP P-3016
3A	V-3190	6"	BUTTERFLY	BUV1	FEED PUMP P-301A (ALT)
3A	V-3200	6"	BUTTERFLY	BUV1	FEED PUMP P-301A (ALT)
3A	V-3015	12"	BUTTERFLY	BUV2	FEED TO PUMP P-3015
3A	V-301A	12"	BUTTERFLY	BUV2	FEED TO PUMP P-301A
3A	V-3016	12"	BUTTERFLY	BUV2	FEED TO PUMP P-3016
3A	V-3210	1/2"	BALL	BAV2	AIR FEED TO FCV-3010 & 3020
3A	V-3220	1/2"	BALL	BAV2	AIR FEED TO FCV-3015 & 3016
3A	PCV-3010	1/4"	REGULATOR		FCV-3010
3A	V-3070	3/8"	BALL	BAV2	AIR FEED TO PCV-3010
3A	PCV-3020	1/4"	REGULATOR		FCV-3020
3A	V-3080	3/8"	BALL	BAV2	AIR FEED TO PCV-3020
3A	V-3255	1"	BALL	BAV1	S-3015
3A	V-308A	1"	BALL	BAV1	S-301A
3A	V-3256	1"	BALL	BAV1	S-3016
P-301A	V-302A	1/2"	BALL	BAV1	PI-301A
P-301A	V-303A	1/2"	BALL	BAV1	AP-301A
P-301A	V-304A	12"	BUTTERFLY	BUV2	P-301A DISCH
P-301A	V-305A	12"	CHECK	CHV1	P-301A DISCH
P-301A	V-306A	12"	BUTTERFLY	BUV2	DISCH P-301A TO FBR-5
P-301A	V-307A	12"	BUTTERFLY	BUV2	DISCH P-301A TO FBR-6
P-3015	V-3025	1/2"	BALL	BAV1	PI-3015
P-3015	V-3035	1/2"	BALL	BAV1	AP-3015
P-3015	V-3045	12"	BUTTERFLY	BUV2	P-3015 DISCH
P-3015	V-3055	12"	CHECK	CHV1	P-3015 DISCH
P-3015	V-3065	1/2"	BALL	BAV1	NUTRIENT FEED
P-3015	V-3075	1/2"	CHECK	CHV3	NUTRIENT FEED
P-3015	V-3085	1/2"	BALL	BAV1	ELECTR DONOR FEED
P-3015	V-3095	1/2"	CHECK	CHV3	ELECTR DONOR FEED
P-3015	V-3105	1/2"	BALL	BAV1	AE-3015

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P-3015	V-3115	1/2"	BALL	BAV1	PS-3015
P-3015	V-3125	1/4"	BALL		COPLANAR
P-3015	FV-3015	10"	ACTUATED	BUV2	FBR-5 INLET
P-3015	V-3135	10"	BUTTERFLY	BUV2	RATE SET FOR FBR-5
P-3015	V-3145	1/2"	BALL	BAV1	PI-3025
P-3015	V-3265	3/8"	BALL	BAV2	STEEL, AIR FEED TO FV-3015
FBR-5	V-3155	3"	BALL	BAV1	FBR-5 NOZZLE W/STRAINER
FBR-5	V-3165	3"	PLUG	PGV2	FBR-5 DRAIN
FBR-5	V-3175	1"	BALL	BAV1	ORP AE3025
FBR-5	V-3205	1"	DIAPHRAGM	DIV1	SERVICE WATER TO FBR-5
FBR-5	V-3215	1/2"	BALL	BAV1	PI-3035
FBR-5	V-3225	1/2"	BALL	BAV2	AIR FEED TO BIOMASS CNTRL PNLS
FBR-5	V-3235	1/4"	BALL	BAV3	AIR FEED TO BIOMASS CNTRL PNL A
FBR-5	PCV-3055	1/4"	REGULATOR		AIR FEED TO BIOMASS CNTRL PNL A
FBR-5	V-3245	1/4"	BALL	BAV3	AIR FEED TO BIOMASS CNTRL PNL B
FBR-5	PCV-3045	1/4"	REGULATOR		AIR FEED TO BIOMASS CNTRL PNL B
P-3016	V-3026	1/2"	BALL	BAV1	PI-3016
P-3016	V-3036	1/2"	BALL	BAV1	AP-3016
P-3016	V-3046	12"	BUTTERFLY	BUV2	P-3016 DISCH
P-3016	V-3056	12"	CHECK	CHV1	P-3016 DISCH
P-3016	V-3066	1/2"	BALL	BAV1	NUTRIENT FEED
P-3016	V-3076	1/2"	CHECK	CHV3	NUTRIENT FEED
P-3016	V-3086	1/2"	BALL	BAV1	ELECTR DONOR FEED
P-3016	V-3096	1/2"	CHECK	CHV3	ELECTR DONOR FEED
P-3016	V-3106	1/2"	BALL	BAV1	AE-3016
P-3016	V-3116	1/2"	BALL	BAV1	PS-3016
P-3016	V-3126	1/4"	BALL		COPLANAR
P-3016	FV-3016	10"	ACTUATED	BUV2	FBR-6 INLET
P-3016	V-3136	10"	BUTTERFLY	BUV2	RATE SET FOR FBR-6
P-3016	V-3146	1/2"	BALL	BAV1	PI-3026
P-3016	V-3266	3/8"	BALL	BAV2	STEEL, AIR FEED TO FV-3016
FBR-6	V-3156	3"	BALL	BAV1	FBR-6 NOZZLE W/STRAINER
FBR-6	V-3166	3"	PLUG	PGV2	FBR-6 DRAIN
FBR-6	V-3176	1"	BALL	BAV1	ORP AE3026
FBR-6	V-3206	1"	DIAPHRAGM	DIV1	SERVICE WATER TO FBR-6
FBR-6	V-3216	1/2"	BALL	BAV1	PI-3036
FBR-6	V-3226	1/2"	BALL	BAV2	AIR FEED TO BIOMASS CNTRL PNLS
FBR-6	V-3236	1/4"	BALL	BAV3	AIR FEED TO BIOMASS CNTRL PNL C
FBR-6	PCV-3026	1/4"	REGULATOR		AIR FEED TO BIOMASS CNTRL PNL C
FBR-6	V-3246	1/4"	BALL	BAV3	AIR FEED TO BIOMASS CNTRL PNL D
FBR-6	PCV-3046	1/4"	REGULATOR		AIR FEED TO BIOMASS CNTRL PNL D
P-3015	V-3185	1"	BALL	BAV1	AE-3025
P-3015	V-3195	1"	BALL	BAV1	AE-3025
P-3016	V-3186	1"	BALL	BAV1	AE-3026
P-3016	V-3196	1"	BALL	BAV1	AE-3026
3B	V-3330	1/2"	BALL	BAV1	PI-3100
3B	V-3340	1/2"	BALL	BAV1	AP-3100
3B	V-3320	10"	BUTTERFLY	BUV2	FBR- 7&8 EFFLUENT
3B	V-3350	1/4"	BALL		COPLANAR, FE3030
3B	V-3360	1/4"	BALL		COPLANAR, FE3040
3B	FCV-3040	6"	ACTUATED	BUV1	FEED LINE A
3B	FCV-3040	6"	ACTUATED	BUV1	FEED LINE B
3B	V-3390	1/2"	CHECK	CHV3	PH FEED
3B	V-3340	1/2"	CHECK	CHV3	PH FEED
3B	V-3410	1/2"	BALL	BAV1	PH FEED
3B	V-3420	1/2"	BALL	BAV1	PH FEED
3B	V-3430	1/2"	BALL	BAV1	PI-3110
3B	V-3440	1/2"	BALL	BAV1	PI-3120
3B	V-3450	1/2"	BALL	BAV1	AP-3110
3B	V-3460	1/2"	BALL	BAV1	AP-3120
3B	V-3470	6"	BUTTERFLY	BUV1	FEED PUMP P-3017
3B	V-3480	6"	BUTTERFLY	BUV1	FEED PUMP P-3018
3B	V-3490	6"	BUTTERFLY	BUV1	FEED PUMP P-302A (ALT)
3B	V-3500	6"	BUTTERFLY	BUV1	FEED PUMP P-302A (ALT)
3B	V-3017	12"	BUTTERFLY	BUV2	FEED TO PUMP P-3017
3B	V-3018	12"	BUTTERFLY	BUV2	FEED TO PUMP P-3018

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	Valve No.	Valve size (in.)	Valve Type	Valve Spec.	Comment
3B	V-311A	12"	BUTTERFLY	BUV2	FEED TO PUMP P-302A
3B	V-3510	1/2"	BALL	BAV2	AIR FEED TO FCV-3030 & 3040
3B	V-3520	1/2"	BALL	BAV2	AIR FEED TO FCV-3017 & 3018
3B	PCV-3110	1/4"	REGULATOR		FCV-3030
3B	V-3370	3/8"	BALL	BAV2	AIR FEED TO PCV-3030
3B	PCV-3120	1/4"	REGULATOR		FCV-3040
3B	V-3380	3/8"	BALL	BAV2	AIR FEED TO PCV-3040
3B	V-3257	1"	BALL	BAV1	S-3017
3B	V-318A	1"	BALL	BAV1	S-302A
3B	V-3258	1"	BALL	BAV1	S-3018
P-302A	V-312A	1/2"	BALL	BAV1	PI-302A
P-302A	V-313A	1/2"	BALL	BAV1	AP-302A
P-302A	V-314A	12"	BUTTERFLY	BUV2	P-302A DISCH
P-302A	V-315A	12"	CHECK	CHV1	P-302A DISCH
P-302A	V-316A	12"	BUTTERFLY	BUV2	DISCH P-302A TO FBR-7
P-302A	V-317A	12"	BUTTERFLY	BUV2	DISCH P-302A TO FBR-8
P-3017	V-3027	1/2"	BALL	BAV1	PI-3017
P-3017	V-3037	1/2"	BALL	BAV1	AP-3017
P-3017	V-3047	12"	BUTTERFLY	BUV2	P-3017 DISCH
P-3017	V-3057	12"	CHECK	CHV1	P-3017 DISCH
P-3017	V-3087	1/2"	BALL	BAV1	NUTRIENT FEED
P-3017	V-3097	1/2"	CHECK	CHV3	NUTRIENT FEED
P-3017	V-3067	1/2"	BALL	BAV1	ELECTR DONOR FEED
P-3017	V-3077	1/2"	CHECK	CHV3	ELECTR DONOR FEED
P-3017	V-3107	1/2"	BALL	BAV1	AE-3017
P-3017	V-3117	1/2"	BALL	BAV1	PS-3017
P-3017	V-3127	1/4"	BALL		COPLANAR
P-3017	FV-3017	10"	ACTUATED	BUV2	FBR-7 INLET
P-3017	V-3137	10"	BUTTERFLY	BUV2	RATE SET FOR FBR-7
P-3017	V-3147	1/2"	BALL	BAV1	PI-3027
P-3017	V-3267	3/8"	BALL	BAV2	STEEL, AIR FEED TO FV-3017
FBR-7	V-3157	3"	BALL	BAV1	FBR-7 NOZZLE W/STRAINER
FBR-7	V-3167	3"	PLUG	PGV2	FBR-5 DRAIN
FBR-7	V-3177	1"	BALL	BAV1	ORP-AE-3027, FBR-7 RECYCLE
FBR-7	V-3207	1"	DIAPHRAGM	DIV1	SERVICE WATER TO FBR-7
FBR-7	V-3037	1/2"	BALL	BAV1	PI-3037
FBR-7	V-3227	1/2"	BALL	BAV2	AIR FEED TO BIOMASS CNTRL PNLS
FBR-7	V-3237	1/4"	BALL	BAV3	AIR FEED TO BIOMASS CNTRL PNL A
FBR-7	PCV-3027	1/4"	REGULATOR		AIR FEED TO BIOMASS CNTRL PNL A
FBR-7	V-3247	1/4"	BALL	BAV3	AIR FEED TO BIOMASS CNTRL PNL B
FBR-7	PCV-3017	1/4"	REGULATOR		AIR FEED TO BIOMASS CNTRL PNL B
P-3018	V-3028	1/2"	BALL	BAV1	PI-3018
P-3018	V-3038	1/2"	BALL	BAV1	AP-3018
P-3018	V-3048	12"	BUTTERFLY	BUV2	P-3018 DISCH
P-3018	V-3058	12"	CHECK	CHV1	P-3018 DISCH
P-3018	V-3068	1/2"	BALL	BAV1	NUTRIENT FEED
P-3018	V-3078	1/2"	CHECK	CHV3	NUTRIENT FEED
P-3018	V-3088	1/2"	BALL	BAV1	ELECTR DONOR FEED
P-3018	V-3098	1/2"	CHECK	CHV3	ELECTR DONOR FEED
P-3018	V-3108	1/2"	BALL	BAV1	AE-3018
P-3018	V-3118	1/2"	BALL	BAV1	PS-3018
P-3018	V-3128	1/4"	BALL		COPLANAR
P-3018	FV-3018	10"	ACTUATED	BUV2	FBR-8 INLET
P-3018	V-3138	10"	BUTTERFLY	BUV2	RATE SET FOR FBR-8
P-3018	V-3148	1/2"	BALL	BAV1	PI-3028
P-3018	V-3268	3/8"	BALL	BAV2	STEEL, AIR FEED TO FV-3018
FBR-8	V-3158	3"	BALL	BAV1	FBR-8 NOZZLE W/STRAINER
FBR-8	V-3168	3"	PLUG	PGV2	FBR-8 DRAIN
FBR-8	V-3178	1"	BALL	BAV1	ORP-AE-3028, FBR-8 RECYCLE
FBR-8	V-3208	1"	DIAPHRAGM	DIV1	SERVICE WATER TO FBR-8
FBR-8	V-3218	1/2"	BALL	BAV1	PI-3038
FBR-8	V-3228	1/2"	BALL	BAV2	AIR FEED TO BIOMASS CNTRL PNLS
FBR-8	V-3238	1/4"	BALL	BAV3	AIR FEED TO BIOMASS CNTRL PNL C
FBR-8	PCV-3028	1/4"	REGULATOR		AIR FEED TO BIOMASS CNTRL PNL C
FBR-8	V-3248	1/4"	BALL	BAV3	AIR FEED TO BIOMASS CNTRL PNL D
FBR-8	PVC-3018	1/4"	REGULATOR		AIR FEED TO BIOMASS CNTRL PNL D

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	Valve No.	Valve size (in.)	Valve Type	Valve Spec.	Comment
FBR-8	V-3188	1"	BALL	BAV1	AE-3028
FBR-8	V-3198	1"	BALL	BAV1	AE-3028
FBR-8	V-3187	1"	BALL	BAV1	AE-3027
FBR-8	V-3197	1"	BALL	BAV1	AE-3027
3C	V-3611	1 1/2"	DIAPHRAGM	DIV4	T-3011 SIDE DRAIN
3C	V-3621	4"	PLUG	PGV2	T-3011 CONE DRAIN
3C	V-3631	1 1/2"	DIAPHRAGM	DIV4	T-3011 DISCH
3C	FV-3011	1 1/2"	ACTUATED	DIV4	T-3011 DISCH
3C	FV-3021	1"	ACTUATED	BAV1	SERVICE WATER INLET
3C	FV-3031	1 1/2"	ACTUATED	DIV4	P-3011 INLET
3C	V-3641	1 1/2"	BALL	BAV1	SERVICE WATER INLET
3C	V-3651	1 1/2"	CHECK	CHV2	SERVICE WATER INLET
3C	V-3671	1 1/2"	DIAPHRAGM	DIV4	P-3011 DISCH TO FBR-5
3C	V-3661	1 1/2"	DIAPHRAGM	DIV4	P-3011 DISCH TO FBR-6
3C	LCV-3011	10"	ACTUATED	BUV2	T-3011 FBR EFFLUENT
3C	PCV-3011	3/8"	REGULATOR		AIR FEED TO LCV-3011
3C	V-3691	1/2"	BALL	BAV2	AIR FEED TO FV-3011
3C	V-3681	1/2"	BALL	BAV2	AIR FEED TO BUBLER & LCV-3011
3C	V-3701	3/8"	BALL	BAV2	AIR FEED TO LCV-3011
3C	V-3721	3/8"	BALL	BAV2	AIR FEED TO FI-3011
3C	V-3731	3/8"	BALL	BAV2	AIR FEED TO FV-3021
3C	V-3741	3/8"	BALL	BAV2	AIR FEED TO FV-3031
3C	V-3751	3/8"	BALL	BAV2	AIR FEED TO FV-3011
3C	V-3711	1"	BALL	BAV1	CPVC, P-3011 INLET DRAIN
3C	V-3761	3/8"	BALL	BAV2	FROM FI-3011
3C	V-3771	3/8"	BALL	BAV2	FROM FI-3011
3D	V-3612	1 1/2"	DIAPHRAGM	DIV4	T-3012 SIDE DRAIN
3D	V-3622	4"	PLUG	PGV2	T-3012 CONE DRAIN
3D	V-3632	1 1/2"	DIAPHRAGM	DIV4	T-3012 DISCH
3D	FV-3012	1 1/2"	ACTUATED	DIV4	T-3012 DISCH
3D	FV-3022	1"	ACTUATED	BAV1	SERVICE WATER INLET
3D	FV-3032	1 1/2"	ACTUATED	DIV4	P-3012 INLET
3D	V-3642	1 1/2"	BALL	BAV1	SERVICE WATER INLET
3D	V-3652	1 1/2"	CHECK	CHV2	SERVICE WATER INLET
3D	V-3662	1 1/2"	DIAPHRAGM	DIV4	P-3012 DISCH TO FBR-7
3D	V-3672	1 1/2"	DIAPHRAGM	DIV4	P-3012 DISCH TO FBR-8
3D	LCV-3012	10"	ACTUATED	BUV2	T-3012 FBR EFFLUENT
3D	PCV-3012	3/8"	REGULATOR		AIR FEED TO LCV-3012
3D	V-3692	1/2"	BALL	BAV2	AIR FEED TO FV-3012
3D	V-3682	1/2"	BALL	BAV2	AIR FEED TO BUBLER & LCV-3012
3D	V-3702	3/8"	BALL	BAV2	AIR FEED TO LCV-3012
3D	V-3722	3/8"	BALL	BAV2	AIR FEED TO FI-3012
3D	V-3752	3/8"	BALL	BAV2	AIR FEED TO FV-3012
3D	V-3742	3/8"	BALL	BAV2	AIR FEED TO FV-3012
3D	V-3732	3/8"	BALL	BAV2	AIR FEED TO FV-3012
3D	V-3712	1"	BALL	BAV1	CPVC, P-3012 INLET DRAIN
3D	V-3762	3/8"	BALL	BAV2	FROM FI-3012
3D	V-3772	3/8"	BALL	BAV2	FROM FI-3012
4	V-411	2"	BALL	BAV1	CPVC, BLOWER DISCHARGE
4	V-412	2"	CHECK	CHV4	CPVC, BLOWER DISCHARGE
4	V-417	10"	BUTTERFLY	BUV2	CPVC, T-401 AERATION TANK INLET
4	V-415	3"	PLUG	PGV2	FRP, TANK T-401 DRAIN
4	V-414	3/8"	BALL	BAV1	POP, DAF POLYMER
4	V-413	3/8"	BALL	BAV1	T-401
4	V-416	3"	BUTTERFLY	BUV1	CPVC,THICKENER OVERFLOW
4	V-419	1"	BALL	BAV1	CPVC, AIR BLEED-OFF
4	V-420	2"	BALL	BAV1	CPVC, BLOWER DISCHARGE
5	V-500	1/4"	BALL		COPLANAR FOR FE-503
5	V-505	10"	BUTTERFLY	BUV2	CPVC, DAF D-501 BY-PASS
5	V-501	14"	BUTTERFLY	BUV2	CPVC, DAF D-501 INLET
5	V-502	4"	BUTTERFLY	BUV1	CPVC, SUCTION TO PUMP P-501
5	V-513	1"	BALL	BAV1	CPVC, SUCTION TO PUMP P-501
5	V-514	1/2"	BALL	BAV1	CPVC, PI-503
5	V-515	1/2"	BALL	BAV1	CPVC, PI-503
5	V-516	4"	CHECK	CHV1	CPVC, DAF PRESSURE TANK, T-501
5	V-517	4"	BUTTERFLY	BUV1	CPVC, PUMP P-501 DISCHARGE

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	Valve No.	Valve size (in.)	Valve Type	Valve Spec.	Comment
5	V-518	1/2"	BALL	BAV1	CPVC, P-501
5	V-519	1/2"	BALL	BAV1	CPVC, P-501
5	V-520	1/4"	BALL		COPLANAR FOR FE-502
5	V-521	3"	DIAPHRAGM	DIV5	CPVC, P-501 DISCHARGE TO T-501
5	PSV-501	1/2"	REGULATOR		PRESSURE TANK T-501
5	V-512	4"	CHECK	CHV1	CPVC, DAF PRESS. TANK, T-501DISCHARGE
5	V-504	2 1/2"	DIAPHRAGM	DIV5	CPVC, RETURN TO DAF TANK, D-501
5	V-527	1/2"	BALL	BAV2	STEEL, FI-501
5	V-528	1/2"	BALL	BAV2	STEEL, FI-501, THROTTLING
5	V-529	1/2"	NEEDLE	GLV2	STEEL, FI-501, THROTTLING
5	V-530	1/2"	CHECK	CHV4	STEEL, FI-501 DISCHARGE
5	V-522	1/2"	BALL	BAV1	CPVC, PRESS. TANK T-501, BLEED-OFF
5	V-523	1/2"	BALL	BAV1	CPVC, PRESSURE GAUGE
5	V-524	1/2"	BALL	BAV1	CPVC, PRESSURE GAUGE
5	V-509	2"	BALL	BAV1	CPVC, LEVEL INDICATOR LT-501
5	V-510	2"	BALL	BAV1	CPVC, LEVEL INDICATOR LT-501
5	V-511	1"	BALL	BAV1	CPVC, LEVEL INDICATOR DRAIN
5	PCV-501	1/2"	REGULATOR		STEEL, AIR TO PRESS. TANK T-501
5	V-526	1/2"	BALL	BAV2	STEEL, AIR TO PRESS. TANK T-501
5	V-505	10"	BUTTERFLY	BUV2	CPVC, DAF D-5011 EFFLUENT
5	V-531	1/2"	BALL	BAV2	STEEL, AIR TO PUMP P-502
5	PCV-504	1/2"	REGULATOR		STEEL, AIR TO PUMP P-502
5	LV-501	1/2"	SOLENOID		CPVC, T-501 BLEED-OFF
5	V-506	2"	DIAPHRAGM	DIV4	CPVC, PUMP SUCTION, P-502
5	V-507	2"	DIAPHRAGM	DIV4	CPVC, PUMP SUCTION, P-502
5	V-508	2"	DIAPHRAGM	DIV4	CPVC, PUMP DISCHARGE, P-502
5	V-550	1/4"	BALL		COPLANAR FOR FE-507
5	V-575	10"	BUTTERFLY	BUV2	CPVC, DAF D-551 BY-PASS
5	V-551	14"	BUTTERFLY	BUV2	CPVC, DAF D-502 INLET
5	V-552	4"	BUTTERFLY	BUV1	CPVC, SUCTION TO PUMP P-551
5	V-563	1/2"	BALL	BAV1	CPVC, SUCTION TO PUMP P-551
5	V-564	1/2"	BALL	BAV1	CPVC, PI-506
5	V-565	1/2"	BALL	BAV1	CPVC, PI-506
5	V-566	4"	CHECK	CHV1	CPVC, DAF PRESSURE TANK, T-551
5	V-567	4"	BUTTERFLY	BUV1	CPVC, PUMP P-551 DISCHARGE
5	V-568	1/2"	BALL	BAV1	CPVC, P-506
5	V-569	1/2"	BALL	BAV1	CPVC, P-506
5	V-570	1/4"	BALL		COPLANAR FOR FE-506
5	V-571	3"	DIAPHRAGM	DIV5	CPVC, P-506 DISCHARGE TO T-551
5	PSV-505	1/2"	REGULATOR		PRESSURE TANK T-505
5	V-562	4"	CHECK	CHV1	CPVC, DAF PRESSURE TANK, T-551
5	V-554	2 1/2"	DIAPHRAGM	DIV5	CPVC, RETURN TO DAF TANK, D-551
5	V-577	1/2"	BALL	BAV2	STEEL, FI-505
5	V-578	1/2"	BALL	BAV2	STEEL, FI-505
5	V-579	1/2"	NEEDLE	GLV2	STEEL, FI-505, THROTTLING
5	V-580	1/2"	CHECK	CHV4	STEEL, FI-505 DISCHARGE
5	V-572	1/2"	BALL	BAV1	CPVC, PRESS. TANK T-551, BLEED-OFF
5	V-573	1/2"	BALL	BAV1	CPVC, PRESSURE GAUGE
5	V-574	1/2"	BALL	BAV1	CPVC, PRESSURE GAUGE
5	V-559	2"	BALL	BAV1	CPVC, LEVEL INDICATOR LT-551
5	V-560	2"	BALL	BAV1	CPVC, LEVEL INDICATOR LT-551
5	V-561	1"	BALL	BAV1	CPVC, LEVEL INDICATOR DRAIN
5	PCV-505	1/2"	REGULATOR		STEEL, AIR TO PRESS. TANK T-551
5	V-576	1/2"	BALL	BAV2	STEEL, AIR TO PRESS. TANK T-551
5	V-555	10"	BUTTERFLY	BUV2	CPVC, DAF D-551 EFFLUENT
5	V-581	1/2"	BALL	BAV2	STEEL, AIR TO PUMP P-551
5	PCV-551	1/2"	REGULATOR		STEEL, AIR TO PUMP P-552
5	V-556	2"	DIAPHRAGM	DIV4	CPVC, PUMP SUCTION, P-552
5	V-557	2"	DIAPHRAGM	DIV4	CPVC, PUMP SUCTION, P-552
5	V-558	2"	DIAPHRAGM	DIV4	CPVC, PUMP DISCHARGE, P-502
5	LV-505	1/2"	SOLENOID		CPVC, T-551 BLEED-OFF
5	V-506	6"	BUTTERFLY	BUV1	CPVC, RETURN TO D-501
5	V-553	6"	BUTTERFLY	BUV1	CPVC, RETURN TO D-551
6	V-601	10"	BUTTERFLY	BUV2	CPVC, T-601 EFFLUENT TANK DISCH.
6	V-602	2"	BALL	BAV1	CPVC, T-601 EFFLUENT TANK DRAIN
6	V-603	8"	BUTTERFLY	BUV2	CPVC, EFFLUENT PUMP SUCTION

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	Valve No.	Valve size (in.)	Valve Type	Valve Spec.	Comment
6	V-604	8"	BUTTERFLY	BUV2	CPVC, EFFLUENT PUMP DISCH.
6	V-605	8"	BUTTERFLY	BUV2	CPVC, EFFLUENT PUMP SUCTION
6	V-606	8"	BUTTERFLY	BUV2	CPVC, EFFLUENT PUMP DISCH.
6	V-608	8"	CHECK	CHV1	CPVC, EFFLUENT PUMP DISCH.
6	V-609	2"	BALL	BAV1	CPVC, SERVICE WATER
6	V-610	1/2"	BALL	BAV1	CPVC, TURBIDITY SENSOR ISOLATION
6	V-629	2"	BALL	BAV1	CPVC, SERVICE WATER
6	V-611	8"	BUTTERFLY	BUV2	CPVC, SYSTEM RECYCLE
6	V-612	8"	CHECK	CHV1	CPVC, SYSTEM RECYCLE
6	V-613	8"	BUTTERFLY	BUV2	CPVC, UV SYSTEM
6	V-614	8"	BUTTERFLY	BUV2	CPVC, UV SYSTEM
6	V-626	8"	BUTTERFLY	BUV2	CPVC, UV SYSTEM
6	V-627	8"	BUTTERFLY	BUV2	CPVC, UV SYSTEM
6	V-615	2"	BALL	BAV1	CPVC, UV SYSTEM DRAIN
6	V-616	2"	DIAPHRAGM	DIV1	CPVC, EFFLUENT RECYCLE
6	V-617	1/2"	BALL	BAV2	STEEL, AIR ISOLATION
6	V-621	1/2"	BALL	BAV1	CPVC, PRESSIRE GAUGE
6	V-618	1/2"	BALL	BAV1	CPVC, SAMPLE PORT
6	V-624	1"	BALL	BAV1	CPVC, SERVICE WATER FLUSH TO P-603
6	V-619	2"	BUTTERFLY	BUV1	CPVC, DAF UNDERFLOW AND FLOAT
6	V-620	2"	BUTTERFLY	BUV1	CPVC, EXCESS BIOMASS
6	V-622	4"	PLUG	PGV2	CPVC, P-603 PUMP SUCTIION
6	V-623	3"	PLUG	PGV2	CPVC, P-603 PUMP DISCH.
6	V-625	3"	PLUG	PGV2	CPVC, P-603 PUMP DISCH.
6	V-628	2"	BACKFLOW		CPVC, SERVICE WATER
6	V-634	3/8"	BALL	BAV2	STEEL, AIR TO FCV-601
6	LCV-601	8"	ACTUATOR	BUV2	CPVC,PUMP DISCH.
6	V-633	3/8"	BALL	BAV2	STEEL, AIR TO FI-601
6	V-607	1/2"	BALL	BAV1	CPVC, PI-602
6	V-635	2"	CHECK	CHV2	CPVC, SERVICE WATER
6	V-631	1/2"	BALL	BAV1	CPVC, PRESSURE GAUGE
6	V-632	1/2"	BALL	BAV1	CPVC, PRESSURE GAUGE
6	V-630	1/4"	BALL		COPLANAR FOR FE-602
6	PCV-601	3/8"	REGULATOR		STEEL, AIR TO LCV-601
6	V-636	2"	BALL	BAV1	CPVC, SAFETY SHOWER
7A	V-701	2"	BALL	BAV1	PH TOTE
7A	V-701A	2"	BALL	BAV1	PH TOTE
7A	V-711A	1"	BALL	BAV1	PH PUMP SUCTION
7A	V-712A	1"	BALL	BAV1	PH PUMP SUCTION
7A	V-713A	1"	BALL	BAV1	PH PUMP SUCTION
7A	V-714A	1"	BALL	BAV1	PH PUMP SUCTION
7A	V-715A	1"	BALL	BAV1	PH PUMP SUCTION
7A	V-716A	1"	BALL	BAV1	PH PUMP SUCTION
7A	V-717A	1"	BALL	BAV1	PH PUMP SUCTION
7A	V-718A	1"	BALL	BAV1	PH PUMP SUCTION
7A	V-711B	3/8"	BALL	BAV1	PH PUMP SUCTION
7A	V-712B	3/8"	BALL	BAV1	PH PUMP SUCTION
7A	V-713B	3/8"	BALL	BAV1	PH PUMP SUCTION
7A	V-714B	3/8"	BALL	BAV1	PH PUMP SUCTION
7A	V-715B	3/8"	BALL	BAV1	PH PUMP SUCTION
7A	V-716B	3/8"	BALL	BAV1	PH PUMP SUCTION
7A	V-717B	3/8"	BALL	BAV1	PH PUMP SUCTION
7A	V-718B	3/8"	BALL	BAV1	PH PUMP SUCTION
7A	V-711C	1/2"	BALL	BAV1	CALIBRATION COLUMN
7A	V-712C	1/2"	BALL	BAV1	CALIBRATION COLUMN
7A	V-713C	1/2"	BALL	BAV1	CALIBRATION COLUMN
7A	V-714C	1/2"	BALL	BAV1	CALIBRATION COLUMN
7A	V-715C	1/2"	BALL	BAV1	CALIBRATION COLUMN
7A	V-716C	1/2"	BALL	BAV1	CALIBRATION COLUMN
7A	V-717C	1/2"	BALL	BAV1	CALIBRATION COLUMN
7A	V-718C	1/2"	BALL	BAV1	CALIBRATION COLUMN
7A	V-711D	3/8"	BALL	BAV1	PH PUMP DISCHARGE
7A	V-712D	3/8"	BALL	BAV1	PH PUMP DISCHARGE
7A	V-713D	3/8"	BALL	BAV1	PH PUMP DISCHARGE
7A	V-714D	3/8"	BALL	BAV1	PH PUMP DISCHARGE
7A	V-715D	3/8"	BALL	BAV1	PH PUMP DISCHARGE

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	Valve No.	Valve size (in.)	Valve Type	Valve Spec.	Comment
7A	V-716D	3/8"	BALL	BAV1	PH PUMP DISCHARGE
7A	V-717D	3/8"	BALL	BAV1	PH PUMP DISCHARGE
7A	V-718D	3/8"	BALL	BAV1	PH PUMP DISCHARGE
T-702	V-702	2"	BALL	BAV1	NUTRIENT TOTE
T-702	V-702A	1/2"	BALL	BAV1	NUTRIENT TOTE
T-702	V-702B	3"	BALL	BAV1	NUTRIENT TOTE
T-702	V-721A	1"	BALL	BAV1	NUTRIENT PUMP SUCTION
T-702	V-722A	1"	BALL	BAV1	NUTRIENT PUMP SUCTION
T-702	V-723A	1"	BALL	BAV1	NUTRIENT PUMP SUCTION
T-702	V-724A	1"	BALL	BAV1	NUTRIENT PUMP SUCTION
T-702	V-725A	1"	BALL	BAV1	NUTRIENT PUMP SUCTION
T-702	V-726A	1"	BALL	BAV1	NUTRIENT PUMP SUCTION
T-702	V-727A	1"	BALL	BAV1	NUTRIENT PUMP SUCTION
T-702	V-728A	1"	BALL	BAV1	NUTRIENT PUMP SUCTION
T-702	V-721B	3/8"	BALL	BAV1	NUTRIENT PUMP SUCTION
T-702	V-722B	3/8"	BALL	BAV1	NUTRIENT PUMP SUCTION
T-702	V-723B	3/8"	BALL	BAV1	NUTRIENT PUMP SUCTION
T-702	V-724B	3/8"	BALL	BAV1	NUTRIENT PUMP SUCTION
T-702	V-725B	3/8"	BALL	BAV1	NUTRIENT PUMP SUCTION
T-702	V-726B	3/8"	BALL	BAV1	NUTRIENT PUMP SUCTION
T-702	V-727B	3/8"	BALL	BAV1	NUTRIENT PUMP SUCTION
T-702	V-728B	3/8"	BALL	BAV1	NUTRIENT PUMP SUCTION
T-702	V-721C	1/2"	BALL	BAV1	CALIBRATION COLUMN
T-702	V-722C	1/2"	BALL	BAV1	CALIBRATION COLUMN
T-702	V-723C	1/2"	BALL	BAV1	CALIBRATION COLUMN
T-702	V-724C	1/2"	BALL	BAV1	CALIBRATION COLUMN
T-702	V-725C	1/2"	BALL	BAV1	CALIBRATION COLUMN
T-702	V-726C	1/2"	BALL	BAV1	CALIBRATION COLUMN
T-702	V-727C	1/2"	BALL	BAV1	CALIBRATION COLUMN
T-702	V-728C	1/2"	BALL	BAV1	CALIBRATION COLUMN
T-702	V-721D	3/8"	BALL	BAV1	NUTRIENT PUMP DISCHARGE
T-702	V-722D	3/8"	BALL	BAV1	NUTRIENT PUMP DISCHARGE
T-702	V-723D	3/8"	BALL	BAV1	NUTRIENT PUMP DISCHARGE
T-702	V-724D	3/8"	BALL	BAV1	NUTRIENT PUMP DISCHARGE
T-702	V-725D	3/8"	BALL	BAV1	NUTRIENT PUMP DISCHARGE
T-702	V-726D	3/8"	BALL	BAV1	NUTRIENT PUMP DISCHARGE
T-702	V-727D	3/8"	BALL	BAV1	NUTRIENT PUMP DISCHARGE
T-702	V-728D	3/8"	BALL	BAV1	NUTRIENT PUMP DISCHARGE
T-702	V-727	1 1/2"	BALL	BAV1	NUTRIENT TOTE DRAIN
T-702	V-717A	1 1/2"	BALL	BAV1	NUTRIENT TOTE LEVEL LT-717
T-702	V-717B	1/2"	BALL	BAV1	NUTRIENT TOTE LEVEL LT-717
T-702	V-717C	1 1/2"	BALL	BAV1	NUTRIENT TOTE LEVEL LT-717 DRAIN
7B	V-731A	1/2"	BALL	BAV1	ELECTRON DONOR METERING PUMP SUCTION
7B	V-732A	1/2"	BALL	BAV1	ELECTRON DONOR METERING PUMP SUCTION
7B	V-733A	1/2"	BALL	BAV1	ELECTRON DONOR METERING PUMP SUCTION
7B	V-734A	1/2"	BALL	BAV1	ELECTRON DONOR METERING PUMP SUCTION
7B	V-735A	1/2"	BALL	BAV1	ELECTRON DONOR METERING PUMP SUCTION
7B	V-736A	1/2"	BALL	BAV1	ELECTRON DONOR METERING PUMP SUCTION
7B	V-737A	1/2"	BALL	BAV1	ELECTRON DONOR METERING PUMP SUCTION
7B	V-738A	1/2"	BALL	BAV1	ELECTRON DONOR METERING PUMP SUCTION
7B	V-739A	1"	BALL	BAV1	ELECTRON DONOR BOOSTER PUMP SUCTION
7B	V-731B	1/2"	BALL	BAV1	EDS CALIBRATION COLUMN
7B	V-732B	1/2"	BALL	BAV1	EDS CALIBRATION COLUMN
7B	V-733B	1/2"	BALL	BAV1	EDS CALIBRATION COLUMN
7B	V-734B	1/2"	BALL	BAV1	EDS CALIBRATION COLUMN
7B	V-735B	1/2"	BALL	BAV1	EDS CALIBRATION COLUMN
7B	V-736B	1/2"	BALL	BAV1	EDS CALIBRATION COLUMN
7B	V-737B	1/2"	BALL	BAV1	EDS CALIBRATION COLUMN
7B	V-738B	1/2"	BALL	BAV1	EDS CALIBRATION COLUMN
7B	V-739B	1"	BALL	BAV1	EDS BOOSTER PUMP DISCH.
7B	V-731C	1/2"	BALL	BAV1	ELECTRON DONOR METERING PUMP DISCH.
7B	V-732C	1/2"	BALL	BAV1	ELECTRON DONOR METERING PUMP DISCH.
7B	V-733C	1/2"	BALL	BAV1	ELECTRON DONOR METERING PUMP DISCH.
7B	V-734C	1/2"	BALL	BAV1	ELECTRON DONOR METERING PUMP DISCH.
7B	V-735C	1/2"	BALL	BAV1	ELECTRON DONOR METERING PUMP DISCH.
7B	V-736C	1/2"	BALL	BAV1	ELECTRON DONOR METERING PUMP DISCH.

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	Valve No.	Valve size (in.)	Valve Type	Valve Spec.	Comment
7B	V-737C	1/2"	BALL	BAV1	ELECTRON DONOR METERING PUMP DISCH.
7B	V-738C	1/2"	BALL	BAV1	ELECTRON DONOR METERING PUMP DISCH.
7B	V-739C	1"	BALL	BAV1	ELECTRON DONOR BOOSTER PUMP DISCH.
7B	V-739D	1"	BALL	BAV1	ELECTRON DONOR BOOSTER PUMP DISCH.
7B	V-704	2"	BALL	BAV1	POLYMER FEED SYSTEM
7B	V-704A	2"	BALL	BAV1	POLYMER FEED SYSTEM
7B	V-705	2"	BALL	BAV1	POLYMER FEED SYSTEM
7B	V-705A	2"	BALL	BAV1	POLYMER FEED SYSTEM
7B	V-749	1/2"	BALL	BAV1	POLYMER FEED SYSTEM
7B	V-741A	3/8"	BALL	BAV1	POLYMER FEED SYSTEM
7B	V-742A	3/8"	BALL	BAV1	POLYMER FEED SYSTEM
7B	V-741B	1/2"	BALL	BAV1	POLYMER FEED SYSTEM
7B	V-742B	1/2"	BALL	BAV1	POLYMER FEED SYSTEM
7B	V-741C	3/8"	BALL	BAV1	POLYMER FEED SYSTEM
7B	V-742C	3/8"	BALL	BAV1	POLYMER FEED SYSTEM
7B	PCV-739	1"	REGULATOR		ELECTRON DONOR T-703
7B	FV-703	1"	SOLENOID		ELECTRON DONOR T-703
7B	V-751	3"	BALL	BAV1	ELECTRON DONOR T-703
7B	V-752	3"	CHECK	CHV1	ELECTRON DONOR T-703
7B	PSV-705		RELIEF		ELECTRON DONOR T-703
7B	PSV-704		RELIEF		ELECTRON DONOR T-703
7B	PSV-703		RELIEF		ELECTRON DONOR T-703
7C	V-751A	3"	BALL	BAV1	CPVC, FERRIC CHLORIDE FEED
7C	V-751B	2"	BALL	BAV1	CPVC, FERRIC CHLORIDE FEED
7C	V-751C	2"	BALL	BAV1	CPVC, FERRIC CHLORIDE FEED
7C	V-751D	1/2"	BALL	BAV1	CPVC, FERRIC CHLORIDE FEED
7C	FV-751E	1"	ACTUATED	BAV1	CPVC, AUTOMATED FERRIC CHLORIDE
7C	V-752	1/2"	BALL	BAV2	STEEL, INSTRUMENT AIR
7C	V-753	8"	KNIFE	KGV1	T-752
7C	V-754	2"	BALL	BAV1	CPVC, T-751 SECONDARY CONF. DRAIN
7C	V-55	2"	BALL	BAV1	CPVC, T-751 DRAIN
7C	V-756	1"	BALL	BAV1	CPVC, SAMPLE PORT
7C	V-757	1/2"	BALL	BAV1	CPVC, DRAIN
7C	PSV-751		RELIEF		T-752
8	V-801	2"	CHECK	CHV4	STEEL, COMPRESSED AIR LINE, P-801
8	V802	2"	BALL	BAV2	STEEL, COMPRESSED AIR LINE P-801
8	V-803	2"	BALL	BAV2	STEEL, COMPRESSED AIR LINE P-802
8	V-804	2"	CHECK	CHV4	STEEL, SERVICE AIR
8	V-805	3"	BALL	BAV2	STEEL, SERVICE AIR
8	V-806	1/4"	BALL	BAV2	STEEL, AIR COMP. TANK PRESS. GAUGE
8	V-807	1/2"	BALL	BAV2	STEEL, AIR COMP. TANK DRAIN LINE
8	V-808	1/2"	BALL	BAV2	STEEL, AIR COMP. TANK DRAIN LINE
8	V-809	1/2"	CHECK	CHV4	STEEL, AIR COMP. TANK DRAIN LINE
8	V-810	2"	BALL	BAV2	STEEL, SERVICE AIR
8	V-811	1 1/2"	BALL	BAV2	STEEL, SERVICE AIR
8	V-812	1 1/2"	CHECK	CHV4	STEEL, SERVICE AIR
8	PCV-8002	2"	REGULATOR		STEEL, SERVICE AIR
8	FCV-801	2"	SOLENOID		STEEL, SERVICE AIR
9	V-901	3"	PLUG	PGV2	SLUDGE FEED TO T-901
9	V-902	1"	BALL	BAV1	SERVICE WATER FEED
9	V-903	3"	PLUG	PGV2	T-901 DISCH
9	V-904	2"	DIAPHRAGM	DIV4	P-901 INTAKE
9	V-905	3"	PLUG	PGV2	P-901 DISCH
9	V-906	2"	DIAPHRAGM	DIV4	P-902INTAKE
9	V-907	3"	PLUG	PGV2	P-902 DISCH
9	V-908	3"	BALL	BAV1	T-901 RETURN
9	V-909	3"	BALL	BAV1	X-902 INTAKE
9	V-910	3"	BALL	BAV1	X-901 INTAKE
9	V-911	3"	BALL	BAV1	X-901 INTAKE
9	V-912	2"	BALL	BAV1	T-902 INLET
9	V-913	1/2"	BALL	BAV2	STEEL, SERVICE AIR FEED TO FILTER PRESS
9	V-914	2"	BALL	BAV1	T-902 OUTLET
9	V-915	2"	BALL	BAV1	T-902 INLET
9	V-916	2"	BALL	BAV1	X-901
9	V-917	2"	BALL	BAV1	X-901
9	V-918	2"	BALL	BAV1	X-902

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	Valve No.	Valve size (in.)	Valve Type	Valve Spec.	Comment
9	V-919	2"	BALL	BAV1	X-902
9	V-920	1/2"	BALL	BAV2	INST. AIR FEED TO PLATE SHIFTER
9	V-921	1/2"	BALL	BAV2	INST. AIR FEED TO PLATE SHIFTER
9	V-922	1/2"	BALL	BAV2	AIR BLOW DOWN TO X-901
9	V-923	1/2"	BALL	BAV2	AIR BLOW DOWN TO X-902
9	V-924	1/2"	BALL	BAV2	AIR FEED TO F-901
9	PCV-901	1/2"	REGULATOR		AIR TO P-901
9	FCV-901	1/2"	SOLENOID		AIR TO P-901
9	V-925	1/2"	BALL	BAV2	AIR FEED TO F-902
9	PCV-902	1/2"	REGULATOR		AIR TO P-902
9	FCV-902	1/2"	SOLENOID		AIR TO P-902
9	V-926	3"	PLUG	PGV2	CPVC, BY-PASS TO T-902
9	V-927	1"	BALL	BAV1	FILTRATE RECYCLE PMP DISCH.
9	V-928	1/2"	BALL	BAV2	SERVICE AIR FOR FILTER PRESS BLOW
9	V-929	1"	BALL	BAV1	FLUSH ON FILTRATE RECYCLE PUMP SUCTION
9	V-930	2"	BALL	BAV1	T-902 DRAIN
VALVES ADDED 2006					

SYS	FULL LINE NO.	LINE NO.	PIPE SPEC.	MATERIAL	SIZE (inch)	LOCATION FROM	LOCATION TO	NORMAL OPERATING		DESIGN		INSULATION		TEST		VALVES	P&ID NO.
								PRESS psig	TEMP (deg.F)	PRESS psig	TEMP (deg.F)	TYPE	THK (inch)	TYPE	PRESS psig		
BA		0															
BA	2"-BA-S04P10-001-I	1.0		SO4P10	2.00	B-401	2"-BA-CVCP80-002-N	13	140	150	90	FRP	1	HYD	20	V-411, V-412	4
BA	2"-BA-CVCP80-002-N	2.0		CPVC80	2.00	2"-BA-S04P10-001-I	4"-BA-CVCP80-002-N	13	100	145	90	NA	NA	HYD	20		4
BA	4"-BA-CVCP80-002-N	2.0		CPVC80	4.00	T-401	2"-BA-CVCP80-002-N & 1"-WW-CVCP80-097-HT&I	13	100	145	90	NA	NA	HYD	20		4
CA		0															
CA	2"-CA-CSTP40-001-N	1.0		CSTP40	2.00	P-801	T-801	NA	NA	NA	NA	NA	NA	NA	NA	V-801, V-802	8
CA	2"-CA-CSTP40-002-N	2.0		CSTP40	2.00	P-802	T-801	NA	NA	NA	NA	NA	NA	NA	NA	V-803, V-804	8
CA	1 1/2"-CA-CSTP40-003-N	3.0		CSTP40	1.50	T-801	T-802	NA	NA	NA	NA	NA	NA	NA	NA	V-811	8
CA	2"-CA-CSTP40-003-N	3.0		CSTP40	2.00	T-801	1"-CA-CSTP40-003-N	NA	NA	NA	NA	NA	NA	NA	NA	PCV-802, V-805, V-810	8
CA	1"-CA-CSTP40-003-N	3.0		CSTP40	1.00	2"-CA-CSTP40-003-N	1"-CA-CSTP40-003-N AND SERVICE AIR	110	100	150	90	NA	NA	PNEU	150		8, 9
ED		0															
ED	3"-ED-S04P80-001-N	1.0		S04P80	3.00	TRUCK FILL	T-703	NA	NA	NA	NA	NA	NA	NA	NA	LCV-703, V-750, V-751	7B
ED	1"-ED-S04P80-002-N	2.0		S04P80	1.00	P-739A & -B	1"-ED-S04P80-003-N	50	90	150	90	NA	NA	HYD	75	V-739B&C, V-753B&C	7B
ED	1"-ED-S04P80-003-N	3.0		S04P80	1.00	1"-ED-S04P80-002-N	P-731 THRU P-738	NA	NA	NA	NA	NA	NA	NA	NA		7B
ED	1/2"-ED-S04P80-004-N	4.0		S04P80	0.50	1"-ED-S04P80-003-N	P-731	NA	NA	NA	NA	NA	NA	NA	NA	V-731A	7B
ED	1/2"-ED-S04P80-005-N	5.0		S04P80	0.50	P-731	10"-WW-CVCP80-008-N	70	90	150	90	NA	NA	HYD	105	V-731C, V-1081, V-1091	1A, 7B
ED	1/2"-ED-S04P80-006-N	6.0		S04P80	0.50	1"-ED-S04P80-003-N	P-732	NA	NA	NA	NA	NA	NA	NA	NA	V-732A	7B
ED	1/2"-ED-S04P80-007-N	7.0		S04P80	0.50	P-732	10"-WW-CVCP80-010-N	70	90	150	90	NA	NA	HYD	105	V-732C, V-1092, V-1082	1A, 7B
ED	1/2"-ED-S04P80-008-N	8.0		S04P80	0.50	1"-ED-S04P80-003-N	P-733	NA	NA	NA	NA	NA	NA	NA	NA	V-733A	7B
ED	1/2"-ED-S04P80-009-N	9.0		S04P80	0.50	P-733	10"-WW-CVCP80-036-N	70	90	150	90	NA	NA	HYD	105	V-733C, V-1063, V-1073	1B, 7B
ED	1/2"-ED-S04P80-010-N	10.0		S04P80	0.50	1"-ED-S04P80-003-N	P-734	NA	NA	NA	NA	NA	NA	NA	NA	V-734A	7B
ED	1/2"-ED-S04P80-011-N	11.0		S04P80	0.50	P-734	10"-WW-CVCP80-038-N	70	90	150	90	NA	NA	HYD	105	V-734C, V-1084, V-1094	1B, 7B
ED	1/2"-ED-S04P80-012-N	12.0		S04P80	0.50	1"-ED-S04P80-003-N	P-735	NA	NA	NA	NA	NA	NA	NA	NA	V-735A	7B
ED	1/2"-ED-SO4P80-013-N	13.0		S04P80	0.50	P-735	10"-WW-CVCP80-022-N	70	90	150	90	NA	NA	HYD	105	V-735C, V-3085, V-3095	3A, 7B
ED	1/2"-ED-S04P80-014-N	14.0		S04P80	0.50	1"-ED-S04P80-003-N	P-736	NA	NA	NA	NA	NA	NA	NA	NA	V-736A	7B
ED	1/2"-ED-SO4P80-015-N	15.0		S04P80	0.50	P-736	10"-WW-CVCP80-023-N	70	90	150	90	NA	NA	HYD	105	V-736C, V-3086, V-3096	3A, 7B
ED	1/2"-ED-S04P80-016-N	16.0		S04P80	0.50	1"-ED-S04P80-003-N	P-737	NA	NA	NA	NA	NA	NA	NA	NA	V-737A	7B
ED	1/2"-ED-S04P80-017-N	17.0		S04P80	0.50	P-737	10"-WW-CVCP80-051-N	70	90	150	90	NA	NA	HYD	105	V-737C, V-3067, V-3077	3B, 7B
ED	1/2"-ED-S04P80-018-N	18.0		S04P80	0.50	1"-ED-S04P80-003-N	P-738	NA	NA	NA	NA	NA	NA	NA	NA	V-738A	7B
ED	1/2"-ED-S04P80-019-N	19.0		S04P80	0.50	P-738	10"-WW-CVCP80-052-N	70	90	70	90	NA	NA	HYD	105	V-738C, V-3088, V-3098	3B, 7B
ED	1"-ED-S04P80-020-N	20.0		S04P80	1.00	1"-ED-S04P80-002-N	T-703	10	90	60	90	NA	NA	HYD	15	PCV-739	7B
ED	1"-ED-S04P80-021-N	21.0		S04P80	1.00	ELECTRON DONOR CALIBRATION COLUMNS	T-703	ATMOS	90	60	90	NA	NA	HYD	15		7B

SYS	FULL LINE NO.	LINE NO.	PIPE SPEC.	MATERIAL	SIZE (inch)	LOCATION FROM	LOCATION TO	NORMAL OPERATING PRESS psig	NORMAL OPERATING TEMP (deg.F)	DESIGN PRESS psig	DESIGN TEMP (deg.F)	INSULATION TYPE	INSULATION THK (inch)	TEST TYPE	TEST PRESS psig	VALVES	P&ID NO.
FC		0															
FC	3"-FC-CVCP80-001-N	1.0		CPVC80	3.00	T-751	TRUCK FILL	20	90	145	90	NA	NA	HYD	30	V-751A	7C
FC	2"-FC-CVCP80-002-N	2.0		CPVC80	2.00	2"-FC-CVCP80-004-N	T-751	20	90	145	90	NA	NA	HYD	30	V-751B	7C
FC	1"-FC-CVCP80-003-N	3.0		CPVC80	1.00	2"-FC-CVCP80-003-N	P-758 & P-759	20	90	145	90	NA	NA	HYD	30	V-772, -774 & 756	7C
FC	2"-FC-CVCP80-003-N	3.0		CPVC80	2.00	T-751	P-751, 1"-FC-CVCP80-003-N	10	90	145	90	NA	NA	HYD	15	V-751C	7C
FC	1"-FC-CVCP80-004-N	4.0		CPVC80	1.00	2"-FC-CVCP80-004-N	T-901	20	90	145	90	NA	NA	HYD	30	FV-751E	7C, 9
FC	2"-FC-CVCP80-004-N	4.0		CPVC80	2.00	P-751	1"-FC-CVCP80-004-N	20	90	145	90	NA	NA	HYD	30		7C
FC	3/4"-FC-CVCP80-005-N	5.0		CPVC80	0.75	P-758	T-602	ATMOS	90	145	90	NA	NA	SERVICE	TEST	V-638, V-773	6, 7C
FC	1/2"-FC-CVCP80-006-N	0.5		CPVC80	0.50	P-759	T-401	20	90	145	90	NA	NA	HYD	30	V-413, -775	4, 7C
IA		0.0															
IA	1 1/2"-IA-CSTP-100-N	100.0		CSTP	1.50	T-802	INSTRUMENT AIR MAIN HEADER	100	90	150	90	NA	NA	PNEU	150	PCV-803, V-812, V-813	8, 12
NU		0															
NU	3"-NU-CVCP80-001-N	1.0		CPVC80	3.00	T-702	TRUCK FILL	10	90	145	73	NA	NA	HTD	15	V-702B	7A
NU	1"-NU-CVCP80-002-N	2.0		CPVC80	1.00	2"-NU-CVCP80-002-N	P-721 THRU P-728	NA	NA	NA	NA	NA	NA	NA	NA	V-721A THRU V-	7A
NU	2"-NU-CVCP80-002-N	2.0		CPVC80	2.00	T-702	1"-NU-CVCP80-002-N	10	90	145	73	NA	NA	HYD	15	V-702	7A
NU	1"-NU-CVCP80-004-N	4.0		CPVC80	1.00	2"-NU-CVCP80-004-N	(2) 3/8"-NU-POPT (P-753A & -B)					NA	NA			V-765	7C
NU	2"-NU-CVCP80-004-N	4.0		CPVC80	2.00	T-753	1"-NU-CVCP80-004-N					NA	NA			V-758	7C
NU	3/8"-NU-POPT-N			POPT	0.38	P-721	10"-WW-CVCP80-008-N	50	90	100	90	NA	NA	HYD	75	V-721D, V-1061, V-1071	1A, 7A
NU	3/8"-NU-POPT-N			POPT	0.38	P-722	10"-WW-CVCP80-010-N	50	90	100	90	NA	NA	HYD	75	V-722D, V-1062, V-1072	1A, 7A
NU	3/8"-NU-POPT-N			POPT	0.38	P-725	10"-WW-CVCP80-022-N	50	90	100	90	NA	NA	HYD	75	V-725D, V-3065, V-3075	3A, 7A
NU	3/8"-NU-POPT-N			POPT	0.38	P-726	10"-WW-CVCP80-023-N	50	90	100	90	NA	NA	HYD	75	V-726D, V-3066, V-3076	3A, 7A
NU	3/8"-NU-POPT-N			POPT	0.38	P-723	10"-WW-CVCP80-036-N	50	90	100	90	NA	NA	HYD	75	V-723D, V-1083, V-1093	1B, 7A
NU	3/8"-NU-POPT-N			POPT	0.38	P-724	10"-WW-CVCP80-038-N	50	90	100	90	NA	NA	HYD	75	V-724D, V-1064, V-1074	1B, 7A
NU	3/8"-NU-POPT-N			POPT	0.38	P-727	10"-WW-CVCP80-051-N	50	90	100	90	NA	NA	HYD	75	V-727D, V-3087, V-3097	3B, 7A
NU	3/8"-NU-POPT-N			POPT	0.38	P-728	10"-WW-CVCP80-052-N	50	90	100	90	NA	NA	HYD	75	V-728D, V-3068, V-3078	3B, 7A
NU	3/8"-NU-POPT-N			POPT	0.38	1"-NU-CVCP80-004-N	P-753A					NA	NA			V-760	7C
NU	3/8"-NU-POPT-N			POPT	0.38	1"-NU-CVCP80-004-N	P-753B					NA	NA			V-762	7C
NU	3/8"-NU-POPT-N			POPT	0.38	P-753A & -B	10"-WW-CVCP80-100-N					NA	NA			V-761, -4 & V-1555 & -6	1B, 7C
P		0															
P	2"-P-CVCP80-001-HT&I	1.0		CPVC80	2.00	T-704	P-741	3	90	145	73	FRP	1	HYD	5	V-704, V-741A	7B
P	1/2"-P-CVCP80-002-HT&I	2.0		CPVC80	0.50	P-741	T-602	30	90	145	73	FRP	1	HYD	45	V-741C	6, 7B
P	2"-P-CVCP80-003-HT&I	3.0		CPVC80	2.00	T-705	P-742	3	90	145	73	FRP	1	HYD	5	V-705, V-742A	7B
P	1/2"-P-CVCP80-004-HT&I	4.0			0.50	P-742	10"-WW-CVCP80-062-N	30	90	145	73	FRP	1	HYD	45	V-414, V-742C	4, 7B

SYS	FULL LINE NO.	LINE NO.	PIPE SPEC.	MATERIAL	SIZE (inch)	LOCATION FROM	LOCATION TO	NORMAL OPERATING PRESS psig	NORMAL OPERATING TEMP (deg.F)	DESIGN PRESS psig	DESIGN TEMP (deg.F)	INSULATION TYPE	INSULATION THK (inch)	TEST TYPE	TEST PRESS psig	VALVES	P&ID NO.
PA		0															
PA	6"-PA-CVCP80-001	1.0		CPVC80	6.00	T-401	B-402	ATMOS	90	230	73	NA	NA	PNEU	5		4
PA	8"-PA-CVCD-002	2.0		CPVC80	8.00	B-402	T-402A & T-402B	10' WC	100	230	73	NA	NA	PNEU	DEAD HEAD	V-404, V-405	4
PA	6"-PA-CVCP80-003	3.0		CPVC80	6.00	T-402A & T-402B	DISCHARGE TO ATMOSPHERE	ATMOS	100	230	73	NA	NA	SERVICE	TEST		4
SH		0															
SH	2"-SH-CVCP80-001-N	1.0		CPVC80	2.00	T-701	1"-SH-CVCP80-002-N	10	90	230	73	NA	NA	HYD	15	V-701, V-701A	7A
SH	1"-SH-CVCP80-002-N	2.0		CPVC80	1.00	2"-SH-CVCP80-001-N	P-711 THU P-718	NA	NA	NA	NA	NA	NA	NA	NA	V-711A THRU V-	
SH	3/8"-SH-POPT-N			POPT	0.38	P-711	6"-WW-CVCP80-001-N	50	90	100	90	NA	NA	HYD	75	V-1090, V-1110, V-711D	1A, 7A
SH	3/8"-SH-POPT-N			POPT	0.38	P-712	6"-WW-CVCP80-003-N	50	90	100	90	NA	NA	HYD	75	V-1100, V-1120, V-712D	1A, 7A
SH	3/8"-SH-POPT-N			POPT	0.38	P-715	6"-WW-CVCP80-017-N	50	90	100	90	NA	NA	HYD	75	V-3090, V-3110, V-715D	3A, 7A
SH	3/8"-SH-POPT-N			POPT	0.38	P-716	6"-WW-CVCP80-018-N	50	90	100	90	NA	NA	HYD	75	V-3100, V-3120, V-716D	3A, 7A
SH	3/8"-SH-POPT-N			POPT	0.38	P-713	6"-WW-CVCP80-029-N	50	90	100	90	NA	NA	HYD	75	V-1390, V-1410, V-713D	1B, 7A
SH	3/8"-SH-POPT-N			POPT	0.38	P-714	6"-WW-CVCP80-031-N	50	90	100	90	NA	NA	HYD	75	V-1400, V-1420, V-714D	1B, 7A
SH	3/8"-SH-POPT-N			POPT	0.38	P-717	6"-WW-CVCP80-046-N	50	90	100	90	NA	NA	HYD	75	V-3390, V-3410, V-717D	3B, 7A
SH	3/8"-SH-POPT-N			POPT	0.38	P-718	6"-WW-CVCP80-047-N	50	90	100	90	NA	NA	HYD	75	V-3400, V-3420, V-718D	3B, 7A
SL	**(LINES 6, 11 & 36 NOT USED)**	0															
SL	2"-SL-CVCP80-001-N	1.0		CPVC80	2.00	FBR-5, -6, -7 & -8	T-602	ATMOS	90	145	90	NA	NA	HYD	5	V-618, V-619	3A, 3B, 6
SL	2"-SL-CVCP80-002-N	2.0		CPVC80	2.00	FBR-5	2"-SL-CVCP80-001-N	ATMOS	90	145	90	NA	NA	HYD	5		3A
SL	2"-SL-CVCP80-003-N	3.0		CPVC80	2.00	FBR-6	2"-SL-CVCP80-001-N	ATMOS	90	145	90	NA	NA	HYD	5		3A
SL	2"-SL-CVCP80-004-N	4.0		CPVC80	2.00	FBR-6	2"-SL-CVCP80-003-N	ATMOS	90	145	90	NA	NA	HYD	5		3A
SL	4"-SL-CVCP80-005-N	5.0		CPVC80	4.00	T-602 WEIR TROUGH	T-401	ATMOS	90	145	90	NA	NA	SERVICE	TEST	V-4I5, -416B & -421	4, 6
SL	2"-SL-CVCP80-007-N	7.0		CPVC80	2.00	FBR-7	2"-SL-CVCP80-001-N	ATMOS	90	145	90	NA	NA	HYD	5		3B
SL	2"-SL-CVCP80-008-N	8.0		CPVC80	2.00	FBR-7	2"-SL-CVCP80-007-N	ATMOS	90	145	90	NA	NA	HYD	5		3B
SL	2"-SL-CVCP80-009-N	9.0		CPVC80	2.00	FBR-8	2"-SL-CVCP80-001-N	ATMOS	90	145	90	NA	NA	HYD	5		3B
SL	2"-SL-CVCP80-010-N	10.0		CPVC80	2.00	FBR-8	2"-SL-CVCP80-009-N	ATMOS	90	145	90	NA	NA	HYD	5		3B
SL	4"-SL-CVCP80-012-N	12.0		CPVC80	4.00	D-501	P-501	10	90	145	90	NA	NA	HYD	15	V-502	5
SL	4"-SL-CVCP80-013-N	13.0		CPVC80	4.00	P-501	T-501	60	90	145	90	NA	NA	HYD	90	V-516, V-517, V-521	5
SL	4"-SL-CVCP80-014-N	14.0		CPVC80	4.00	T-501	D-501	60	90	145	90	NA	NA	HYD	90	V-503, V-504, V-512	5
SL	3"-SL-CVCP80-015-N	15.0		CPVC80	3.00	D-501	P-502	10	90	145	90	NA	NA	HYD	15	V-507	5
SL	2"-SL-CVCP80-016-I	16.0		CPVC80	2.00	P-502	T-602	43	90	110	90	FRP	1	HYD	65	V-508, V-639	5, 6
SL	4"-SL-CVCP80-017-N	17.0		CPVC80	4.00	D-551	P-551	10	90	145	90	NA	NA	HTD	15	V-552	5
SL	4"-SL-CVCP80-018-N	18.0		CPVC80	4.00	P-551	T-551	60	90	145	90	NA	NA	HYD	90	V-566, V-567, V-571	5
SL	4"-SL-CVCP80-019-N	19.0		CPVC80	4.00	T-551	D-551	60	90	145	90	NA	NA	HYD	90	V-553, V-554, V-562	5

SYS	FULL LINE NO.	LINE NO.	PIPE SPEC.	MATERIAL	SIZE (inch)	LOCATION FROM	LOCATION TO	NORMAL OPERATING PRESS psig	NORMAL OPERATING TEMP (deg.F)	DESIGN PRESS psig	DESIGN TEMP (deg.F)	INSULATION TYPE	INSULATION THK (inch)	TEST TYPE	TEST PRESS psig	VALVES	P&ID NO.
SL	3"-SL-CVCP80-020-N	20.0		CPVC80	3.00	D-551	P-552	10	90	145	90	NA	NA	HYD	15	V-557	5
SL	2"-SL-CVCP80-021-I	21.0		CPVC80	2.00	P-552	2"-SL-CVCP80-016-I	43	90	110	90	FRP	1	HYD	55	V-558	5
SL	3"-SL-CVCP80-022-N	22.0		CPVC80	3.00	T-602	10"-WW-CVCP80-062-N & 4"-SL-CVCP80-005-N	ATMOS	90	145	90	NA	NA	HYD	15	V-416, V-416A	4, 6
SL	4"-SL-CVCP80-023-N	23.0		CPVC80	4.00	T-602	P-603	9	90	145	90	NA	NA	HYD	13	V-622	6
SL	3"-SL-CVCP80-024-N	24.0		CPVC80	3.00	P-603	T-901	43	90	110	90	NA	NA	HYD	FILL	V-623	6, 9
SL	3"-SL-CVCP80-025-N	25.0		CPVC80	3.00	3"-SL-CVCP80-024-N	TRUCK FILL	43	90	110	90	NA	NA	HYD	65	V-625	6
SL	3"-SL-CVCP80-026-N	26.0		CPVC80	3.00	T-901	P-901 & P-902	10	90	110	90	FRP	1.5	HYD	15	V-903, V-904, V-906	9
SL	3"-SL-CVCP80-027-N	27.0		CPVC80	3.00	P-901	X-901, 3"-SL-CVCP80-029-N	40	90	80	90	NA	NA	HYD	60	V-905, V-910, V-911	9
SL	3"-SL-CVCP80-028-N	28.0		CPVC80	3.00	X-902	T-902	ATMOS	90	110	90	NA	NA	HYD	15	V-932	9
SL	3"-SL-CVCP80-029-N	29.0		CPVC80	3.00	3"-SL-CVCP80-027-N	T-901	30	90	110	90	NA	NA	HYD	45	V-912	9
SL	3"-SL-CVCP80-030-N	30.0		CPVC80	3.00	3"-SL-CVCP80-029-N	3"-SL-CVCP80-032-N	ATMOS	90	110	90	NA	NA	HYD	15	V-913	9
SL	3"-SL-CVCP80-031-N	31.0		CPVC80	3.00	3"-SL-CVCP80-028-N	3"-SL-CVCP80-035-N	ATMOS	90	110	90	NA	NA	HYD	15	V-932	9
SL	3"-SL-CVCP80-032-N	32.0		CPVC80	3.00	X-901 DISCHARGE MANIFOLD	T-902	ATMOS	90	110	90	NA	NA	HYD	15		9
SL	2"-SL-CVCP80-033-N	33.0		CPVC80	2.00	X-901 DRIP TRAYS	3"-SL-CVCP80-032-N	ATMOS	90	110	90	NA	NA	HYD	15		9
SL	3"-SL-CVCP80-034-N	34.0		CPVC80	3.00	P-902	X-902 & 3"-SL-CVCP80-035-N	40	90	80	90	NA	NA	HYD	60	V-907, V-933, V-934	9
SL	3"-SL-CVCP80-035-N	35.0		CPVC80	3.00	3"-SL-CVCP80-034-N	3"-SL-CVCP80-029-N	40	90	80	90	NA	NA	HYD	60	V-935	9
SL	3"-SL-CVCP80-037-N	37.0		CPVC80	3.00	X-902 DISCHARGE MANIFOLD	3"-SL-CVCP80-028-N	ATMOS	90	110	90	NA	NA	HYD	15		9
SL	2"-SL-CVCP80-038-N	38.0		CPVC80	2.00	X-902 DRIP TRAYS	2"-SL-CVCP80-028-N	ATMOS	90	110	90	NA	NA	HYD	15		9
SL	3"-SL-CVCP80-039-N	39.0		CPVC80	3.00	D-501	3"-SL-CVCP80-015-N	10	90	110	90	NA	NA	HYD	15	V-506	5
SL	3"-SL-CVCP80-040-N	40.0		CPVC80	3.00	D-551	3"-SL-CVCP80-020-N	10	90	110	90	NA	NA	HYD	15	V-556	5
SL	3"-SL-CVCP80-041-N	41.0		CPVC80	3.00	T-902	END	ATMOS	90	NA	NA	NA	NA	NA	NA		9
SLM		0															
SLM	2"-SLM-CVCP80-001-N	1.0		CPVC80	2.00	2"-SLM-CVCP80-001-N	SLM HEADER DROPS	85	90	110	90	NA	NA	HYD	148	V-1207	12
SLM	2"-SLM-CVCP80-001-N	1.0		CPVC80	2.00	STABILIZED LAKE MEAD WATER	2"-SW-CVCP80-002-N	85	90	110	90	NA	NA	HYD	148		6, 12
SLM	1 1/2" & 1/2"-SLM-CVCP80-001-HT&I	1.0		CPVC80	1.5&0.5	2"-SLM-CVCP80-001-N	SS-1202 THROUGH SS-1206	85	90	110	90	FRP	1	HYD	148	V-1202 TO - 06	12
SLM	1/2"-SLM-CVCP80-001-HT&I	1.0		CPVC80	0.50	2"-SLM-CVCP80-001-N	BIOFILTER STRAINER S-401	85	90	110	90	FRP	1	HYD	148	V-401	4
SW		0															
SW	2", 1 1/2", 1" & 1/2"-SW-CVCP80-001-N	1.0		CPVC80	2,1.5,1,0.5	8"-WW-CVCP80-072-N	SERVICE WATER MAIN HEADER & BRANCHES	18	90	110	90	NA	NA	HYD	27	V-609, V-635	6
SW	2"-SW-CVCP80-002-N	2.0		CPVC80	2.00	2"-SLM-CVCP80-001-N	2"-SW-CVCP80-001-N	18	90	110	90	NA	NA	HYD	27	V-629	6
SW	1"-SW-CVCP80-003-N	2.0		CPVC80	1.00	2"-SW-CVCP80-001-N	4"-SL-CVCP80-023-N	18	90	110	90	NA	NA	HYD	27	V-624	6
TW		0															
TW	8"-TW-CVCP80-001-N	1.0		CPVC80	8.00	X-621	TW-8-03009 (EXISTING)	38	90	110	90	NA	NA	HYD	57	V-627	6, 10C

SYS	FULL LINE NO.	LINE NO.	PIPE SPEC.	MATERIAL	SIZE (inch)	LOCATION FROM	LOCATION TO	NORMAL OPERATING PRESS psig	NORMAL OPERATING TEMP (deg.F)	DESIGN PRESS psig	DESIGN TEMP (deg.F)	INSULATION TYPE	INSULATION THK (inch)	TEST TYPE	TEST PRESS psig	VALVES	P&ID NO.
WW		0															
WW	6"-WW-CVCP80-001-N	1.0		CPVC80	6.00	10"-WW-CVC80-100-N	6"-WW-CVCP80-002-N	60	90	110	90	NA	NA	HYD	90	FCV-1010, V-1020	1A
WW	6"-WW-CVCP80-002-N	2.0		CPVC80	6.00	6"-WW-CVCP80-001-N	12"-WW-CVCP40-005-N & -006-N	NA	NA	NA	NA	NA	NA	NA	NA	V-1170, V-1190	1A
WW	6"-WW-CVCP80-003-N	3.0		CPVC80	6.00	10"-WW-CVC80-100-N	6"-WW-CVCP80-004-N	60	90	110	90	NA	NA	HYD	90	FCV-1020, V-1030	1A
WW	6"-WW-CVCP80-004-N	4.0		CPVC80	6.00	6"-WW-CVCP80-003-N	12"-WW-CVCP40-006-N & -007-N	NA	NA	NA	NA	NA	NA	NA	NA	V-1180, V-1200	1A
WW	12"-WW-CVCP40-005-N	5.0		CPVC40	12.00	20"-WW-FRPP-013-N	P-1011	NA	NA	NA	NA	NA	NA	NA	NA	V-1011	1A
WW	12"-WW-CVCP40-006-N	6.0		CPVC40	12.00	20"-WW-FRPP-013-N	P-101A	NA	NA	NA	NA	NA	NA	NA	NA	V-101A	1A
WW	12"-WW-CVCP40-007-N	7.0		CPVC40	12.00	20"-WW-FRPP-013-N	P-1012	NA	NA	NA	NA	NA	NA	NA	NA	V-1012	1A
WW	10"-WW-CVCP80-008-N	8.0		CPVC80	10.00	12"-WW-CVCP40-008-N	FBR-1	18	90	110	90	NA	NA	HYD	27	FV-1011, V-1131	1A
WW	12"-WW-CVCP40-008-N	8.0		CPVC40	12.00	P-1011	10"-WW-CVCP80-008-N	18	90	110	90	NA	NA	HYD	27	V-1041, V-1051	1A
WW	12"-WW-CVCP40-009-N	9.0		CPVC40	12.00	P-101A	12"-WW-CVCP40-028-N	NA	NA	NA	NA	NA	NA	NA	NA	V-104A, V-105A	1A
WW	10"-WW-CVCP80-010-N	10.0		CPVC80	10.00	12"-WW-CVCP40-010-N	FBR-2	18	90	110	90	NA	NA	HYD	27	FV-1012, V-1132	1A
WW	12"-WW-CVCP40-010-N	10.0		CPVC40	12.00	P-1012	10"-WW-CVCP80-010-N	18	90	110	90	NA	NA	HYD	27	V-1042, V-1052	1A
WW	16"-WW-FRPP-011-N	11.0		FRP	16.00	FBR-1	T-2011	10	90	50	90	NA	NA	HYD	15		1A, 2A
WW	16"-WW-FRPP-012-N	12.0		FRP	16.00	FBR-2	T-2011	10	90	50	90	NA	NA	HYD	15		1A, 2A
WW	20"-WW-FRPP-013-N	13.0		FRP	20.00	T-2011	12"-WW-CVCP40-005-N, -006-N & -007-N	10	90	50	90	NA	NA	HYD	15		1A, 2A
WW	10"-WW-CVCP80-014-N	14.0		CPVC80	10.00	T-2011	10"-WW-CVCP80-015-N	10	90	110	90	NA	NA	HYD	15	LCV-2011, V-3000	2A, 3A
WW	10"-WW-CVCP80-015-N	15.0		CPVC80	10.00	10"-WW-CVCP80-014-N & -043-N	10"-WW-CVCP80-016-N	18	90	110	90	NA	NA	HYD	27		3A
WW	10"-WW-CVCP80-016-N	16.0		CPVC80	10.00	10"-WW-CVCP80-015-N	6"-WW-CVCP80-017-N, -018-N, -046-N & -047-N	18	90	110	90	NA	NA	HYD	27	V-3300	3A, 3B
WW	6"-WW-CVCP80-017-N	17.0		CPVC80	6.00	10"-WW-CVCP80-016-N	6"-WW-CVCP80-044-N	18	90	110	90	NA	NA	HYD	27	FCV-3010, V-3030	3A
WW	6"-WW-CVCP80-018-N	18.0		CPVC80	6.00	10"-WW-CVCP80-016-N	6"-WW-CVCP80-045-N	18	90	110	90	NA	NA	HYD	27	FCV-3020, V-3040	3A
WW	12"-WW-CVCP40-019-N	19.0		CPVC40	12.00	20"-WW-FRPP-075-N	P-3015	NA	NA	NA	NA	NA	NA	NA	NA	V-3015	3A
WW	12"-WW-CVCP40-020-N	20.0		CPVC40	12.00	20"-WW-FRPP-075-N	P-3016	NA	NA	NA	NA	NA	NA	NA	NA	V-3016	3A
WW	12"-WW-CVCP40-021-N	21.0		CPVC40	12.00	20"-WW-FRPP-075-N	P-301A	NA	NA	NA	NA	NA	NA	NA	NA	V-301A	3A
WW	10"-WW-CVCP80-022-N	22.0		CPVC80	10.00	12"-WW-CVCP40-022-N	FBR-5	18	90	110	90	NA	NA	HYD	27	FV-3015, V-3135	3A
WW	12"-WW-CVCP40-022-N	22.0		CPVC40	12.00	P-3015	10"-WW-CVCP80-022-N	18	90	110	90	NA	NA	HYD	27	V-3045, V-3055	3A
WW	10"-WW-CVCP80-023-N	23.0		CPVC80	10.00	12"-WW-CVCP40-023-N	FBR-6	18	90	110	90	NA	NA	HYD	27	FV-3016, V-3136	3A
WW	12"-WW-CVCP40-023-N	23.0		CPVC40	12.00	P-3016	10"-WW-CVCP80-023-N	18	90	110	90	NA	NA	HYD	27	V-3046, V-3056	3A
WW	12"-WW-CVCP40-024-N	24.0		CPVC40	12.00	P-301A	12"-WW-CVCP40-025-N	18	90	110	90	NA	NA	HYD	27	V-304A, V-305A	3A
WW	12"-WW-CVCP40-025-N	25.0		CPVC40	12.00	12"-WW-CVCP40-024-N	12"-WW-CVCP80-022-N & -023-N	NA	NA	NA	NA	NA	NA	NA	NA	V-306A , V-307A	3A
WW	16"-WW-FRPP-026-N	26.0		FRP	16.00	FBR-5	T-3011	10	90	50	90	NA	NA	HYD	15		3A, 3C
WW	16"-WW-FRPP-027-N	27.0		FRP	16.00	FBR-6	T-3011	10	90	50	90	NA	NA	HYD	15		3A, 3C
WW	12"-WW-CVCP40-028-N	28.0		CPVC40	12.00	12"-WW-CVCP40-009-N	12"-WW-CVCP80-008-N & -010-N	NA	NA	NA	NA	NA	NA	NA	NA	V-106A, V-107A	1A

SYS	FULL LINE NO.	LINE NO.	PIPE SPEC.	MATERIAL	SIZE (inch)	LOCATION FROM	LOCATION TO	NORMAL OPERATING PRESS psig	NORMAL OPERATING TEMP (deg.F)	DESIGN PRESS psig	DESIGN TEMP (deg.F)	INSULATION TYPE	INSULATION THK (inch)	TEST TYPE	TEST PRESS psig	VALVES	P&ID NO.
WW	6"-WW-CVCP80-029-N	29.0		CPVC80	6.00	10"-WW-CVCP80-100-N	6"-WW-CVCP80-030-N	60	90	110	90	NA	NA	HYD	90	FCV-1110, V-1330	1B
WW	6"-WW-CVCP80-030-N	30.0		CPVC80	6.00	6"-WW-CVCP80-029-N	12"-WW-CVCP40-033-N & -034-N	NA	NA	NA	NA	NA	NA	NA	NA	V-1470, V-1490	1B
WW	6"-WW-CVCP80-031-N	31.0		CPVC80	6.00	10"-WW-CVCP80-100-N	6"-WW-CVCP80-032-N	60	90	110	90	NA	NA	HYD	90	FCV-1120, V-1340	1B
WW	6"-WW-CVCP80-032-N	32.0		CPVC80	6.00	6"-WW-CVCP80-031-N	12"-WW-CVCP40-034-N & -035-N	NA	NA	NA	NA	NA	NA	NA	NA	V-1480, V-1500	1B
WW	12"-WW-CVCP40-033-N	33.0		CPVC40	12.00	20"-WW-FRPP-042-N	P-1013	NA	NA	NA	NA	NA	NA	NA	NA	V-1013	1B
WW	12"-WW-CVCP40-034-N	34.0		CPVC40	12.00	20"-WW-FRPP-042-N	P-102A	NA	NA	NA	NA	NA	NA	NA	NA	V-111A	1B
WW	12"-WW-CVCP40-035-N	35.0		CPVC40	12.00	20"-WW-FRPP-042-N	P-1014	NA	NA	NA	NA	NA	NA	NA	NA	NA	1B
WW	10"-WW-CVCP80-036-N	36.0		CPVC80	10.00	12"-WW-CVCP40-036-N	FBR-3	18	90	110	90	NA	NA	HYD	27	FV-1013, V-1133	1B
WW	12"-WW-CVCP40-036-N	36.0		CPVC40	12.00	P-1013	10"-WW-CVCP80-036-N	18	90	110	90	NA	NA	HYD	27	V-1043, V-1053	1B
WW	12"-WW-CVCP40-037-N	37.0		CPVC40	12.00	P-102A	12"-WW-CVCP40-039-N	18	90	110	90	NA	NA	HYD	27	V-114A, V-115A	1B
WW	10"-WW-CVCP80-038-N	38.0		CPVC80	10.00	12"-WW-CVCP40-038-N	FBR-4	18	90	110	90	NA	NA	HYD	27	FV-1014, V-1134	1B
WW	12"-WW-CVCP40-038-N	38.0		CPVC40	12.00	P-1014	10"-WW-CVCP80-038-N	18	90	110	90	NA	NA	HYD	27	V-1044, V-1054	1B
WW	12"-WW-CVCP40-039-N	39.0		CPVC40	12.00	12"-WW-CVCP40-037-N	12"-WW-CVCP80-036-N & -038-N	NA	NA	NA	NA	NA	NA	NA	NA	V-116A, V-1530	1B
WW	16"-WW-FRPP-040-N	40.0		FRP	16.00	FBR-3	T-2012	10	90	110	90	NA	NA	HYD	15		1B, 2B
WW	16"-WW-FRPP-041-N	41.0		FRP	16.00	FBR-4	T-2012	10	90	110	90	NA	NA	HYD	15		1B, 2B
WW	20"-WW-FRPP-042-N	42.0		FRP	20.00	T-2012	12"-WW-CVCP40-033-N, -034-N & -035-N	10	90	50	90	NA	NA	HYD	15	15	1B, 2B
WW	10"-WW-CVCP80-043-N	43.0		CPVC80	10.00	T-2012	10"-WW-CVCP80-015-N	10	90	110	90	NA	NA	HYD	15	LCV-2012, V-3010	2B, 3A
WW	6"-WW-CVCP80-044-N	44.0		CPVC80	6.00	6"-WW-CVCP80-017-N	12"-WW-CVCP40-019-N & -021-N	NA	NA	NA	NA	NA	NA	NA	NA	V-3190, V-3170	3A
WW	6"-WW-CVCP80-045-N	45.0		CPVC80	6.00	6"-WW-CVCP80-018-N	12"-WW-CVCP40-020-N & -021-N	NA	NA	NA	NA	NA	NA	NA	NA	V-3180, V-3200	3A
WW	6"-WW-CVCP80-046-N	46.0		CPVC80	6.00	10"-WW-CVCP80-016-N	6"-WW-CVCP80-057-N	18	90	110	90	NA	NA	HYD	27	FCV-3030, V-3330	3B
WW	6"-WW-CVCP80-047-N	47.0		CPVC80	6.00	10"-WW-CVCP80-016-N	6"-WW-CVCP80-058-N	18	90	110	90	NA	NA	HYD	27	FCV-3040, V-3340	3B
WW	12"-WW-CVCP40-048-N	48.0		CPVC40	12.00	20"-WW-FRPP-059-N	P-3017	NA	NA	NA	NA	NA	NA	NA	NA	V-3017	3B
WW	12"-WW-CVCP40-049-N	49.0		CPVC40	12.00	20"-WW-FRPP-059-N	P-3018	NA	NA	NA	NA	NA	NA	NA	NA	V-3018	3B
WW	12"-WW-CVCP40-050-N	50.0		CPVC40	12.00	P-302A	12"-WW-CVCP80-119-N	NA	NA	NA	NA	NA	NA	NA	NA	V-314A, V-315A	3B
WW	10"-WW-CVCP80-051-N	51.0		CPVC80	10.00	12"-WW-CVCP40-051-N	FBR-7	18	90	110	90	NA	NA	HYD	27	FV-3017, V-3137	3B
WW	12"-WW-CVCP40-051-N	51.0		CPVC40	12.00	P-3017	10"-WW-CVCP80-051-N	18	90	110	90	NA	NA	HYD	27	V-3047, V-3057	3B
WW	10"-WW-CVCP80-052-N	52.0		CPVC80	10.00	12"-WW-CVCP40-052-N	FBR-8	18	90	110	90	NA	NA	HYD	27	FV-3018, V-3138	3B
WW	12"-WW-CVCP40-052-N	52.0		CPVC40	12.00	P-3018	10"-WW-CVCP80-052-N	18	90	110	90	NA	NA	HYD	27	V-3048, V-3058	3B
WW	12"-WW-CVCP40-053-N	53.0		CPVC40	12.00	20"-WW-FRPP-059-N	P-302A	NA	NA	NA	NA	NA	NA	NA	NA	V-311A	3B
WW	16"-WW-FRPP-055-N	55.0		FRP	16.00	FBR-7	T-3012	10	90	50	90	NA	NA	HYD	15		3B, 3D
WW	16"-WW-FRPP-056-N	56.0		FRP	16.00	FBR-8	T-3012	10	90	50	90	NA	NA	HYD	15		3B, 3D
WW	6"-WW-CVCP80-057-N	57.0		CPVC80	6.00	6"-WW-CVCP80-046-N	12"-WW-CVCP40-048-N & -053-N	NA	NA	NA	NA	NA	NA	NA	NA	V-3470, V-3490	3B
WW	6"-WW-CVCP80-058-N	58.0		CPVC80	6.00	6"-WW-CVCP80-047-N	12"-WW-CVCP40-049-N & -053-N	NA	NA	NA	NA	NA	NA	NA	NA	V-3480, V-3500	3B

SYS	FULL LINE NO.	LINE NO.	PIPE SPEC.	MATERIAL	SIZE (inch)	LOCATION FROM	LOCATION TO	NORMAL OPERATING PRESS psig	NORMAL OPERATING TEMP (deg.F)	DESIGN PRESS psig	DESIGN TEMP (deg.F)	INSULATION TYPE	INSULATION THK (inch)	TEST TYPE	TEST PRESS psig	VALVES	P&ID NO.
WW	20"-WW-FRPP-059-N	59.0		FRP	20.00	T-3012	12"-WW-CVCP40-048-N, -049-N & -053-N	10	90	50	90	NA	NA	HYD	15		3B, 3D
WW	10"-WW-CVCP80-060-N	60.0		CPVC80	10.00	T-3011	T-401	10	90	110	90	NA	NA	HYD	15	LCV-3011, V-417	3C, 4
WW	10"-WW-CVCP80-061-N	61.0		CPVC80	10.00	10"-WW-CVCP80-015-N	T-401	18	90	110	90	NA	NA	HYD	27	V-3020	3A, 4
WW	10"-WW-CVCP80-062-N	62.0		CPVC80	10.00	T-401	10"-WW-CVCP40-063-N & -066-N	ATMOS	90	110	90	NA	NA	HYD	15		4, 5
WW	10"-WW-CVCP80-063-N	63.0		CPVC80	10.00	10"-WW-CVCP80-062-N	14"-WW-CVCP80-063-N	10	90	110	90	NA	NA	HYD	15		5
WW	14"-WW-CVCP40-063-N	63.0		CPVC40	14.00	10"-WW-CVCP80-063-N	D-501 & 10"-WW-CVCP80-064-N	10	90	110	90	NA	NA	HYD	15	V-501	5
WW	10"-WW-CVCP80-064-N	64.0		CPVC80	10.00	14"-WW-CVCP40-063-N	10"-WW-CVCP80-065-N	10	90	110	90	NA	NA	HYD	15	V-525	5, 6
WW	10"-WW-CVCP80-065-N	65.0		CPVC80	10.00	D-501	T-601	10	90	110	90	NA	NA	HYD	15	V-505	5, 6
WW	10"-WW-CVCP80-066-N	66.0		CPCV80	10.00	10"-WW-CVCP80-062-N	14"-WW-CVCP80-066-N	10	90	110	90	NA	NA	HYD	15		5
WW	14"-WW-CVCP40-066-N	66.0		CPVC40	14.00	10"-WW-CVCP80-066-N	D-551 & 10"-WW-CVCP80-067-N	10	90	110	90	NA	NA	HYD	15	V-551	5
WW	10"-WW-CVCP80-067-N	67.0		CPVC80	10.00	14"-WW-CVCP40-066-N	10"-WW-CVCP80-065-N	10	90	110	90	NA	NA	HYD	15	V-575	5
WW	10"-WW-CVCP80-068-N	68.0		CPVC80	10.00	D-551	10"-WW-CVCP80-065-N	10	90	110	90	NA	NA	HYD	15	V-555	5
WW	8"-WW-CVCP80-069-N	69.0		CPVC80	8.00	10"-WW-CVCP80-069-N	P-602	NA	NA	NA	NA	NA	NA	NA	NA	V-603	6
WW	10"-WW-CVCP80-069-N	69.0		CPVC80	10.00	T-601	8"-WW-CVCP80-069-N & -070-N	10	90	110	90	NA	NA	HYD	15	V-601	6
WW	8"-WW-CVCP80-070-N	70.0		CPVC80	8.00	10"-WW-CVCP80-069-N	P-601	NA	NA	NA	NA	NA	NA	NA	NA	V-605	6
WW	8"-WW-CVCP80-071-N	71.0		CPVC80	8.00	P-602	8"-WW-CVCP80-072-N	40	90	110	90	NA	NA	HYD	60	V-604	6
WW	8"-WW-CVCP80-072-N	72.0		CPVC80	8.00	P-601	X-621	40	90	110	90	NA	NA	HYD	60	LCV-601, V-606, V-608, V-611, V-612, V-1320	6
WW	8"-WW-CVCP80-073-N	73.0		CPVC80	8.00	8"-WW-CVCP80-072-N	10"-WW-CVCP80-100-N	40	90	110	90	NA	NA	HYD	60		1B, 6
WW	20"-WW-FRPP-075-N	75.0		FRP	20.00	T-3011	12"-WW-CVCP40-019-N, -020-N & -021-N	10	90	50	90	NA	NA	HYD	15		3A, 3C
WW	10"-WW-CVCP80-076-N	76.0		CPVC80	10.00	T-3012	10"-WW-CVCP80-060-N	ATMOS	90	110	90	NA	NA	HYD		LCV-3012	3D, 4
WW	1"-WW-CVCP80-077-I	77.0		CPVC80	1.00	16"-WW-FRPP-011-N	6"-WW-CVCP80-001-N	10	90	110	90	FRP	1	HYD	15	V-1221, V-1231, V-1241	1A
WW	1"-WW-CVCP80-078-I	78.0		CPVC80	1.00	16"-WW-FRPP-012-N	6"-WW-CVCP80-003-N	10	90	110	90	FRP	1	HYD	15	V-1222, V-1232, V-1242	1A
WW	1 1/2"-WW-CVCP80-079-N	79.0		CPVC80	1.50	T-2011	P-2011	12	90	110	90	NA	NA	HYD	18	FV-2011, FV-2031, V-2031	2A
WW	1 1/2"-WW-CVCP80-080-N	80.0		CPVC80	1.50	P-2011	V-2061 & V-2071	30	90	90	90	NA	NA	HYD	45	V-2061, V-2071	2A
WW	1 1/2"-WW-CVCP80-081-N	81.0		CPVC80	1.50	V-2061	FBR-1	30	90	90	90	NA	NA	SERVICE	TEST		1A, 2A
WW	1"-WW-CVCP80-082-I	82.0		CPVC80	1.00	16"-WW-FRPP-026-N	6"-WW-CVCP80-017-N	10	90	90	90	FRP	1	HYD	15	V-3175, V-3185, V-3195	3A
WW	1"-WW-CVCP80-083-I	83.0		CPVC80	1.00	16"-WW-FRPP-027-N	6"-WW-CVCP80-018-N	10	90	90	90	FRP	1	HYD	15	V-3176, V-3186, V-3196	3A
WW	1 1/2"-WW-CVCP80-084-N	84.0		CPVC80	1.50	T-3011	P-3011	12	90	90	90	NA	NA	HYD	18	FV-3011, FV-3031, V-3631	3C
WW	1 1/2"-WW-CVCP80-085-N	85.0		CPVC80	1.50	P-3011	V-3661 & V-3671	30	90	90	90	NA	NA	HYD	45	V-3661, V-3671	3C
WW	1 1/2"-WW-CVCP80-086-N	86.0		CPVC80	1.50	V-3661	FBR-5	30	90	90	90	NA	NA	SERVICE	TEST		3A, 3C
WW	1"-WW-CVCP80-087-I	87.0		CPVC80	1.00	16"-WW-FRPP-040-N	6"-WW-CVCP80-029-N	10	90	90	90	FRP	1	HYD	15	V-1223, V-1233, V-1243	1B
WW	1"-WW-CVCP80-088-I	88.0		CPVC80	1.00	16"-WW-FRPP-041-N	6"-WW-CVCP80-031-N	10	90	90	90	FRP	1	HYD	15	V-1224, V-1234, V-1244	1B
WW	1 1/2"-WW-CVCP80-090-N	90.0		CPVC80	1.50	T-2012	P-2012	12	90	90	90	NA	NA	HYD	27	FV-2012, FV-2033, V-2032	2B

SYS	FULL LINE NO.	LINE NO.	PIPE SPEC.	MATERIAL	SIZE (inch)	LOCATION FROM	LOCATION TO	NORMAL OPERATING PRESS psig	NORMAL OPERATING TEMP (deg.F)	DESIGN PRESS psig	DESIGN TEMP (deg.F)	INSULATION TYPE	INSULATION THK (inch)	TEST TYPE	TEST PRESS psig	VALVES	P&ID NO.
WW	1 1/2"-WW-CVCP80-091-N	91.0		CPVC80	1.50	V-2062	FBR-3	30	90	90	90	NA	NA	SERVICE	TEST		1B, 2B
WW	1"-WW-CVCP80-092-I	92.0		CPVC80	1.00	16"-WW-FRPP-055-N	6"-WW-CVCP80-046-N	10	90	90	90	FRP	1	HYD	15	V-3177, V-3187, V-3197	3B
WW	1"-WW-CVCP80-093-I	93.0		CPVC80	1.00	16"-WW-FRPP-056-N	6"-WW-CVCP80-047-N	10	90	90	90	FRP	1	HYD	15	V-3178, V-3188, V-3198	3B
WW	1 1/2"-WW-CVCP80-094-N	94.0		CPVC80	1.50	T-3012	P-3012	12	90	90	90	NA	NA	HYD	27	FV-3012, FV-3032, V-3632	3D
WW	1 1/2"-WW-CVCP80-095-N	95.0		CPVC80	1.50	P-3012	V-3662 & V-3672	30	90	90	90	NA	NA	HYD	45		3D
WW	1 1/2"-WW-CVCP80-096-N	96.0		CPVC80	1.50	V-3662	FBR-7	30	90	90	90	NA	NA	SERVICE	TEST		3B, 3D
WW	1"-WW-CVCP80-097-HT&I	97.0		CPVC80	1.00	4"-BA-CVCP80-002-N	T-401	13	100	90	90	FRP	1	HYD	20	V-419	4
WW	2"-WW-CVCP80-098-N	98.0		CPVC80	2.00	T-902	P-903	10	90	90	90	NA	NA	HYD	15	V-914	9
WW	1"-WW-CVCP80-099-N	99.0		CPVC80	1.00	P-903	2"-WW-CVCP80-099-N	20	90	30	90	NA	NA	HYD	30	V-927, V-931	4, 9
WW	2"-WW-CVCP80-099-I	99.0		CPVC80	2.00	1"-WW-CVCP80-099-N	10"-WW-CVCP80-062-N	20	90	30	90	FRP	1	HYD	30		4
WW	8"-WW-CVCP80-100-N	100.0		CPVC80	8.00	EQUALIZED FEED	10"-WW-CVCP80-100-N	60	90	110	90	NA	NA	HYD	90	HV-216, PCV-1015	1B
WW	10"-WW-CVCP80-100-N	100.0		CPVC80	10.00	8"-WW-CVCP80-100-N	6"-WW-CVCP80-001-N, 003-N, 029-N & 0	60	90	110	90	NA	NA	HYD	90	HV-216, PCV-1015, V-1300, V-1543	1A, 1B
WW	1/2"-WW-CSTP40-101-N	101.0		CSTP40	0.50	P-801	AIR COMPRESSOR SKID DRAIN FUNNEL	ATMOS	90	NA	NA	NA	NA	NA	NA		8
WW	1/2"-WW-CSTP40-102-N	102.0		CSTP40	0.50	P-802	AIR COMPRESSOR SKID DRAIN FUNNEL	ATMOS	90	NA	NA	NA	NA	NA	NA		8
WW	1/2"-WW-CSTP40-104-N	104.0		CSTP40	0.50	T-801	AIR COMPRESSOR SKID DRAIN FUNNEL	ATMOS	90	NA	NA	NA	NA	NA	NA	V-807	8
WW	2"-WW-CVCP80-103-N	103.0		CPVC80	2.00	AIR COMPRESSOR SKID DRAIN FUNNEL	FLOOR DRAIN	ATMOS	90	NA	NA	NA	NA	NA	NA		8
WW	1/2"-WW-CSTP40-105-N	105.0		CSTP40	0.50	F-802	AIR COMPRESSOR SKID DRAIN FUNNEL	ATMOS	90	NA	NA	NA	NA	NA	NA		8
WW	1/2"-WW-CSTP40-106-N	106.0		CSTP40	0.50	F-803	AIR COMPRESSOR SKID DRAIN FUNNEL	ATMOS	90	NA	NA	NA	NA	NA	NA		8
WW	3"-WW-CVCP80-107-N	107.0		CPVC80	3.00	P-1101	3"-WW-CVCP80-108-N & -109-N	15	90	110	90	NA	NA	HYD	23	V-1101, V-1102	11
WW	3"-WW-CVCP80-108-N	108.0		CPVC80	3.00	P-1102	3"-WW-CVCP80-107-N & -109-N	15	90	110	90	NA	NA	HYD	23	V-1103, V-1104	11
WW	3"-WW-CVCP80-109-N	109.0		CPVC80	3.00	3"-WW-CVCP80-107-N & -108N	P-1202	15	90	110	90	NA	NA	HYD	23	V-1105	11
WW	1 1/2"-WW-CVCP80-110-N	110.0		CPVC80	1.50	V-2071	FBR-2	30	90	90	90	NA	NA	SERVICE	TEST		1A, 2A
WW	1 1/2"-WW-CVCP80-111-N	111.0		CPVC80	1.50	V-2072	FBR-4	30	90	90	90	NA	NA	SERVICE	TEST		1B, 2B
WW	1 1/2"-WW-CVCP80-112-N	112.0		CPVC80	1.50	V-3671	FBR-6	30	90	90	90	NA	NA	SERVICE	TEST		3A, 3C
WW	1 1/2"-WW-CVCP80-113-N	113.0		CPVC80	1.50	V-3672	FBR-8	30	90	90	90	NA	NA	SERVICE	TEST		3B, 3D
WW	2"-WW-CVCP80-114-N	114.0		CPVC80	2.00	T-402A & T-402B	T-404	9	90	110	90	NA	NA	HYD	FILL		4
WW	2"-WW-CVCP80-115-N	115.0		CPVC80	2.00	1"-WW-CVCP80-115-N	10"-WW-CVCP80-062-N	15	90	110	90	NA	NA	HYD	23		4
WW	1"-WW-CVCP80-115-N	115.0		CPVC80	1.00	P-402	2"-WW-CVCP80-115-N	15	90	110	90	NA	NA	HYD	23	V-412A	4
WW	1 1/2"-WW-CVCP80-116-N	116.0		CPVC80	1.50	P-2012	V-2062 & V-2072	30	90	110	90	NA	NA	HYD	45	V-2062, V-2072	2B
WW	2"-WW-CVCP80-117-N	117.0		CPVC80	2.00	8"-WW-CVCP80-072-N	T-601	18	90	110	90	NA	NA	HYD	27	V-616	6
WW	1/2"-WW-CVCP80-118-N	118.0		CPVC80	0.50	8"-WW-CVCP80-072-N	T-601	18	90	110	90	NA	NA	HYD	27	V-610	6
WW	12"-WW-CVCP80-119-N	119.0		CPVC80	12.00	12"-WW-CVCP80-050-N	12"-WW-CVCP80-051-N & -052-N	NA	NA	NA	NA	NA	NA	NA	NA	V-316A, V-317A	3B

SYS	FULL LINE NO.	LINE NO.	PIPE SPEC.	MATERIAL	SIZE (inch)	LOCATION FROM	LOCATION TO	NORMAL OPERATING PRESS psig	NORMAL OPERATING TEMP (deg.F)	DESIGN PRESS psig	DESIGN TEMP (deg.F)	INSULATION TYPE	INSULATION THK (inch)	TEST TYPE	TEST PRESS psig	VALVES	P&ID NO.
WW	1"-WW-CVCP80-120-N	120.0		CPVC80	1.00	8"-WW-CVCP80-100-N	10"-WW-CVCP80-100-N	60	90	110	90	NA	NA	HYD	90	V-1544, V-1547	1B
WW	10"-WW-CVCP80-121-N	121.0		CPVC80	10.00	T-601	END	ATMOS	90	NA	NA	NA	NA	NA	NA		6
WW	4"-WW-CVCP80-122-N	122.0		CPVC80	4.00	T-901	END	ATMOS	90	NA	NA	NA	NA	NA	NA		9

Fluid Abbr.	Service
BA	Blower Air
ED	Electron Donor
FC	Ferric Chloride
IA	Instrument Air
NU	Nutrient
P	Polymer
PHA	Phosphoric Acid
POP	
PA	Process Air
SL	Sludge
SO4	
SH	Sodium Hydroxide (Caustic)
SLM	Stabilized Lake Mead Water
SW	Service Water
CA	Service Air
TW	Treated Water
WW	Wastewater

NOTES:

LEGEND:

HYD	=HYDROSTATIC LEAK TEST- For details on Testing Methods use Division 15
PNEU	= PNEUMATIC LEAK TEST
SER	= SERVICE LEAK TEST
VT	= VISUAL EXAMINATION
N	= NO INSULATION
H	= HEAT RETENTION
I	= PERSONEL PROTECTION INSULATION/PERSONEL PROTECTION
HT&I	= HEAT TRACE AND INSULATE FOR FREEZE PROTECTION
*	= INSULATE WITH CELLULAR GLASS INSULATION MATERIALS (SEE NOTE 1)
NA	= NOT APPLICABLE
ATMOS	= ATMOSPHERE

NERT
LINE DESIGNATION TABLE

SYS	FULL LINE NO.	LINE NO.	PIPE SPEC.	MATERIAL	SIZE (inch)	LOCATION FROM	LOCATION TO	NORMAL OPERATING		DESIGN		INSULATION		TEST		VALVES	Piping Drawing NO.	P&ID NO.
								PRESS psig	TEMP (deg.F)	PRESS psig	TEMP (deg.F)	TYPE	THK (inch)	TYPE	PRESS psig			
BA																		
CA																		
CA	2"-CA-CSTP40-470-N	470		CSTP40	2	AIR COMPRESSOR SKID	OXYGEN AIR TREATMENT SKID	110	100	150	90	NA	NA	PNEU	150	-	M-17, 67	8, 16
ED																		
ED	1/2"-ED-SO4P80-449-N	449		S04P80	1/2	P-73A	10"-WW-CVCP80-431-N	70	90	150	90	NA	NA	HYD	105	V-4492, 4493,4494	M-10,65	7B, 14
FC																		
IA																		
	1/2"-IA-CSTP40-100-N	100		CSTP40	1/2	INSTR AIR HEADER	X-621 (UV), FI-621 (@T-621)	100	90	150	90	NA	NA	PNEU	150	V-5191, 5190, FI-621	M-67, PID-10C	12, 10C
	1/2"-IA-CSTP40-443-N	443		CSTP40	1/2	INSTR AIR HEADER	FBR-A FLUIDIZATION PUMP SKID, FV-1401, BIOMASS SEP PNL	100	90	150	90	NA	NA	PNEU	150	V-4431, 4090, PCV-4430, SV-1401	M-10, 65, PID-14	12, 14
	3/4"-IA-CSTP40-486-N	486		CSTP40	3/4	INSTR AIR HEADER	T-1702 (SAND FILTER), FILTER REJECT PUMP SKID	100	90	150	90	NA	NA	PNEU	150	V-4860	M-68	12, 17
	3/8"-IA-POPT-493-N	493		POPT	3/8	FILTER REJECT PUMP SKID	T-1701	30	90	50	90	NA	NA	PNEU	VT		PID-17	17
NU																		
	3/8"-NU-POPT-448-N	448		POPT	3/8	P-72A	FBR-A FLUIDIZATION PUMP SKID	50	90	100	90	NA	NA	HYD	75	V-4484, 4485	M-16, 65 PID-7A,14	7A, 14
O2																		
	3/4"-O2-SO4P80-475-N	475		S04P80	3/4	OXYGEN/AIR TREATMENT SKID	E-1302	40	90	50	90	NA	NA	PNEU	75	FV-1601, FI-1601, V-4751, 4752	M-67, 71PID-10C	16, 10C
	3/4"-O2-SO4P80-476-N	476		S04P80	3/4	3/4"-O2-SO4P80-475-N	E-1603	40	90	50	90	NA	NA	PNEU	75	V-4760, 4761, 4762, FV-1602, FI-1602	M-71, PID-16	16
P																		
	2"-P-CVCP80-530-N	530		CVCP80	2	POLYMER APPLICATION SKID P-930	T-901	30	90	30	90	NA	NA	HYD	45	-	M-67, 17, 18, 70	9
PA																		
PHA																		
PHA	3/8"-PHA-S16T-415-N	415		316 SS TUBE	3/8	P-1521	3/8"-NU-POPT-N @ FBR-1	50	90	100	90	NA	NA	HYD	75	V-4153, 4154	M-66,-125	15,1A
PHA	3/8"-PHA-S16T-526-N	526		316 SS TUBE	3/8	P-1522	3/8"-NU-POPT-N @ FBR-2	50	90	100	90	NA	NA	HYD	75	V-5262, 5263	M-66,-125	15,1A
PHA	3/8"-PHA-S16T-534-N	534		316 SS TUBE	3/8	P-1523	3/8"-NU-POPT-N @ FBR-3	50	90	100	90	NA	NA	HYD	75	V-5343, 5344	M-66,-125	15,1B
PHA	3/8"-PHA-S16T-536-N	536		316 SS TUBE	3/8	P-1524	3/8"-NU-POPT-N @ FBR-4	50	90	100	90	NA	NA	HYD	75	V-5362, 5363	M-66,-125	15,1B
PHA	3/8"-PHA-S16T-538-N	538		316 SS TUBE	3/8	P-1520A	10"-WW-CVCP80-431-N	50	90	100	90	NA	NA	HYD	75	V-5382, 5383	M-65,-125	15,14

NERT
LINE DESIGNATION TABLE

SYS	FULL LINE NO.	LINE NO.	PIPE SPEC.	MATERIAL	SIZE (inch)	LOCATION FROM	LOCATION TO	NORMAL OPERATING		DESIGN		INSULATION		TEST		VALVES	Piping Drawing NO.	P&ID NO.
								PRESS psig	TEMP (deg.F)	PRESS psig	TEMP (deg.F)	TYPE	THK (inch)	TYPE	PRESS psig			
SH																		
SH	2"-SH-CVCP80-002-N	2		CPVC80	2	T-701	EXIST CAUSTIC SKID	10	90	145	90	NA	NA	HYD	15	V-5165, 5160	M-16, 66	7A
SH	3"-SH-CVCP80-515-N	515		CPVC80	3	TRUCK FILL	T-701	20	90	145	90	NA	NA	HYD	30	V-5150, 5151	M-66	7A
SH	3/8"-SH-POPT-445-N	445		POPT	3/8	P-71A	FBR-A FLUIDIZATION PUMP SKID	50	90	100	90	NA	NA	HYD	75	-	M-16, 65, 105	7A, 14
SL																		
SL	4"-SL-CVCP80-491-N	491		CPVC80	4	P-603	T-1603	43	90	110	90	NA	NA	HYD	FILL	V-4910, V-4820	M-70, 18, 17, 67, 71	6,16
SL	4"-SL-CVCP80-477-N	477		CPVC80	4	T-1603	P-1601	10	90	145	90	NA	NA	HYD	VT	V-4770, 4771, 4776	M-71	16
SL	4"-SL-CVCP80-477A-N	477A		CPVC80	4	P-1601	T-1603 (MIXING MANIFOLD)	60	90	145	90	NA	NA	HYD	90	V-4774, 4775, 4791, 4790, 4800,4810, E-1603	M-71,	16
SL	4"-SL-CVCP80-478-N	478		CPVC80	4	4"-SL-477A	T-901	60	90	145	90	NA	NA	HYD	90	V-4780	M-71, 67, 17, 18, 70	16,9
SL	2"-SL-CVCP80-428-N	428		CPVC80	2	2"-SL-CVCP80-016-I	4"-SL-CVCP80-491-N	60	90	145	90	NA	NA	HYD	90	V-4280, 4281	M-70	6
SLM	AT AP-5 POND																	
SLM	3"-SLM-GCSP40-402-N	402		GCSP40	3	OLD D-1 FOUNDATION	3"-SLM-HDPEP11-402-N	120	90	120	90	NA	NA	HYD	180	V-4022, 4023, RPZ-4100 PCV-4100	M-69, 3-1	13
SLM	3"-SLM-HDPEP11-402-N	402		HDPEP11	3	3"-SLM-GCSP40-402-N	AP-5 PUMP SKID	85	90	110	90	NA	NA	HYD	148		M-3-1	13
SLM	2"-SLM-HDPEP11-402-N	402		HDPEP11	2	3"-SLM-HDPEP11-402-N	1/2"-SLM-CVCP80-483/484/485-HT&I	85	90	110	90	NA	NA	HYD	148	V-4830, 4840, 4850	M-3-1	13
SLM	3"-SLM-CVCP80-541-N	541		CPVCP80	3	AP-5 PUMP SKID	AP-5 POND SPRAY HEADER	85	90	110	90	NA	NA	HYD	148		M-3-2	13
SLM	AT EQUIPMENT AREA																	
SLM	1 1/2"-SLM-CVCP80-001-N	001		CPVC80	1 1/2	PRE EXIST SLM HDR (BLDG D-1)	SS-1210	85	90	110	90	NA	NA	HYD	148	V-1210	FIELD RUN	12
SLM	1 1/2"-SLM-CVCP80-001-N	001		CPVC80	1 1/2	PRE EXIST SLM HDR (BLDG D-1)	SS-1211	85	90	110	90	NA	NA	HYD	148	V-1211	FIELD RUN	12
SLM	1"-SLM-CVCP80-402A-N	402		CPVC80	1	1"-SLM-CVCP80-527-N	P-1601	85	90	110	90	NA	NA	HYD	148	V-4026, FI-4027	FIELD RUN	12, 16
SLM	1 1/2"-SLM-CVCP80-487-N	487		CPVC80	1 1/2	PRE EXIST SLM HDR (BLDG D-1)	P-1701A/B	85	90	110	90	NA	NA	HYD	148	-	M-68, 17	12, 17
SLM	1"-SLM-CVCP80-527-N	527		CPVC80	1	3"-SLM-CVCP80-001-N	DRY POLYMER FEED SKID	85	90	110	90	NA	NA	HYD	148	V-5271	M-67	12, 9
SLM	3"-SLM-CVCP80-540-N	540		CPVC80	3	LW-3-02504	BW-8-02005	85	90	110	90	NA	NA	HYD	148	V-5401	M-31	10B
SLM	2"-SLM-CVCP80-546-N	546		CPVC80	2	2"-SLM-CVCP80-001-N	SS-1208 (HT&I @ SHOWER)	85	90	110	90	NA	NA	HYD	148	V-4000	M-11, 10, 65	12
SLM	2"-SLM-CVCP80-539-N	539		CPVC80	1	2"-SLM-CVCP80-544-N	PHOSPHORIC ACID PUMP SKID	85	90	110	90	NA	NA	HYD	148		M-16, 66	12, 15
SLM	2"-SLM-CVCP80-544-N	544		CPVC80	1	2"-SLM-CVCP80-001-N	NUTRIENT FEED SKID	85	90	110	90	NA	NA	HYD	148	V-5440	M-16	12, 7A
SW																		
SW	1 1/2"-SW-CVCP80-440-N	440		CPVC80	1 1/2	1 1/2"-SW-CVCP80-001-N	1 1/2"-WW-CVCP80-438-N	85	90	110	90	NA	NA	HYD	148	V-4403, 4401, 4402	M-10, 65	2A, 14
SW	1 1/2"-SW-CVCP80-441-N	441		CPVC80	1 1/2	1 1/2"-SW-CVCP80-440-N	FLUIDIZATION PUMP SKID	85	90	110	90	NA	NA	HYD	148	V-4411	M-65, 105	14
SW	1 1/2"-SW-CVCP80-461-N	461		CPVC80	1 1/2	1 1/2"-SW-CVCP80-441-N	FBR-A	85	90	110	90	NA	NA	HYD	148	V-4610, 4612	M-65, 103	14
SW	1 1/2"-SW-CVCP80-545-N	545		CPVC80	1 1/2	1 1/2"-SW-CVCP80-001-N	FBR CATWALK	85	90	110	90	NA	NA	HYD	148	V-5404, 5406, 5405	FIELD RUN	2A
SW	1"-SW-CVCP80-540-N	540		CPVC80	1	2"-SW-CVCP80-001-N	2"-SL-CVCP80-428-N	85	90	110	90	NA	NA	HYD	148	V-5390, 5400	M-70	6
TW																		

NERT
LINE DESIGNATION TABLE

SYS	FULL LINE NO.	LINE NO.	PIPE SPEC.	MATERIAL	SIZE (inch)	LOCATION FROM	LOCATION TO	NORMAL OPERATING		DESIGN		INSULATION		TEST		VALVES	Piping Drawing NO.	P&ID NO.
								PRESS psig	TEMP (deg.F)	PRESS psig	TEMP (deg.F)	TYPE	THK (inch)	TYPE	PRESS psig			
WW	AT AP-5 POND TO GW-11 POND																	
WW	4"-WW-EPDMH-406-N (AND SPARE)	406		EPDM CHEM DUTY SUCTION	4	AP-5 POND	AP-5 PUMP SKID	VAC	90	30	90	NA	NA	HYD	NA	S-1302	M-3-2	13
WW	3"-WW-CVCP80-426-N	426		CVPC80	3	AP-5 PUMP SKID	AP-5 POND SPRAY HEADER	50	90	110	90	NA	NA	HYD	75		M-3-2	13
WW	6"-WW-HDPEP11-407-N	407		HDPEP11	6	AP-5 PUMP SKID	6"-WW-CVCP80-407-N	50	90	110	90	NA	NA	HYD	75		M-3-1, 69-1	13, 10A
WW	6"-WW-CVCP80-407-N	407		CPVC80	6	6"-WW-HDPEP11-407-N	GWTP EFFLUENT	50	90	110	90	NA	NA	HYD	75	V-4074, 4075, 4076, FE-AP-5	M-69 SHT 2	10A
WW	6"-WW-HDPEP11-408-N	408		HDPEP11	6	RW-6-01001	GW-11 SPRAY HEADER	50	90	110	90	NA	NA	HYD	75	V-4078, V-4081	M-69	10A
WW	2"-WW-HDPEP11-405-N	405		HDPEP11	2	AP-5 SPRAY HEADER	POND (TYP 3 PLCS)	50	90	110	90	NA	NA	HYD	75	V-EXIST	M-3	13
WW	AT FBR-A																	
WW	6"-WW-CVCP80-417-N	417		CPVC80	6	10"WW-CVCP80-100-N	FBR-A FLUIDIZATION SKID	60	90	110	90	NA	NA	HYD	90	V-4174, FE-1440	M-10, 65, 105	1A, 14
WW	12"-WW-CVCP80-429-N	429		CPVC80	12	T-1401	FBR-A FLUIDIZATION SKID	10	90	50	90	NA	NA	HYD	15		M-65, 105	14
WW	10"-WW-CVCP80-431-N	431		CPVC80	10	FBR-A FLUIDIZATION SKID	FBR-A	18	90	110	90	NA	NA	HYD	27	FE-1401, FV-1401, V-4319	M-65, 105	14
WW	14"-WW-FRPP-434-N	434		FRP	14	FBR-A (16" CONNS)	T-1401	10	90	50	90	NA	NA	HYD	15		M-65	14
WW	6"-WW-CVCP80-452-N	452		CPVC80	6	T-1401	10" WW-CVCP80-015-N	10	90	110	90	NA	NA	HYD	15	V-4520	M-65, 10	14, 3A
WW	1 1/2"-WW-CVCP80-438-N	438		CPVC80	1 1/2	T-1401	P-1410	12	90	110	90	NA	NA	HYD	18	V-4381, 4382, 4383	M-65	14
WW	1 1/2"-WW-CVCP80-439-N	439		CPVC80	1 1/2	P-1410	FBR-A	30	90	90	90	NA	NA	HYD	SERVICE	V-4390, 4391	M-65	14
WW	1"-WW-CVCP80-444-I	444		CPVC80	1	14"-WW-FRPP-434-N	FBR-A FLUIDIZATION SKID	10	90	110	90	FRP	1	HYD	15	V-4440	M-65	14
WW	AT PLANT EFFLUENT																	
WW	10"-WW-CVCP80-489-N	489		CPVC80	10	T-1702 (SAND FILTER EFFLUENT)	T-621 (EFFLUENT TANK)	40	90	110	90	NA	NA	HYD	60	V-4890, 4891, 4892, 4893, X-621	M17, -68, 67, 71	17, 10C
WW	4"-WW-CVCP80-495-N	495		CPVC80	4	T-1702 (SAND FILTER REJECT)	T-1701	ATMOS	90	50	90	NA	NA	HYD	SER		M-68	17
WW	8"-WW-CVCP80-502-N	502		CPVC80	8	8"-WW-CVCP80-001-N	T-1702 (SAND FILTER INLET)	38	90	110	90	NA	NA	HYD	57	V-5020	M-17, 68	6, 17
WW	10"-WW-CVCP80-520-N	520		CPVC80	10	T-621	P-1302A	38	90	50	90	NA	NA	HYD	57	V-5201, 5200	M-71	10C
WW	10"-WW-CVCP80-521-N	521		CPVC80	10	10"-WW-CVCP80-520-N	P-1302B	38	90	50	90	NA	NA	HYD	57	V-5210	M-71	10C
WW	10"-WW-CVCP80-522-N	522		CPVC80	10	8"-TW-CVCP80-001-N	10"-WW-CVCP80-489-N	38	90	110	90	NA	NA	HYD	57	V-5220	M-71, 67	10C
WW	3"-WW-CVCP80-409-N	409		CPVC80	3	3"-WW-CVCP80-490-N	10"-WW-CVCP80-162-N	30	90	110	90	NA	NA	HYD	45	V-4090	M-70, 15, 14, 27	17, 4
WW	3"-WW-CVCP80-490-N	490		CPVC80	3	FILTER REJECT PUMP SKID	T-602	30	90	110	90	NA	NA	HYD	45	V-4902, 4903	M-68, 17, 18, 70	17, 6
WW	3"-WW-CVCP80-498-N	498		CPVC80	3	T-1701	FILTER REJECT PUMP SKID	10	90	50	90	NA	NA	HYD	15	V-4983, 4981	M-68	17
WW	1"-WW-CVCP80-547-N	547		CPVC80	1	TW-8-11001	10"-WW-CVCP80-520-N	85	90	110	90	NA	NA	HYD	148	V-5470, 5471, E-1302	M-71	10C
WW	1/2"-WW-POPT-489-N	489		CPVC/POPT	1/2	10"-WW-CVCP80-489-N	D-I SUMP TRENCH	ATMOS	90	50	90	NA	NA	HYD	VT	V-4894, 4895, AE-1702	M-71	10C, 11
WW	1"-WW-CVCP80-501-N	501		CPVC80	1	FILTER REJECT PUMP SKID	4"-WW-CVCP80-495-N	60	90	110	90	NA	NA	HYD	90	-	M-68	17

NERT

LINE DESIGNATION TABLE

SYS	FULL LINE NO.	LINE NO.	PIPE SPEC.	MATERIAL	SIZE (inch)	LOCATION FROM	LOCATION TO	NORMAL OPERATING		DESIGN		INSULATION		TEST		VALVES	Piping Drawing NO.	P&ID NO.
								PRESS psig	TEMP (deg.F)	PRESS psig	TEMP (deg.F)	TYPE	THK (inch)	TYPE	PRESS psig			

Fluid Abbr.	Service
BA	Blower Air
ED	Electron Donor
FC	Ferric Chloride
IA	Instrument Air
NU	Nutrient
O2	Oxygen
P	Polymer
PHA	Phosphoric Acid
PA	Process Air
SL	Sludge
SH	Sodium Hydroxide (Caustic)
SLM	Stabilized Lake Mead Water
SW	Service Water
CA	Service Air
TW	Treated Water
WW	Wastewater

LEGEND:

HYD	=HYDROSTATIC LEAK TEST- For details on Testing Methods use Division 15orate Removal Syst
PNEU	= PNEUMATIC LEAK TEST
SER	= SERVICE LEAK TEST
VT	= VISUAL EXAMINATION
N	= NO INSULATION
H	= HEAT RETENTION
I	= PERSONEL PROTECTION INSULATION/PERSONEL PROTECTION
HT&I	= HEAT TRACE AND INSULATE FOR FREEZE PROTECTION
*	= INSULATE WITH CELLULAR GLASS INSULATION MATERIALS (SEE NOTE 1)
NA	= NOT APPLICABLE
ATMOS	= ATMOSPHERE

NOTES:

1. ALL OTHER INSULATION TO BE MANVILLE MICRO-LOK OR EQUAL FIBERGLASS WITH AN ALL PURPOSE JACKET.
2. CONTRACTOR SHALL INSTALL MULTIFUNCTION VALVES FOR METERING PUMPS. VALVES WILL BE SUPPLIED BY SHAW.
3. CONSERVATION VALVE, CONTROL VALVES AND VALVES THAT ARE NOT NUMBERED WILL BE SUPPLIED BY SHAW.

ENVIROGEN TECHNOLOGIES

INSTRUMENT LIST

Customer: Nevada Environmental Response Trust (NERT)
Location: Henderson, NV
Project No.: 1373-101
Date Issued: 04/28/14

Project Mgr: M. DelVecchio
Project Eng: D. Watt
Project Eng:
Revision: 4
Date Revision Issued: 04/28/14

Items modified or added

ITEM NO.	TAG NO.	DESCRIPTION	SIZE/TYPE	Range	MANUFACTURER	NOTES	P&ID NO.
		FLOW INSTRUMENTS					
1	FIT/FE-1010	P-1011 Feedwater Flow Meter	6" / Orfice Plate	0-350 gpm	Fisher Rosemount		1A
2	FIT/FE-1020	P-1012 Feedwater Flow Meter	6" / Orfice Plate	0-350 gpm	Fisher Rosemount		1A
3	FIT/FE-1011	FBR-1 Influent Flow Meter	10" / Orfice Plate	0-3400 gpm	Fisher Rosemount		1A
4	FIT/FE-1012	FBR-2 Influent Flow Meter	10" / Orfice Plate	0-3400 gpm	Fisher Rosemount		1A
5	FIT/FE-1110	P-1013 Feedwater Flow Meter	6" / Orfice Plate	0-350 gpm	Fisher Rosemount		1B
6	FIT/FE-1120	P-1014 Feedwater Flow Meter	6" / Orfice Plate	0-350 gpm	Fisher Rosemount		1B
7	FIT/FE-1013	FBR-3 Influent Flow Meter	10" / Orfice Plate	0-3400 gpm	Fisher Rosemount		1B
8	FIT/FE-1014	FBR-4 Influent Flow Meter	10" / Orfice Plate	0-3400 gpm	Fisher Rosemount		1B
9	FI-2011	Instrument Air Flow Indicator	3/8" / Variable Area	0 - 1 SCFH	Wallace & Tiernan		2A
10	FI-2012	Instrument Air Flow Indicator	3/8" / Variable Area	0 - 1 SCFH	Wallace & Tiernan		2B
11	FIT/FE-3010	P-3015 Feedwater Flow Meter	6" / Orfice Plate	0-350 gpm	Fisher Rosemount		3A
12	FIT/FE-3020	P-3016 Feedwater Flow Meter	6" / Orfice Plate	0-350 gpm	Fisher Rosemount		3A
13	FIT/FE-3015	FBR-5 Influent Flow Meter	10" / Orfice Plate	0-3400 gpm	Fisher Rosemount		3A
14	FIT/FE-3016	FBR-6 Influent Flow Meter	10" / Orfice Plate	0-3400 gpm	Fisher Rosemount		3A
15	FI-3015	FBR-5 Biomass Separator instrument air flow indicator	1/4" / Variable Area	0 - 100 SCFH	Wallace & Tiernan		3A
16	FI-3025	FBR-5 Biomass Separator instrument air flow indicator	1/4" / Variable Area	0 - 100 SCFH	Wallace & Tiernan		3A
17	FI-3016	FBR-6 Biomass Separator instrument air flow indicator	1/4" / Variable Area	0 - 100 SCFH	Wallace & Tiernan		3A
18	FI-3026	FBR-6 Biomass Separator instrument air flow indicator	1/4" / Variable Area	0 - 100 SCFH	Wallace & Tiernan		3A
19	FIT/FE-3030	P-3017 Feedwater Flow Meter	6" / Orfice Plate	0-350 gpm	Fisher Rosemount		3B
20	FIT/FE-3040	P-3018 Feedwater Flow Meter	6" / Orfice Plate	0-350 gpm	Fisher Rosemount		3B
21	FIT/FE-3017	FBR-7 Influent Flow Meter	10" / Orfice Plate	0-3400 gpm	Fisher Rosemount		3B
22	FIT/FE-3018	FBR-8 Influent Flow Meter	10" / Orfice Plate	0-3400 gpm	Fisher Rosemount		3B
23	FI-3017	FBR-7 Biomass Separator instrument air flow indicator	1/4" / Variable Area	0 - 100 SCFH	Wallace & Tiernan		3B
24	FI-3027	FBR-7 Biomass Separator instrument air flow indicator	1/4" / Variable Area	0 - 100 SCFH	Wallace & Tiernan		3B
25	FI-3018	FBR-8 Biomass Separator instrument air flow indicator	1/4" / Variable Area	0 - 100 SCFH	Wallace & Tiernan		3B
26	FI-3028	FBR-8 Biomass Separator instrument air flow indicator	1/4" / Variable Area	0 - 100 SCFH	Wallace & Tiernan		3B
27	FI-3011	Instrument Air Flow Indicator	3/8" / Variable Area	0 - 1 SCFH	Wallace & Tiernan		3C
28	FI-3012	Instrument Air Flow Indicator	3/8" / Variable Area	0 - 1 SCFH	Wallace & Tiernan		3D
29	FI- 501	DAF Pressure Tank T-501 Instrument Air Flow Indicator	3/8" / Variable Area	0 - 5 SCFM	Wallace & Tiernan		5
30	FE/FIT-502	DAF Recycle Flow Meter	4" / Orfice Plate	0 - 144 gpm	Fisher Rosemount		5
31	FE/FIT-503	DAF D-501 Bypass Flow Meter	14" / Orfice Plate		Fisher Rosemount		5
32	FI- 505	DAF Pressure Tank T-505 Instrument Air Flow Indicator	3/8" / Variable Area	0 - 5 SCFM	Wallace & Tiernan		5
33	FE/FIT-506	DAF Recycle Flow Meter	4" / Orfice Plate	0 - 144 gpm	Fisher Rosemount		5
34	FE/FIT-507	DAF D-505 Bypass Flow Meter	14" / Orfice Plate		Fisher Rosemount		5
35	FI-601	Effluent tank T-601 bubbler system air flow indicator	3/8" / Variable Area	0 - 1 SCFH	Wallace & Tiernan		6
36	FIT/FE-602	UV Disinfection Effluent Flow Meter DELETED	8" / Orfice Plate		Fisher Rosemount		6
37	FS-721	Nutrient feed metering pump P-721 discharge flow switch			pump manufacturer		7A
38	FS-722	Nutrient feed metering pump P-722 discharge flow switch			pump manufacturer		7A
39	FS-723	Nutrient feed metering pump P-723 discharge flow switch			pump manufacturer		7A
40	FS-724	Nutrient feed metering pump P-724 discharge flow switch			pump manufacturer		7A

INSTRUMENT LIST

Customer: Nevada Environmental Response Trust (NERT)
Location: Henderson, NV
Project No.: 1373-101
Date Issued: 04/28/14

Project Mgr: M. DelVecchio
Project Eng: D. Watt
Project Eng:
Revision: 4
Date Revision Issued: 04/28/14

Items modified or added

ITEM NO.	TAG NO.	DESCRIPTION	SIZE/TYPE	Range	MANUFACTURER	NOTES	P&ID NO.
41	FS-725	Nutrient feed metering pump P-725 discharge flow switch			pump manufacturer		7A
42	FS-726	Nutrient feed metering pump P-726 discharge flow switch			pump manufacturer		7A
43	FS-727	Nutrient feed metering pump P-727 discharge flow switch			pump manufacturer		7A
44	FS-728	Nutrient feed metering pump P-728 discharge flow switch			pump manufacturer		7A
45	FE/FIT-739	Electron donor booster pump P-739 discharge flow meter	1" vortex flow meter	0 - 17 gpm	Fisher Rosemount		7B
46	FS-901	Filter Press feed pumps P-901 inlet air flow switch	1/2"				9
47	FS-902	Filter Press feed pumps P-902 inlet air flow switch	1/2"				9
		LEVEL INSTRUMENTS					
48	LIT-2011	Separator Tank T-2011 Level Indicating Transmitter	pressure	0-120" W.C.	Fisher Rosemount		2A
49	LIT-2012	Separator Tank T-2012 Level Indicating Transmitter	pressure	0-120" W.C.	Fisher Rosemount		2B
50	LIT-3011	Separator Tank T-3011 Level Indicating Transmitter	pressure	0-120" W.C.	Fisher Rosemount		3C
51	LIT-3012	Separator Tank T-3012 Level Indicating Transmitter	pressure	0-120" W.C.	Fisher Rosemount		3D
52	LSH-401	Aeration Tank T-401 High Level Switch	2" Flange / tuning fork		Endress + Hauser		4
53	LT/LE-501	DAF Pressure Tank T-501 Level	2" Flange / capacitance		Endress + Hauser		5
54	LSH-502	DAF Vessel Float Tank D-501 High Level Float Switch	3" Flange / tuning fork		Endress + Hauser		5
55	LT/LE-551	DAF Pressure Tank T-551 Level	2" Flange / capacitance		Endress + Hauser		5
56	LSH-505	DAF Vessel Float Tank D-551 High Level Float Switch	2" Flange / tuning fork		Endress + Hauser		5
57	LT-601	Effluent Tank T-601 Level Transmitter	Pressure		Fisher Rosemount		6
58	LI/LSL-701	pH tank T-701 level indicator with low level switch	2" / Site Gauge		GEMS		7A
59	LI/LSL-717	Nutrient tank T-702 level indicator with low level switch	2" / Site Gauge		GEMS		7A
60	LE/LIT-703	Electron Donor Tank T-703 level transmitter	magnetostrictive probe		OMNTEC		7B
61	LS-703A	Electron Donor Tank T-703 leak detection level switch	optic		OMNTEC		7B
62	LS-703B	Electron Donor Tank T-703 leak detection level switch	optic		OMNTEC		7B
63	LI/LSL-704	Polymer feed tank T-704 level indicator with low level switch	2" / Site Gauge		GEMS		7B
64	LI/LSL-705	Polymer feed tank T-705 level indicator with low level switch	2" / Site Gauge		GEMS		7B
65	LE/LIT-751	Ferric chloride storage tank T-751 level transmitter.	ultrasonic		Endress + Hauser		7C
66	LS-751	Ferric chloride storage tank T-751 leak detection level switch.	2" Flange / tuning fork		Endress + Hauser		7C
67	LSH-752	Lime Silo T-752 high level switch	2" Flange / tuning fork		Endress + Hauser		7C
68	LSL-752	Lime Silo T-752 low level switch	2" Flange / tuning fork		Endress + Hauser		7C
69	LSH-755	Lime Silo T-752 Hopper high level switch	2" Flange / tuning fork		Endress + Hauser		7C
70	LSL-755	Lime Silo T-752 hopper low level switch	2" Flange / tuning fork		Endress + Hauser		7C
71	LSH-901	Sludge conditioning Tank T-901 high level switch	2" Flange / tuning fork		Endress + Hauser		9
72	LSL-901	Sludge conditioning Tank T-901 low level switch	2" Flange / tuning fork		Endress + Hauser		9
73	LSLL-901	Sludge conditioning Tank T-901 low level switch	2" Flange / tuning fork		Endress + Hauser		9
74	LSHH-902	Filtrate tank T-902 high level switch	1-1/2" Flange / tuning fork		Endress + Hauser		9
75	LSH-902	Filtrate tank T-902 high level switch	1-1/2" Flange / tuning fork		Endress + Hauser		9
76	LSL-902	Filtrate tank T-902 low level switch	1-1/2" Flange / tuning fork		Endress + Hauser		9
		PRESSURE INSTRUMENTS					

INSTRUMENT LIST

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Project No.: 1373-101
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Project Mgr: M. DelVecchio
Project Eng: D. Watt
Project Eng:
Revision: 4
Date Revision Issued: 04/28/14

Items modified or added

ITEM NO.	TAG NO.	DESCRIPTION	SIZE/TYPE	Range	MANUFACTURER	NOTES	P&ID NO.
63	PCV-1010	FCV-1010 air regulator		0-160 psi	control valve manufacturer		1A
64	PI-1020	FCV-1010 air regulator Pressure Guage		0-160 psi	control valve manufacturer		1A
65	PCV-1020	FCV-1020 air regulator		0-160 psi	control valve manufacturer		1A
66	PI-1030	FCV-1020 air regulator Pressure Guage		0-160 psi	control valve manufacturer		1A
67	PI-1040	P-1011 suction pressure	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		1A
68	PI-1050	P-1012 suction pressure	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		1A
69	PI-1011	P-1011 discharge pressure	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		1A
70	PI-1012	P-1012 discharge pressure	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		1A
71	PI-101A	P-101A discharge pressure	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		1A
72	PS-1011	FBR-1 influent pressure switch		0-30 psi	Ashcroft		1A
73	PS-1012	FBR-2 influent pressure switch		0-30 psi	Ashcroft		1A
74	PI-1021	FBR-1 influent pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		1A
75	PI-1022	FBR-2 influent pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		1A
76	PI-1031	P-1021 discharge pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		1A
77	PI-1032	P-1022 discharge pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		1A
78	PCV-1110	FCV-1110 air regulator		0-160 psi	control valve manufacturer		1B
79	PI-1120	FCV-1110 air regulator Pressure Guage		0-160 psi	control valve manufacturer		1B
80	PCV-1120	FCV-1120 air regulator		0-160 psi	control valve manufacturer		1B
81	PI-1130	FCV-1020 air regulator Pressure Guage		0-160 psi	control valve manufacturer		1B
82	PI-1140	P-1013 suction pressure	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		1B
83	PI-1150	P-1014 suction pressure	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		1B
84	PI-1013	P-1013 discharge pressure	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		1B
85	PI-1014	P-1014 discharge pressure	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		1B
86	PI-102A	P-102A discharge pressure	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		1B
87	PS-1013	FBR-3 influent pressure switch		0-30 psi	Ashcroft		1B
88	PS-1014	FBR-4 influent pressure switch		0-30 psi	Ashcroft		1B
89	PI-1023	FBR-3 influent pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		1B
90	PI-1024	FBR-4 influent pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		1B
91	PI-1033	P-1023 discharge pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		1B
92	PI-1034	P-1024 discharge pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		1B
93	PCV-2011	LCV-2011 inlet air regulator		0-160 psi	control valve manufacturer		2A
94	PI-2011	LCV-2011 air regulator Pressure Guage		0-160 psi	control valve manufacturer		2A
95	PCV-2012	LCV-2012 inlet air regulator		0-160 psi	control valve manufacturer		2B
96	PI-2012	LCV-2012 air regulator Pressure Guage		0-160 psi	control valve manufacturer		2B
97	PCV-3010	FCV-3010 air regulator		0-160 psi	control valve manufacturer		3A
98	PI-3030	FCV-3010 air regulator Pressure Guage		0-160 psi	control valve manufacturer		3A
99	PCV-3020	FCV-3020 air regulator		0-160 psi	control valve manufacturer		3A
100	PI-3040	FCV-3020 air regulator Pressure Guage		0-160 psi	control valve manufacturer		3A
101	PI-3010	P-3015 suction pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		3A
102	PI-3020	P-3016 suction pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		3A
103	PI-3015	P-3015 discharge pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		3A
104	PI-3016	P-3016 discharge pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		3A

INSTRUMENT LIST

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Project Eng: D. Watt
Project Eng:
Revision: 4
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Items modified or added

ITEM NO.	TAG NO.	DESCRIPTION	SIZE/TYPE	Range	MANUFACTURER	NOTES	P&ID NO.
105	PI-301A	P-301A discharge pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		3A
106	PS-3015	FBR-5 influent pressure switch		0-30 psi	Ashcroft		3A
107	PS-3016	FBR-6 influent pressure switch		0-30 psi	Ashcroft		3A
108	PI-3025	FBR-5 influent pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		3A
109	PI-3026	FBR-6 influent pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		3A
110	PI-3035	FBR-5 service water pressure gauge	3-1/2" / Bourdon tube	0-60 psi	Ashcroft 1009		3A
111	PI-3036	FBR-6 service water pressure gauge	3-1/2" / Bourdon tube	0-60 psi	Ashcroft 1009		3A
112	PCV-3015	FBR-5 biomass separator air regulator		0-160 psi			3A
113	PI-3045	FBR-5 biomass separator air regulator pressure gauge		0-160 psi			3A
114	PCV-3025	FBR-5 biomass separator air regulator		0-160 psi			3A
115	PI-3055	FBR-5 biomass separator air regulator pressure gauge		0-160 psi			3A
116	PCV-3016	FBR-6 biomass separator air regulator		0-160 psi			3A
117	PI-3046	FBR-6 biomass separator air regulator pressure gauge		0-160 psi			3A
118	PCV-3026	FBR-6 biomass separator air regulator		0-160 psi			3A
119	PI-3056	FBR-6 biomass separator air regulator pressure gauge		0-160 psi			3A
120	PCV-3110	FCV-3030 air regulator		0-160 psi	control valve manufacturer		3B
121	PI-3130	FCV-3030 air regulator Pressure Guage		0-160 psi	control valve manufacturer		3B
122	PCV-3120	FCV-3040 air regulator		0-160 psi	control valve manufacturer		3B
123	PI-3140	FCV-3040 air regulator Pressure Guage		0-160 psi	control valve manufacturer		3B
124	PI-3110	P-3017 suction pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		3B
125	PI-3120	P-3018 suction pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		3B
126	PI-3017	P-3017 discharge pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		3B
127	PI-3018	P-3018 discharge pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		3B
128	PI-302A	P-302A discharge pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		3B
129	PS-3017	FBR-7 influent pressure switch		0-30 psi	Ashcroft		3B
130	PS-3018	FBR-8 influent pressure switch		0-30 psi	Ashcroft		3B
131	PI-3027	FBR-7 influent pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		3B
132	PI-3028	FBR-8 influent pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		3B
133	PI-3037	FBR-7 service water pressure gauge	3-1/2" / Bourdon tube	0-60 psi	Ashcroft 1009		3B
134	PI-3038	FBR-8 service water pressure gauge	3-1/2" / Bourdon tube	0-60 psi	Ashcroft 1009		3B
135	PCV-3017	FBR-7 biomass separator air regulator		0-160 psi			3B
136	PI-3047	FBR-7 biomass separator air regulator pressure gauge		0-160 psi			3B
137	PCV-3027	FBR-7 biomass separator air regulator		0-160 psi			3B
138	PI-3057	FBR-7 biomass separator air regulator pressure gauge		0-160 psi			3B
139	PCV-3018	FBR-8 biomass separator air regulator		0-160 psi			3B
140	PI-3048	FBR-8 biomass separator air regulator pressure gauge		0-160 psi			3B
141	PCV-3028	FBR-8 biomass separator air regulator		0-160 psi			3B
142	PI-3058	FBR-8 biomass separator air regulator pressure gauge		0-160 psi			3B
143	PCV-3011	LCV-3011 inlet air regulator		0-160 psi	control valve manufacturer		3C
144	PI-3011	LCV-3011 air regulator Pressure Guage		0-160 psi	control valve manufacturer		3C
145	PCV-3012	LCV-3012 inlet air regulator		0-160 psi	control valve manufacturer		3D
146	PI-3012	LCV-3012 air regulator Pressure Guage		0-160 psi	control valve manufacturer		3D

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Project Eng: D. Watt
Project Eng:
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Items modified or added

ITEM NO.	TAG NO.	DESCRIPTION	SIZE/TYPE	Range	MANUFACTURER	NOTES	P&ID NO.
147	PSV-401	Air Blower B-401 relief valve		set @ 15psi			4
148	PSL-401	Blower B-401 discharge line pressure switch (low)			Ashcroft		4
149	PSV-402	Aeration Tank T-401 pressure relief valve					4
150	PI-501	DAF Pressure Tank T-501 Vent pressure gauge	3-1/2" / Bourdon tube	0-100 psi	Ashcroft 1009		5
151	PSV-501	DAF Pressure Tank T-501 relief valve	1" Flange	60 psi	Farris		5
152	PI-502	DAF Pressure Pump P-501 discharge pressure gauge	3-1/2" / Bourdon tube	0-100 psi	Ashcroft 1009		5
153	PCV-501	DAF Pressure Tank T-501 air regulator w/ filter		0-160 psi			5
154	PI-510	DAF Pressure Pump P-501 suction pressure gauge	3-1/2" / Bourdon tube	0-15 psi	Ashcroft 1009		5
155	PI-503	DAF pressure tank T-501 air regulator pressure gauge	3-1/2" / Bourdon tube	0-160 psi	Ashcroft 1009		5
156	PCV-504	DAF Float pump P-502 air regulator w/ filter		0-160 psi	By pump manufacturer		5
157	PI-504	DAF float pump P-502 air regulator pressure gauge		0-160 psi	By pump manufacturer		5
158	PI-505	DAF Pressure Tank T-551 Vent pressure gauge	3-1/2" / Bourdon tube	0-100 psi	Ashcroft 1009		5
159	PSV-505	DAF Pressure Tank T-551 relief valve	1" Flange	60 psi	Farris		5
160	PI-506	DAF Pressure Pump P-551 discharge pressure gauge	3-1/2" / Bourdon tube	0-100 psi	Ashcroft 1009		5
161	PCV-505	DAF Pressure Tank T-551 air regulator w/ filter		0-160 psi			5
162	PI-508	DAF Pressure Pump P-551 suction pressure gauge	3-1/2" / Bourdon tube	0-15 psi	Ashcroft 1009		5
163	PI-507	DAF pressure tank T-551 air regulator pressure gauge	3-1/2" / Bourdon tube	0-160 psi	Ashcroft 1009		5
164	PCV-551	DAF Float pump P-552 air regulator w/ filter		0-160 psi	By pump manufacturer		5
165	PI-551	DAF float pump P-552 air regulator pressure gauge		0-160 psi	By pump manufacturer		5
166	PI-602	Effluent Pumps P-601/602 discharge pressure gauge	3-1/2" / Bourdon tube	0-50 psi	Ashcroft 1009		6
167	PCV-601	Effluent control valve LCV-601 actuator air regulator		0-160 psi	control valve manufacturer		6
168	PI-601	Effluent control valve LCV-601 air regulator pressure gauge		0-160 psi	control valve manufacturer		6
169	PI-603	Effluent Pressure Gauge		0-60 psi	Ashcroft 1009		6
170	PCV-739	Electron donor booster pump P-739 backpressure/safety valve					7B
171	PI-739	PCV-739 backpressure valve pressure gauge					7B
172	PSV-703	Electron donor tank T-703 conservation vent with flame arrester					7B
173	PSV-704	Electron donor tank T-703 safety relief valve					7B
174	PSV-705	Electron donor tank T-703 safety relief valve					7B
175	PI-751	Ferric Chloride feed pump P-751 discharge pressure gauge	3-1/2" / Bourdon tube	0-30 psi	Ashcroft 1009		7C
176	PSV-751	Lime Silo T-752 pressure relief valve					7C
177	PSV-803	Compressed Air Receiver tank T-801 pressure relief valve		150 psi			8
178	PI-801	Compressed Air Receiver tank T-801 pressure gauge		0-160 psi			8
179	PCV-802	Compressed Air Receiver tank T-801 discharge air regulator		set @ 110 psi			8
180	PI-802	Compressed Air Receiver tank T-801 discharge air regulator pressure gauge		0-160 psi			8
181	PCV-803	Compressed Air separator filter T-802 discharge air regulator		set @ 110 psi			8
182	PI-803	Compressed Air separator filter T-802 discharge air regulator pressure gauge	3-1/2" / Bourdon tube	0-160 psi	Ashcroft 1009		8
183	PSL-802	Compressed Air separator filter T-802 discharge air low pressure switch		80 psi	Ashcroft		8
184	PCV-901	Filter press feed pump P-901 inlet air regulator/filter		100 psi			9
185	PI-901	Filter press feed pump P-901 inlet air regulator/filter pressure gauge		0-160 psi			9

INSTRUMENT LIST

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Project Eng:
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Items modified or added

ITEM NO.	TAG NO.	DESCRIPTION	SIZE/TYPE	Range	MANUFACTURER	NOTES	P&ID NO.
186	PCV-902	Filter press feed pump P-902 inlet air regulator/filter		100 psi			9
187	PI-902	Filter press feed pump P-902 inlet air regulator/filter pressure gauge		0-160 psi			9
188		**ANALYTICAL**					
189	AE/AIT-1021	FBR-1 Recycle Water ORP senor/analyzer	1" line / Inline Sensor		Fisher Rosemount		1A
190	AE/AIT-1022	FBR-2 Recycle Water ORP senor/analyzer	1" line / Inline Sensor		Fisher Rosemount		1A
191	AE/AIT-1011	FBR-1 Influent pH sensor/analyzer	10" line / 1-1/2" insertion		Fisher Rosemount		1A
192	AE/AIT-1012	FBR-2 Influent pH sensor/analyzer	10" line / 1-1/2" insertion		Fisher Rosemount		1A
193	AE/AIT-1023	FBR-3 Recycle Water ORP senor/analyzer	1" line / Inline Sensor		Fisher Rosemount		1B
194	AE/AIT-1024	FBR-4 Recycle Water ORP senor/analyzer	1" line / Inline Sensor		Fisher Rosemount		1B
195	AE/AIT-1013	FBR-3 Influent pH sensor/analyzer	10" line / 1-1/2" insertion		Fisher Rosemount		1B
196	AE/AIT-1014	FBR-4 Influent pH sensor/analyzer	10" line / 1-1/2" insertion		Fisher Rosemount		1B
197	AE/AIT-3025	FBR-5 Recycle Water ORP senor/analyzer	12" line / 1-1/2" insertion		Fisher Rosemount		3A
198	AE/AIT-3026	FBR-6 Recycle Water ORP senor/analyzer	12" line / 1-1/2" insertion		Fisher Rosemount		3A
199	AE/AIT-3015	FBR-5 Influent pH sensor/analyzer	10" line / 1-1/2" insertion		Fisher Rosemount		3A
200	AE/AIT-3016	FBR-6 Influent pH sensor/analyzer	10" line / 1-1/2" insertion		Fisher Rosemount		3A
201	AE/AIT-3027	FBR-7 Recycle Water ORP senor/analyzer	12" line / 1-1/2" insertion		Fisher Rosemount		3B
202	AE/AIT-3028	FBR-8 Recycle Water ORP senor/analyzer	12" line / 1-1/2" insertion		Fisher Rosemount		3B
203	AE/AIT-3017	FBR-7 Influent pH sensor/analyzer	10" line / 1-1/2" insertion		Fisher Rosemount		3B
204	AE/AIT-3018	FBR-8 Influent pH sensor/analyzer	10" line / 1-1/2" insertion		Fisher Rosemount		3B
205	AE/AIT-601	Effluent turbidimeter	8" line / 1/2" flow-thru		Hach / GLI International		6
206	AE-703	LEL Meter			MSA		7B
		TEMPERATURE					
207	TI-401	Blower Discharge Temperature	insertion		Ashcroft		4
208		**MISCELLANEOUS**					

ENVIROGEN TECHNOLOGIES

INSTRUMENT LIST

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Items modified or added

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INSTRUMENT LIST

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Items modified or added

Items Added With 2006 Modifications

ITEM NO.	TAG NO.	DESCRIPTION	SIZE/TYPE	Range	MANUFACTURER	NOTES	P&ID NO.
209	AE-1401	**pH Sensor w/ Integral Preamplifier**			Emerson/Rosemount		14
210	AE-1440	**ORP Sensor**			Emerson/Rosemount		14
	AIT-1401	**pH Transmitter**			Emerson/Rosemount		14
	AIT-1440	**ORP Transmitter**			Emerson/Rosemount		14
	FE-1401	**10" Orifice Plate**			Emerson/Rosemount		14
	FE-1440	**6" Orifice Plate**			Emerson/Rosemount		14
	FI/FT-1440 FI/FT-1401	**Differential Pressure Transmitter w/ Integral Manifold**			Emerson/Rosemount		14
	FI-1420 FI-1430	**Flow indicator w/ needle valve** Range: 10-100 scfh		10-100 scfh	Dwyer		14
	FI-4413 FI-4423	**Rotameter w/Needle Valve** Flow: 0 to 1 gpm		0 to 1 gpm	Dwyer		14
	PI-1401 PI-1402 PI-1403 PI-1450	**Pressure Gauge 0-30 psi** Range: 0 to 30 psig		0 to 30 psig	Ashcroft		14
	PI-1426	**Pressure Gauge 0-60 psi** Range: 0 to 60 psig		0 to 60 psig	Ashcroft		14
	PCV-4430/PI-4430 PCV-1420/PI-1420 PCV-1440/PI-1440	**Pressure Regulator, Relieving** Adjustment Range: 0-125 psig		0-125 psig	Wilkerson		14
	PS-1401	**Pressure Switch, 30psi rating** setpoint: 15 psi (falling pressure)			Ashcroft		14
	FI-4103	**Flow Meter** Range: 2-20 gpm		2-20 gpm	Blue & White		13
	FS-4023	**Flow Switch** setpoint: 12.9 gpm (actuation) and 8.9 gpm (deactuation)			Dwyer		13
	FS-4073	**Flow Switch** set point: 21.1 gpm (actuation) and 13.8 gpm (deactuate)			Dwyer		13

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	FS-4103	**Flow Switch** setpoint: 10.8 gpm (actuate) and 9.1 (gpm) deactuate			Dwyer		13
	LE-AP-5	**Ultrasonic Transducer**			Siemens/Milltronics		13
	LIT- AP-5	**Ultrasonic Level Controller**			Siemens/Milltronics		13
	PI-1301	**Pressure Gauge 0-60 psi** Range: 0 to 60 psig		0 to 60 psig	Ashcroft		13
	FI/FT-AP-5	**Magnetic Flowmeter(EXISTING)**			Emerson/Rosemount		10-A
	FI-1701	**Flowmeter with integral metering valve** Range: 0-1 scfh		0-1 scfh	Dwyer		17
	FI-1703 FI-1704	**Rotameter w/Needle Valve** Flow: 0 to 1 gpm		0 to 1 gpm	Dwyer		17
	LIT-1701	**Differential Pressure Transmitter** Pressure Range: -250 to 250 in H20 calibrated range: 0 to +120 in H2O		0 to +120 in H2C	Emerson/Rosemount		17
	PI-1701	**Pressure Gauge 0-60 psi** Range: 0 to 60 psig		0 to 60 psig	Ashcroft		17
	FE-622	**8" Orifice Plate**			Emerson/Rosemount		10-C
	FI/FT-622	**Differential Pressure Transmitter w/ Integral Manifold**			Emerson/Rosemount		10-C
	AE/AIT-1702	**Turbidity Meter w/ Controller** Range: 0.001 to 100 NTU		0.001 to 100 NTU	Hach		10-C
	LE-901	**Ultrasonic Transducer**			Siemens/Milltronics		9
	LIT- 901	**Ultrasonic Level Controller**			Siemens/Milltronics		9
	FI-1602	**Flow indicator w/ needle valve** Range: 100-1000 scfh		100-1000 scfh	Dwyer		16
	FI-4027	**Rotameter w/Needle Valve** Flow: 0-1 gpm		0-1 gpm	Dwyer		16
	PI-1603 PI-1605	**Pressure Gauge 0-60 psi** Range: 0 to 60 psig		0 to 60 psig	Ashcroft		16
	PT-1603	**Level Controller/Transmitter (EXISTING)** Range: 0-125 to 0-750 in H20, calibrated range: 0 to +200 in H2O		0 to +200 in H2C	Emerson/Rosemount		16
	FS-1520A FS-1521 FS-1522 FS-1523 FS-1524	**Flow Indicator/Flow Switch** Range: 3.0/500 cc/min (0.048 - 8.0 GPH)		0.048 - 8.0 GPH	Cole Parmer		15
	FS/FI-72A	**Flow Switch** Range 0.006 to 0.05 GPM (72 GPD)		0.006 to 0.05 GPI	Kobold		7-A

ENVIROGEN TECHNOLOGIES

INSTRUMENT LIST

Customer: Nevada Environmental Response Trust (NERT)
Location: Henderson, NV
Project No.: 1373-101
Date Issued: 04/28/14

Project Mgr: M. DelVecchio
Project Eng: D. Watt
Project Eng:
Revision: 4
Date Revision Issued: 04/28/14

Items modified or added

ITEM NO.	TAG NO.	DESCRIPTION	SIZE/TYPE	Range	MANUFACTURER	NOTES	P&ID NO.
	LE-701	**Ultrasonic Transducer**			Siemens/Milltronics		7-A
	LIT-701	**Ultrasonic Level Controller**			Siemens/Milltronics		7-A
	LS-701	**Leak Sensor**			Endress & Hauser		7-A

APPENDIX J
PUMP LUBRICATION CHART

Pump Tag No	Make/Mfg of Pump	Lubrication for Pump	Lubrication Qty	Lube Frequency	Make/Mfg of Motor	Lubricant for Motor	Lube Frequency
P-1021, P-1022, P-1023, P-1024, P-502, P-522	Penn Valley 3" Double Disc Electric Diaphragm Pump	Not Required	N/A	N/A	Baldor ECP3664T	Polyrex EM (Exxon Mobil)	18,000 hrs
P-2011, P-2012, P-3011, P-3012	Penn Valley 2" Double Disc Electric Diaphragm Pump	Not Required	N/A	N/A	Baldor ECP3582T	Polyrex EM (Exxon Mobil)	18,000 hrs
P-603	Penn Valley 3" Double Disc Electric Diaphragm Pump	Not Required	N/A	N/A	Baldor ECP3770T	Polyrex EM (Exxon Mobil)	9,500 hrs
P-731, P-732, P-733, P-734	LMI E-741-37 Electric Diaphragm Metering Pump	Not Required	N/A	N/A	N/A	N/A	N/A
P-735, P-736, P-737, P-738	LMI E-731-27 Electric Diaphragm Metering Pump	Not Required	N/A	N/A	N/A	N/A	N/A
P-739A, P-739B	Viking GG-895-MD-4 Magnetic Drive/Internal Gear Pump	#2 ball bearing grease	N/A	< 500 hrs	Baldor VM7006A	Polyrex EM (Exxon Mobil)	12,000 hrs
P-751, P-903	Fybroc Series 1500 1X1.5X8 Centrifugal Pump	Oil of 300 SSU viscosity at 100 deg F (approx SAE-20)	3/4 pint of oil	Oil change every 6 mos. Regrease bearings every 10,000 hrs	GE 5KS145SAB209	grease (Polyrex EM)	26,000 hrs
P-901, P-902	Warren Rupp S30B2K1KQAS200 Air Diaphram Pump	SAE 10 non-detergent oil	1 drop/20 scfm	continuous	N/A	N/A	N/A

ITEMS ADDED 2006

Pump Tag No	Make/Mfg of Pump	Lubrication for Pump	Lubrication Qty	Lube Frequency	Make/Mfg of Motor	Lubricant for Motor	Lube Frequency
P-1410	Penn Valley 2" Double Disc Electric Diaphragm Pump	Not Required	N/A	N/A	Baldor ECP3582T	Polyrex EM (Exxon Mobil)	18,000 hrs
P-1401A P-1401B	Fybroc Series 1500 10X8X15, Centrifugal Pump	Oil of 300 SSU viscosity at 100 deg F (approx SAE-20)	6 pints of oil	Oil change every 6 mos. Regrease bearings every 10,000 hrs	GE Ultra, Severe Duty, Premium eff.	GE grease D6A2C23 or any polyurea thickened grease	13,000 hrs
P-1420	Webster S-16, immersible pump	Not Required	N/A	N/A	Baldor	N/A	N/A
P-1520A P-1521, P-1522, P-1523, P-1524	Masterflex peristaltic pumps, 975-3000	Not Required	N/A	N/A	N/A	N/A	N/A
P-1601	Discflo 403-12-2HHD, centrifugal pump	Not Required	N/A	N/A	GE X4D Ultra, Severe Duty, Premium eff.	GE grease D6A2C23 or any polyurea thickened grease	35,000 hrs
P-71A, P-711, P-712, P-713, P-714	Masterflex peristaltic pumps, 975-3000	Not Required	N/A	N/A	N/A	N/A	N/A
P-1701A P-1701B	Fybroc Series 1500 1X1.5X8 Centrifugal Pump	Oil of 300 SSU viscosity at 100 deg F (approx SAE-20)	3/4 pint of oil	Oil change every 6 mos. Regrease bearings every 10,000 hrs	GE Ultra, Severe Duty, Premium eff.	GE grease D6A2C23 or any polyurea thickened grease	35,000 hrs

APPENDIX K
SPARE PARTS

Shelf Spares (Pumps / Blower / UV)	Quantity
Media Return Pump	1
DAF Float Pump	1
Sand FBR Ethanol Pump	1
GAC FBR Ethanol Pump	1
Ferric Chloride Pump	1
Press Feed Pump	1
Nutrient Pump	2
Polymer Dosing Pump (DAF)	1
Polymer Dosing Pump (Thickener)	1
Blower	1
Set of Lamps for UV Disinfection Unit	1
Pump Rebuild Kits	**Quantity**
First Stage Fluidization Pump	1
Second Stage Fluidization Pump	1
DAF Pressure Pump	1
Bed Height Control Pump	1
Thickener Underflow Pump	1
Electron Donor Booster Pump	1
Filtrate Recycle Pump	1
Other Miscellaneous Spares	**Quantity**
FBR Nozzles	24
GAC Media	10,000 lbs.
16 Point Digital Input Card	1
16 Point Digital Output Card	1
16 Point Analog Input Card	1
16 Point Analog Output Card	1
24 volt PLC Power Supply	1
Profibus Communications Module	1

BIOPLANT EFFLUENT CLARITY AND AP-5 TREATMENT
SPARE PARTS

Shelf Spares (Pumps)	Quantity
pH feed pump with drive	1
Phosphoric acid pump head	1
Sludge pump	1
Polymer transfer pump	1
Polymer feed pump	1
Other Miscellaneous Spares	**Quantity**
Siemens S7-414-3 CPU with Flash memory	1
Polymer Agitator	1
AP-5 pump suction hose and strainer	1

APPENDIX L
FBR VALVE LIST

VALVE POSITION CHART
FBR-1

	1st Stage FBR Equalized Feed Valve	FBR-1 Feed Flow Control Valve[2]	P-1011 Equalized Feed Valve	P-101A Equalized FeedValve	FBR-1 Fluidization Pmp Suction Valve	FBR-1 Fluidization Pmp Discharge Valve	S-1011 Drain/Vent Valve	FBR-1 Alternate Fluidization Pmp Suction Valv	FBR-1 Alternate Fluidization Pmp Discharge Valve	P-101A to FBR-1 Valve	S-101A Drain/Vent Valve	FBR-1 Manual Fluidization Flow Control Valve	FBR-1 Flow Valve[2]	Bed Height Control Suction Valve	Bed Height Control Suction Valve	Bed Height Control Discharge Valve	FBR Unscreened Drain Valve[5]	FBR Screened Drain Valve[6]	Electron Donor Supply Valve	Nutrient Solution Supply Valve	PH Solution Supply Valve
Valve Tag Number:	V-1020	FCV-1010	V-1170	V-1190	V-1011	V-1041	V-1251	V-101A	V-104A	V-106A	V-108A	V-1131	FV-1011	V-1171	V-1181	V-1211	V-1161	V-1151	V-1081	V-1091	V-1110
PROCESS OPERATION																					
FBR RUNNING Mode (Feed + Recycle)[1]	O	O	O	[redacted]	O	O	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	adjustable[2]	O	U	U	U	[redacted]	[redacted]	O	O	O
RECYCLE Mode (Fluidization Only)	[redacted]	[redacted]	[redacted]	[redacted]	O	O	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	adjustable[2]	O	U	U	U	[redacted]	[redacted]	O	O	O
Lower Bed Height Control	U	U	U	U	U	U	U	U	U	U	U	U	U	O	[redacted]	O	[redacted]	[redacted]	U	U	U
Upper Bed Height Control	U	U	U	U	U	U	U	U	U	U	U	U	U	[redacted]	O	O	[redacted]	[redacted]	U	U	U
Alternate Fluidization Pump w/ Feed	O	O	[redacted]	O	[redacted]	[redacted]	[redacted][4]	O	O	O	[redacted]	adjustable[2]	O	U	U	U	[redacted]	[redacted]	O	O	O
FBR SHUTDOWN Mode	U	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	U	[redacted]	U	U	U	[redacted]	[redacted]	U	U	U

Legend:

O - Valve Open

[redacted] - Valve Closed

U - Valve not applicable to specified operation. Valveposition should not change from last specified position.

Notes:

1. P-1011 is used for fluidization during normal FBR RUNNING Mode. Alternate Fluidization Pump P-101A is Off.
2. Manual Valve requires operator adjustment to set fuidization flow.
3. Refer to Controls Description for operation of automatic valves.
4. The offline fluidization pump strainer can be vented, drained and cleaned. After cleaning its drain valve should be closed, and lid secured and made ready for service.

Miscellaneous Valves:

5. V-1161 closed except when draining the fluid and media for FBR maintenance.
6. V-1151 closed except when draining the fluid only for FBR maintenance.
7. All instrument isolation valves will be open except when servicing instruments (sensors, gauges, switches, etc.).
8. All manual instrument air valves will be open.

VALVE POSITION CHART

FBR-2

	1st Stage FBR Equalized Feed Valve	FBR-2 Feed Flow Control Valve[2]	P-1012 Equalized Feed Valve	P-102A Equalized Feed Valve	FBR-1 Fluidization Pump Suction Valve	FBR-2 Fluidization Pump Discharge Valve	S-1012 Drain/Vent Valve	FBR-2 Alternate Fluidization Pmp Suction Vave	FBR-2 Alternate Fluidization Pmp Discharge Valve	P-102A to FBR-2 Valve	I-101A Drain/Vent /alve	FBR-2 Manual Fluidization Flow Control Valve	FBR-2 Flow Valve[2]	Bed Height Control Suction Valve	Bed Hight Contol SuctionValve	Bed Height Control Discharge Valve	FBR Unscreened Drain Valve[4]	FBR Screened Drain /alve[4]	Electron Donor Supply Valve	Nutrient Solution Supply Valve	PH Solution Supply Valve
Valve Tag Number:	V-1030	FCV-1020	V-1180	V-1200	V-1012	V-1042	V-1252	V-111A	V-104A	V-107A	V-108A	V-1132	FV-1012	V-1172	V-1182	V-1212	V-1182	V-1152	V-1082	V-1062	V-1120
PROCESS OPERATION																					
FBR RUNNING Mode (Feed + Recycle)[1]	O	O	O	■	O	O	■	■	■	■	■	adjustable[2]	O	U	U	U	■	■	O	O	O
RECYCLE Mode (Fluidization Only)	■	■	■	■	O	O	■	■	■	■	■	adjustable[2]	O	U	U	U	■	■	O	O	O
Lower Bed Height Control	U	U	U	U	U	U	U	U	U	U	U	U	U	O	■	O	■	■	U	U	U
Upper Bed Height Control	U	U	U	U	U	U	U	U	U	U	U	U	U	■	O	O	■	■	U	U	U
Alternate Fluidization Pump w/ Feed	O	O	■	O	■	■	■[4]	O	O	O	■	adjustable[2]	O	U	U	U	■	■	O	O	O
FBR SHUTDOWN Mode	U	■	■	■	■	■	■	■	■	■	■	U	■	U	U	U	■	■	U	U	U

Legend:

O - Valve Open

■ - Valve Closed

U - Valve not applicable to specified operation. Valve position should not change from last specified position.

Notes:

1. P-101 is used for fluidization during normal FBR RUNNING Mode. Alternate Fluidization Pump P-101A is Off.
2. Manual Valve requires operator adjustment to set fluidization flow.
3. Refer to Controls Description for operation of automatic valves.
4. The offline fluidization pump strainer can be vented, drained and cleaned. After cleaning the drain valve should be closed, and lid secured and made ready for service.

Miscellaneous Valves:

5. V-1152 to remain closed except when draining the fluid and media for FBR maintenance.
6. V-1152 to remain closed except when draining the fluid only for FBR maintenance.
7. All instrument isolation valves will be open except when servicing instruments (sensors, gauges, switches, etc.).
8. All manual instrument air valves will be open.

VALVE POSITION CHART
FBR-3

	1st Stage FBR Equalized Feed Valve	FBR-3 Feed Flow Control Valve[2]	P-101B Equalized Feed Valve	P-102A Equalized Feed Valve	FBR-3 Fluidization Pump Suction Valve	FBR-3 Fluidization Pump Discharge Valve	S-101B Drain/Vent Valve	FBR-3 Alternate Fluidization Pump Suction Valve	FBR-3 Alternate Fluidization Pump Discharge Valve	P-102A to FBR-3 Valve	S-102A Drain/Vent Valve	FBR-3 Bleed Fluidization Flow Control Valve	FBR-3 Flow Valve[2]	Bed Height Control Suction Valve	Bed Height Control Suction Valve	Bed Height Control Discharge Valve	FBR Unscreened Drain Valve[2]	FBR Screened Drain Valve[2]	Cleaning Water Supply Valve	Nutrient Solution Supply Valve	PH Solution Supply Valve
Valve Tag Number:	V-930	FCV-1110	V-1470	V-1480	V-1018	V-1043	V-1052	V-111A	V-114A	V-118A	V118A	V-1139	FV-1018	V-1179	V-1183	V-1213	V-1163	V-183	V-1083	V-1063	V-1410
PROCESS OPERATION																					
FBR RUNNING Mode (Feed + Recycle)[1]	[1]	O	O	[3]	O	O	[3]	[3]	[3]	[3]	[3]	adjustable[2]	O	U	U	U	[3]	[1]	O	O	O
RECYCLE Mode (Fluidization Only)	[1]	[3]	[3]	[3]	O	O	[3]	[3]	[3]	[3]	[3]	adjustable[2]	O	U	U	U	[3]	[1]	O	O	O
Lower Bed Height Control	[1]	U	U	U	U	U	U	U	U	U	U	U	U	O	[3]	O	[3]	[1]	U	U	U
Upper Bed Height Control	[1]	U	U	U	U	U	U	U	U	U	U	U	U	[3]	O	O	[3]	[1]	U	U	U
Alternate Fluidization Pump w/ Feed	[1]	O	[3]	O	[3]	[3]	[3]	O	O	O	[3]	adjustable[2]	O	U	U	U	[3]	[1]	O	O	O
FBR SHUTDOWN Mode	[1]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	U	[3]	U	U	U	[3]	[1]	U	U	U

Legend:

O - Valve Open

[3] - Valve Closed

U - Valve not applicable to specified operation. Valve position should not change from last specified position

Notes:

1. P-101B is used for fluidization during normal FBR RUNNING Mode. Alternate Fluidization Pump P-102A is Off.
2. Manual Valve requires operator adjustment to set fluidization flow.
3. Refer to Controls Description for operation of automatic valves.
4. The offline fluidization pump strainer can be vented, drained and cleaned. After cleaning the drain valve should be closed, and lid secured and ready for service.

Miscellaneous Valves:

5. V-1163 to remain closed except when draining the fluid and media for FBR maintenance.
6. V-1153 to remain closed except when draining the fluid only for FBR maintenance.
7. All instrument isolation valves will be open except when servicing instruments (pressure, gauges, switches, etc.).
8. All manual instrument air valves will be open.

VALVE POSITION CHART
FBR-4

	1st Stage FBR Equalized feed Valve	FBR-4 Feed Flow Control Valve [2]	P-101d Equalized Feed Valve	P-102d Equalized Feed Valve	FBR-4 Fluidization Pump Suction Valve	FBR-4 Fluidization Pump Discharge Valve	S-01d Drain/Vent Valve	FBR-4 Alternate Fluidization Pump Suction Valve	FBR-4 Alternate Fluidization Pump Discharge Valve	P-102A to FBR-4 Valve	S-02L Drain/Vent Valve	FBR-4 Manual Fluidization Flow Control Valve	FBR-4 Flow Valve [2]	Bed Height Control Suction Valve	Bed Height Control Suction Valve	Bed Height Control Discharge Valve	FBR Unscreened Drain Valve [3]	FBR Screened Drain Valve	Electron Donor Supply Valve	Nutrient Solution Supply Valve	PH Solution Supply Valve
Valve Tag Number:	V-134l	FCV-1120	V-1480	V1800	V-1014	V-1044	V-1254	V-11A	V-114A	V-118A	V-118A	V-1134	FV-1014	V-1174	V-184	V-1214	V-1184	V-1184	V-106-	V-1264	V-1420
PROCESS OPERATION																					
FBR RUNNING Mode (Feed + Recycle)	O	O	O	▮	O	O	▮	▮	▮	▮	▮	adjustable	O	U	ι	U	▮	▮	O	O	O
RECYCLE Mode(Fluidization Only)	▮	▮	▮	▮	O	O	▮	▮	▮	▮	▮	adjustable	O	U	ι	U	▮	▮	O	O	O
Lower Bed Height Control	U	U	U	U	U	U	U	U	U	U	U	U	U	O	▮	O	▮	▮	U	U	U
Upper Bed Height Control	U	U	U	U	U	U	U	U	U	U	U	U	U	▮	ζ	O	▮	▮	U	U	U
Alternate Fluidization Pump w/ Feed	O	O	▮	O	▮	▮	▮	O	O	O	▮	adjustable	O	U	ι	U	▮	▮	O	O	O
FBR SHUTDOWN Mode	U	▮	▮	▮	▮	▮	▮	▮	▮	▮	▮	U	▮	U	ι	U	▮	▮	U	U	U

Legend:

O - Valve Open

▮ - Valve Closed

U - Valve not applicable to specified operation, Valve position should not change from last specified positior

Notes:

1. P-101d is used for fluidization during normal "BR RUNNING Mode. Alternate Fluidization Pump P-102A is Off.
2. Manual Valve requires operator adjustment to set fluidization flow.
3. Refer to Controls Description for operation of automatic valves.
4. The offline fluidization pump strainer can be rented, drained and cleaned. After cleaning the drain valve should be closed, and lid secured and made ready for service.

Miscellaneous Valves:

5. V-1184 to remain closed except when draining the fluid and media for FBRmaintenance.
6. V-1184 to remain closed except when draining the fluid only for FBR maintenance.
7. All instrument isolation valves will be open except when servicing instruments (sensors, gauges, switches, etc.).
8. All manual instrument air valves will be open

VALVE POSITION CHART
FBR-5

	1st Stage FBR 1 & 2 Effluent Valve	1st Stage FBR I & 4 Effluent Valve	FBR 5 & 6 Recycle Feed to P-3015 Inlet Valve	FBR 5 & 6 Recycle Feed to P-301A Inlet Valve	1st Stage FBR Equalized Feed Valve	FBR-5 Feed Flow Control Valve[3]	FBR-5 Fluidization Pump Suction Valve	FBR-5 Fluidization Pump Discharge Valve	S-3015 Drain/Vent Valve	FBR-5 Alternate Fluidization Pump Suction Valve	FBR-5 Alternate Fluidization Pump Discharge Valve	P-301A to FBR-5 Valve	S-301A Drain/Vent Valve	FBR-5 Manual Fluidization Flow Control Valve[3]	FBR-5 Flow Valve[3]	FBR Unscreened Drain Valve[4]	FBR Screend Drain Valve[4]	Biomass Separtor Control Assembly, Instru Air Shut Off Valve	Biomass Separtor Control Assembly, Instru Air Shut Off Valve	Biomass Separtor Control Assembly, Instru Air Control Vlve	Biomass Separtor Control Assembly, Instru Air Control Valve	Service Water Valve	Electron Donor Supply Valve	Nutrient Solution Supply Valve	PH Solution Supply Valve
Valve Tag Number:	V-3000	V-3010	V-3015	V-301A	V-3030	FCV-3010	V-3170	V-3045	V-3255	V-3190	V-304A	V-306A	V-308A	V-3135	FV-3016	V-3166	V-3151	V-3235	V-3245	FI-3011	FI-3025	V-3205	V-3085	V-3065	V-3110
PROCESS OPERATION																									
FBR RUNNING Mode (Feed + Recycle)[1]	O	O	C	C	O	O	O	O	C	C	C	C	C	adjustable[2]	O	C	C	O	O	adjustable	adjustable	adjustable	O	O	O
RECYCLE Mode (Fluidization Only)	C	C	O	C	C	C	C	O	C	C	C	C	C	adjustable[2]	O	C	C	O	O	adjustable	adjustable	adjustable	O	O	O
Alternate Fluidization Pump w/Feed	O	O	C	O	O	O	C	C	C[4]	O	O	O	C	adjustable[1]	O	C	C	O	O	adjustable	adjustable	adjustable	O	O	O
FBR SHUTDOWN Mode	U	U	C	C	U	C	C	C	C	C	C	C	C	U	C	C	C	C	C	C	C	C	U	U	U

Legend:

O - Valve Open

C - Valve Closed

U - Valve not applicable to specified operation. Valve position should not change from last specified position.

Notes:

1. P-3015 is used for fluidization during normal FBR RUNNING Mode. Alternate Fluidization Pump P-301A is Of.
2. Manual Valve requires operator adjustment to set fluidizationflow.
3. Refer to Controls Description for operation of automatic valve.
4. The offline fluidization pump strainer can be vented, drained and cleaned. After cleaning the drain valve should be closed, and lid secured and made ready for service.

Miscellaneous Valves:

5. V-3166 to remain closed except when draining the fluid and media for FBR maintenance.
6. V-3155 to remain closed except when draining the fluid only for FBR maintenance.
7. All instrument isolation valves will be open except when serving instruments (sensors, gauges, switches, etc.).
8. V-3267 and -3258 will remain closed except when draining the biomass separator assemblies.
9. All manual instrument air valves will be open.

VALVEPOSITION CHART
FBR-6

	1st Stage FBR 1 & 2 Effluent Valve	1st Stage FBR 3 1 4 Effluent Valve	FBR 5 & 6 Recycle Feed to P-3016 Inlet Valve	FBR 5 & 6 Recycle Feed to P-301A Inlet Valve	1st Stage FBR Equalized Feed Valve	FBR-6 Feed Flow Control Valve[3]	FBR-6 Fluidization Pump Suction Valve	FBR-6 Fluidization Pump Discharge Valve	S-3016 Drain/Vent Valve	FBR-6 Alternate Fluidization Pump Suction Valve	FBR-6 Alternate Fluidization Pump Discharge Valve	P-301A to FBR-6 Valve	S-301A Drain/Vent Valve	FBR-6 Manual Fluidization Flow Control Valve[3]	FBR-6 Flow Valve[3]	FBR Unscreened Drain Valve[4]	FBR Screened Drain Valve[5]	Biomass Separtor Control Assembly, Instru Air Shut Off Valve	Biomass Separtor Control Assembly, Instru Air Shut Off Valve	Biomass Separtor Control Assembly, Instru Air Control Valve	Biomass Separtor Control Assembly, Instru Air Control Valve	Service Water Valve	Electron Donor Supply Valve	Nutrient Solution Supply Valve	PH Solution Supply Valve
Valve Tag Number:	V-3000	V-301)	V-3016	V-301A	V-3040	FCV-3020	V-3180	V-3046	V-3288	V-3200	V304A	V-307A	V-308A	V-3138	FV-3016	V-3166	V-3159	V-3236	V-3246	FI-3016	FI-3026	V-3206	/-3066	V-3066	V-3120
PROCESS OPERATION																									
FBR RUNNINGMode (Feed + Recycle)[1]	O	O	■	■	O	O	O	O	■	■	■	■	■	adjustable[2]	O	■	■	O	O	adjustable	adjustale	adjustable	O	O	O
RECYCLE Mode (Fluidization Only)	■	■	O	■	■	■	■	O	■	■	■	■	■	adjustable[2]	O	■	■	O	O	adjustable	adjustale	adjustable	O	O	O
Alternate Fluidization Pump w/Feed	O	O	■	O	O	O	■	■	■[4]	O	O	O	■	adjustable[2]	O	■	■	O	O	adjustable	adjustale	adjustable	O	O	O
FBR SHUTDOWN Mode	U	U	■	■	U	■	■	■	■	■	■	■	■	U	■	■	■	■	■	■	■	■	U	U	U

Legend:

O - Valve Open

■ - Valve Closed

U - Valve not applicable to specified operation. Valve position should not change from last specified position.

Notes:

1. P-3016 is used for fluidization during normal FBR RUNNING mode. Alternate Fluidization Pump P-301A is Of.
2. Manual Valve requires operator adjustment to set fluidization flow.
3. Refer to Controls Description for operation of automatic valves.
4. The offline fluidization pump strainer can be vented, drained ind cleaned. After cleaning the drain valve should be closed, and lid secured and made ready for service.

Miscellaneous Valves:

5. V-3166 to remain closed except when draining the fluid and media for FBR maintenance.
6. V-3156 to remain closed except when draining the fluid only for FBR maintenance.
7. All Instrument isolation valves will be open except when servicing instruments (sensors, gauges, switches, etc).
8. V-3289 and -3270 will remain closed except when draining the biomass separator assemblies.
9. All manual instrument air valves will be open.

VALVE POSITION CHART
FBR-7

	1st Stage FBR Effluent Valve	FBR 7 & 8 Recycle Feed to P-309 B Inlet Valve	FBR 7 & 8 Recycle Feed to P-302A Inlet Valve	1st Stage FBR Equalized Feed Valve	FBR-7 feed Flow Control Valve[3]	FBR-7 Fluidization Pump Suction Valve	FBR-7 Fluidization Pump Discharge Valve	S-3017 Drain/Vent Valve	FBR-7 Alternate Fluidization Pump Suction Valve	FBR-7 Alternate Fluidization Pump Decharge Valve	P-302A to FBR-7 Valve	S-302A Drain/Vent Valve	FBR-7 Manual Fluidization Flow Contol Valve[1]	FBR-7 Flow Valve[3]	FBR-7 Unscreened Drain Valve[4]	FBR-7 Screened Drain Valve[4]	Biomass Separtor Control Assembly, Instru Air Shut Off Valve	Biomass Separtor Control Assembly, Instru Air Shut Off Valve	Biomass Separtor Control Assembly, Instru Air Control Valve	Biomass Separtor Control Assembly, Instru Air Control Valve	Service Water Valve	Electron Donor Supply Vave	Nutrient Solution Supply Valve	PH Solution Supply Valve
Valve Tag Number:	V-3300	V-3015	V-311A	V-3330	ICV-3030	V-3470	V-3047	V-3257	V-3490	V-314A	V-316A	V-318A	V-3137	FV-3017	V-3167	V-3167	V-3227	V-3247	FI-3017	FI-3027	V-3207	V-3097	V-3087	V-3410
PROCESS OPERATION																								
FBR RUNNING Mode (Feed + Recycle)[2]	O	■	■	O	O	O	O	■	■	■	■	■	adjustable[1]	O	■	■	O	O	adjustable	adjustable	adjustable	0	O	C
RECYCLE Mode (Fluidization Only)	■	O	■	■	■	■	O	■	■	■	■	■	adjustable[1]	O	■	■	O	O	adjustable	adjustable	adjustable	0	O	C
Alternate Fluidization Pump w/Feed	O	■	O	O	O	■	■	■[4]	O	O	O	■	adjustable[1]	O	■	■	O	O	adjustable	adjustable	adjustable	0	O	C
FBR SHUTDOWN Mode	U	■	■	U	■	■	■	■	■	■	■	■	U	■	■	■	■	■	■	■	■	U	U	U

Legend:

O - Valve Open

■ - Valve Closed

U - Valve not applicable to specified operation. Valve position should not change from last specified position.

Notes:

1. P-3017 is used for fluidization during normal FBR RUNNING Mode. Alternate Fluidization Pump P-302A is Of.
2. Manual Valve requires operator adjustment to set fluidizationflow.
3. Refer to Controls Description for operation of automatic valve.
4. The offline fluidization pump strainer can be vented, drained and cleaned. After cleaning the drain valve should be closed, and lid secured and made ready for service.

Miscellaneous Valves:

5. V-3167 to remain closed except when draining the fluid and media for FBR maintenance.
6. V-3167 to remain closed except when draining the fluid only for FBR maintenance.
7. All instrument isolation valves will be open except when serving instruments (sensors, gauges, switches, etc.).
8. V-3257 and 3258 will remain closed except when draining the biomass separator assemblies.
9. All manual instrument air valves will be open.

VALVE POSITION CHART
FBR-8

	1st Stage FBR Effluent Valve	FBR 7 & 8 Recycle Feed to P-3018 Inlet Valve	FBR 7 & 8 Recycle Feed to P-302A Inlet Valve	1st Stage FBR Equalized Feed Valve	FBR-8 feed Flow Control Valve[3]	FBR-8 Fluidization Pump Suction Valve	FBR-8 Fluidization Pump Discharge Valve	S-3018 Drain/Vent Valve	FBR-8 Alternate Fluidization Pump Suction Valve	FBR-7 Alternate Fluidization Pump Discharge Valve	P-302A to FBR-7 Valve	S-302A Drain/Vent Valve	FBR-8 Manual Fluidization Flow Control Valve[3]	FBR-8 Flow Valve[3]	FBR-8 Unscreened Drain Valve[3]	FBR-8 Screened Drain Valve[3]	Biomass Separtor Control Assembly, Instru Air Shut Off Valve	Biomass Separtor Control Assembly, Instru Air Shut Off Valve	Biomass Separtor Control Assembly, Instru Air Control Valve	Biomass Separtor Control Assembly, Instru Air Control Valve	Service Water Valve	Electron Donor Supply Valve	Nutrient Solution Supply Valve	PH Solution Supply Valve
Valve Tag Number:	V-3300	V3018	V-311A	V-3330	FCV-330	V-3470	V-3047	V-3258	V-3490	V-314A	V-317A	V-318A	V-313(	FV-3018	V-3168	V-3158	V-3238	V-3248	FI-3018	FI-3028	V-3208	V-3088	V-3068	V-3420
PROCESS OPERATION																								
FBR RUNNING Mode (Feed + Recycle)[1]	O	■	■	O	O	O	O	■	■	■	■	■	adjustable[2]	O	■	■	O	O	adjustable	adjustable	adjustable	O	O	O
RECYCLE Mode (Fluidization Only)	■	O	■	■	■	■	O	■	■	■	■	■	adjustable[2]	O	■	■	O	O	adjustable	adjustable	adjustable	O	O	O
Alternate Fluidization Pump w/Feed	O	■	O	O	O	■	■	■[4]	O	O	O	■	adjustable[2]	O	■	■	O	O	adjustable	adjustable	adjustable	O	O	O
FBR SHUTDOWN Mode	U	■	■	U	■	■	■	■	■	■	■	■	U	■	■	■	■	■	■	■	■	U	U	U

Legend:

O - Valve Open

■ - Valve Closed

U - Valve not applicable to specified operation. Valve position should not change from last specified position.

Notes:

1. P-3018 is used for fluidization during normal FBR RUNNING Mode. Alternate Fluidization Pump P-302A is Off.
2. Manual Valve requires operator adjustment to set fluidization flow.
3. Refer to Controls Description for operation of automatic valves.
4. The offline fuidization pump strainer can be vented, drainedand cleaned. After cleaning the drain valve should be closed, and lid secured and made ready for service.

Miscellaneous Valves:

5. V-3168 to remain closed except when draining the fluid and media for FBR maintenance.
6. V-3158 to remain closed except when draining the fluid onlyfor FBR maintenance.
7. All instrument isolation valves will be open except when servicing instruments (sensers, gauges, switches, etc.).
8. V-3523 and-3524 will remain closed except when draining be biomass separator assemblies.
9. All manual instrument air valves willbe open.

VALVE POSITION CHART
SEPARATOR T-2011 AND MEDIA RETURN

	Separator Level Control Valve[3]	Separator Tank Suction Valve	Separtor Tank Flow Valve	Service Water Isolation Valve	Service Water Flow Valve	Media Return Backflush Valve	Media Return Clean out Valve	Separator Tank Drain Valve	FBR-2 Media Return Valve	FBR-1 Media Return Valve
Valve Tag Number:	LCV-2011	V-2031	FV-2011	V-2041	FV-2021	FV-2031	V-2011	V-2021	V-2061	V-2071
PROCESS OPERATION										
Normal[1] Separator Operation	O	O	■	O	■	■	■	■	U	U
Separator Media Return Cycle	O	O	O	O	■	O	■	■	adjustable[2]	adjustable[2]
Service Water Backflush	O	O	O	O	O	■	■	■	U	U

Legend:
O - Valve Open
■ - Valve Closed
U - Valve not applicable to specified operation, Valve position should not change from last specified position

Notes:
1. During Normal Separator Operation the effluent/recycle stream enters the separator allowing media entrained in the stream to settle. Water is recycled to FBRs 1 & 2 and sent to the 2nd stage FBRs(5, 6, 7, & 8) depending on the level in the separator tank.
2. Manual Valve requires operator adjustment to set media return location based on bed height measurment and the FBR media replenishment requirements.
3. Refer to Controls Description for operation of automatic valves.
4. All 1/2" and 3/8" ball valves on instrument air supply lines are open during normal operation except for V-2171 which is at the end of a line.

VALVE POSITION CHART
SEPARATOR T-2012 AND MEDIA RETURN

	Separator Level Control Valve[3]	Separator Tank Suction Valve	Separtor Tank Flow Valve	Service Water Isolation Valve	Service Water Flow Valve	Media Return Backflush Valve	Media Return Clean out Valve	Separator Tank Drain Valve	FBR-4 Media Return Valve	FBR-3 Media Return Valve
Valve Tag Number:	LCV-2012	V-2032	FV-2012	V-2042	FV-2022	FV-2032	V-2012	V-2022	V-2072	V-2062
PROCESS OPERATION										
Normal[1] Separator Operation	O	O	■	O	■	■	■	■	U	U
Separator Media Return Cycle	O	O	O	O	■	O	■	■	adjustable[2]	adjustable[2]
Service Water Backflush	O	O	O	O	O	■	■	■	U	U

Legend:
O - Valve Open
■ - Valve Closed
U - Valve not applicable to specified operation, Valve position should not change from last specified position

Notes:
1. During Normal Separator Operation the effluent/recycle stream enters the separator allowing media entrained in the stream to settle. Water is recycled to FBRs 3 & 4 and sent to the 2nd stage FBRs(5,6, 7,& 8) depending on the level in the separator tank.
2. Manual Valve requires operator adjustment to set media return location based on bed height measurment and the FBR media replenishment requirements.
3. Refer to Controls Description for operation of automatic valves.
4. All 1/2" and 3/8" ball valves on instrument air supply lines are open during normal operation except for V-2172 which is at the end of a line.
5. Separator Tank Drain Valve will be used during media wash to remove fines from the system and for maintainance on the separator.

VALVE POSITION CHART
SEPARATOR T-3011 AND MEDIA RETURN

	Separator Level Control Valve[3]	Separator Tank Suction Valve	Separtor Tank Flow Valve	Service Water Isolation Valve	Service Water Flow Valve	Media Return Backflush Valve	Media Return Clean out Valve	Separator Tank Drain Valve	FBR-5 Media Return Valve	FBR-6 Media Return Valve
Valve Tag Number:	LCV-3011	V-3631	FV-3011	V-3641	FV-3021	FV-3031	V-3611	V-3621	V-3661	V-3671
PROCESS OPERATION										
Normal[1] Separator Operation	O	O	■	O	■	■	■	■	U	U
Separator Media Return Cycle	O	O	O	O	■	O	■	■	adjustable[2]	adjustable[2]
Service Water Backflush	O	O	O	O	O	■	■	■	U	U

Legend:
O - Valve Open
■ - Valve Closed
U - Valve not applicable to specified operation, Valve position should not change from ast specified position

Notes:
1. During Normal Separator Operation the effluent/recycle stream enters the separator allowing media entrained in the stream to settle.
Water is recycled to FBRs 5 & 6 and sent as effluent to the aeration tank depending on the level in the separator tank.
2. Manual Valve requires operator adjustment to set media return location based on bed height measurment and the FBR media replenishment requirements.
3. Refer to Controls Description for operation of automatic valves.
4. All 1/2" and 3/8" ball valves on instrument air supply lines are open during normal operation except for V-3771 which is at the end of a line.
5. Separator Tank Drain Valve will be used during media wash to remove fines from the system and for maintainance on the separator.

VALVE POSITION CHART
SEPARATOR T-3012 AND MEDIA RETURN

	Separator Level Control Valve[3]	Separator Tank Suction Valve	Separtor Tank Flow Valve	Service Water Isolation Valve	Service Water Flow Valve	Media Return Backflush Valve	Media Return Clean out Valve	Separator Tank Drain Valve	FBR-7 Media Return Valve	FBR-8 Media Return Valve
Valve Tag Number:	LCV-3012	V-3632	FV-3012	V-3642	FV-3022	FV-3032	V-3612	V-3621	V-3662	V-3672
PROCESS OPERATION										
Normal[1] Separator Operation	O	O	■	O	■	■	■	■	U	U
Separator Media Return Cycle	O	O	O	O	■	O	■	■	adjustable[2]	adjustable[2]
Service Water Backflush	O	O	O	O	O	■	■	■	U	U

Legend:
O - Valve Open
■ - Valve Closed
U - Valve not applicable to specified operation, Valve position should not change from last specified position

Notes:
1. During Normal Separatbr Operation the effluent/recycle stream enters the separator allowing media entrained in the stream to settle.
Water is recycled to FBRs 7 & 8 and sent as effluent to the aeration tank depending on the level in the separator tank.
2. Manual Valve requires operator adjustment to set media return location based on bed height measurment and the FBR media replenishment requirements.
3. Refer to Controls Description for operation of automatic valves.
4. All 1/2" and 3/8" ball valves on instrument air supply lines are open during normal operation except for V-3772 which is at the end of a line.
5. Separator Tank Drain Valve will be used during media wash to remove fines from the system and for maintainance on the separator.

APPENDIX M
FBR LOADING EQUATION

FBR Loading Equation

Stream	FLOW [1]	Perchlorate [2]; ClO_4^-	Chlorate [2]; ClO_3^-	Nitrate (as N) [2]; NO_3^--N	
	gpm	*mg/l*	*mg/l*	*mg/l*	
Athen's Road (LS#3) - A	*250*	360	629	40	
Seep/Wash Area (LS#1) - B	*690*	17	25	6.2	
Interceptor Wells Feed to GWTP (Chrome System)	*58*				
GW-11 (Pond) Flow to GWTP	*12*	*1,537*	*3,851*	*55*	Check Effluent Composition from GWTP
Total Flow from GWTP to FBRs	*60*				(Not Used in Spreadsheet)
Portion of Interceptor Wells Flow to FBRs - C	*49.7*	1,400	3,200	42	
Portion of GW-11 Flow to FBRs - D	*10.3*	2,200	7,000	120	
Total Flow to FBRs (A+E+C+D)	1,000	194	403	17.6	

Loading Equation (lbs/day) = $(0.9*NO_3^-N + 0.17*ClO_3^- + 0.18*ClO_4^-)*$ FLOW $*1{,}440 *8.34 / 10^6$

	Limits	*Calculated*	*Within Limits?*	*% of Full Operating Load*
Loading (lbs/day) =	1,514	1,438	Yes	95%
NO_3^-N (mg/l) =	50	18	Yes	
ClO_3^- (mg/l) =	500	406	Yes	
ClO_4^- (mg/l) =	400	194	Yes	

1. Flow values input by operator.

2. Source feed stream concentrations are password protected. Input by authorized personnel only! To password protect this spreadsheet, go to "Tools/Protection/Protect Sheet" and input a password. Then click "O.K.".

3. The above spreadsheet is an example calculation for a specific process condition. The operator should use the electronic model contained in the SCADA and input the actual values. The model will calculate the loading to the plant and the required "K" values.

APPENDIX N
FBR SYSTEM STARTUP

FBR SYSTEM INITIAL STARTUP PROCEDURES

The startup procedures were developed for activation of the newsystem. These procedures will only be required if the sand or gac media must be removed from the system or there is a complete loss of biomass. Normal startup and shutdown procedures, i.e. startup after loss of power, are presented in Chapter 14.

General Startup

Review individual component manufacturer's documentation for additional specifications. Some general guidelines are listed below and should be performed prior to media addition:

1. Stroke all valves prior to flooding system to verify operation.
2. Lubricate and oil all rotating components per manufacturers' recommendations.
3. Energize system. Close disconnect switches. Verify 3-phase motor rotation by\ momentarily "bumping" the motors.
4. Verify instrument calibrations.
5. Confirm communication and correct operation with control system.
6. Refer to overall system startup procedures for the order in which all equipment should be started.
7. Fill reactor vessel and piping with clean water. Bleed all air pockets from system.
8. Check for leaks and tighten loose connections.

Conditioning Sand for Startup

In order to minimize startup time, it is imperative that the sand in FBRs 1 – 4 be "conditioned" for microbial attachment and growth prior to loading the inoculum into the FBRs or prior to introducing feed water to the system. Sand is a smooth surface. Experience has shown that startup times using unconditioned sand are 50 to 150 percent longer than when conditioned sand is used. Conditioned sand for microbial attachment cannot be obtained by simply scratching/abrading the sand or soaking the sand in a chemical (i.e., acid) for a short period of time.

A portion of the sand used in FBRs 1 – 4 (5 to 10 percent) will already be fully conditioned, as it will be obtained from an operating denitrifying FBR system in Sparks, NV. Load this sand into FBRs 1 – 4 according to Section 2.1.4.

The remaining 90 to 95 percent of virgin sand will be conditioned along with the fully conditioned sand noted above for approximately two weeks prior to introducing contaminated feed water to the system. Load the virgin sand into FBRs 1 – 4 according to Sections 2.1.4 and 2.1.6. Operate FBRs 1 – 4 and the two sand separators in recycle mode. Inoculate FBRs 1 – 4 according to Section 2.1.7. Feed batches of nitric acid, ethanol and phosphoric acid to the FBRs to promote growth of denitrifying films on the sand. The batch addition of chemicals to EACH sand FBR should include 10 gallons of nitric acid (HNO_3), 10 gallons of ethanol, and 0.3 gallons of 85% phosphoric acid. The water source will be stabilized lake water. At the start of each batch run, the pH of the water in the FBRs should be adjusted to 6.2 to 6.5 using 20% caustic soda. The nitrate reduction process will increase the alkalinity of the water. The pH may need to be manually adjusted to maintain the pH no higher than 7.5, or precipitation of hardness may occur. It is preferable to operate as close to pH 7.5 as possible to encourage formation of "sticky/filamentous" films. **Provisions may be needed to periodically remove denitrified water from the FBRs and replace the water with stabilized lake water to control temperature (due to sustained operation in recycle mode).** This water will need to be stored (i.e., in either the Aeration Tank or DAFs) until the UV system is operational and has been accepted by the client. Water that contains microorganisms must be passed\ through the UV system prior to discharge. **Also, the provision must be made to allow temporary control of the sand FBRs at a fluid bed height of approximately 2 feet above the level of hydraulic fluidization (i.e., 18.5 feet for an initial settled bed height of 13 feet and an initial expanded bed height of**

16.5 feet). Monitor the concentrations of nitrate-N and soluble TOC in the water during each batch run. When the nitrate-N drops below 5 mg/L from an approximate starting concentration of 100 mg/L per batch, add an additional batch of chemicals. Once the contents of two 55-gallon drums of nitric acid have been added to EACH FBR, operate the FBRs in recycle without further chemical addition.

The following items are assumed to be in place prior to sand conditioning:

1. FBRs 1 – 4 and the two sand separators are fully assembled and full of stabilized lake water.
2. The sand FBRs and sand separators have been fully tested mechanically and have been accepted by the client for startup.

Since the PLC may not be functioning during the sand conditioning period, the temperature alarms will not be available. Therefore, the operators will need to monitor the temperature gauges directly on the FBRs in order to track temperature.

Sand Media Loading (FBRs 1 – 4)

The sand FBRs will be loaded via pneumatic transfer from trucks. Care must be taken to minimize/avoid spillage of sand into the reactor collection systems. Follow the steps below for adding sand to the individual FBRs:

1. Empty the water (assumed to be stabilized lake water from hydro-testing) within the FBRs to the pad sumps; however, see Item #4 below to determine how much water should be emptied.
2. Temporarily cover the top of the collection and effluent system openings and the perforation in the collection header pipes.
3. Isolate all tank valves to the FBRs.
4. The FBRs should be one-third or one-half filled with stabilized lake water.
5. Set up a temporary hose to unload sand from the trucks. This hose should go from ground level, over the top of each reactor and extend just below the collector system. NOTE: When loading the pre-conditioned sand from Sparks, NV, special trucks and/or sand removal techniques may be required, as the sand may form a hard mass in the trucks during transport.

6. One by one empty the trucks of sand into each reactor. As sand is added, fluid levels within each reactor should increase. Add additional water as needed to ensure the sand is covered.

7. Approximately 2,000 cubic feet of sand should be loaded into each FBR to the settled bed height of 13'-0". This is approximately (5) 40,000-pound truckloads of dry sand. Care must be taken to load or distribute the sand evenly across each FBR, or uneven fluidization may occur when the fluidization pumps are turned on (i.e., only the shortest portion of the uneven bed will fluidize). It may be necessary to "bump" the fluidization pumps periodically to re-distribute the sand in each FBR.

8. As the sand is being loaded, the settled bed height in each FBR should be monitored by dropping a weighted probe down through the liquid at the top of each reactor until the probe reaches the top of the settled bed.

9. Remove temporary covers and plugs from the collection boxes and pipes.

Repeat Items 1 – 9 above with remaining first stage FBRs until all four (4) are complete.

Carbon Media Loading (FBRs 5 – 8)

The following items are assumed to be in place prior to loading FBRs 5 – 8 with carbon media:

1. FBRs 5 – 8 and the two carbon separators are fully assembled and full of stabilized lake water.

2. The GAC FBRs and carbon separators have been fully tested mechanically and have been accepted by the client for startup.

The GAC FBRs will be loaded from super sacks. Care must be taken to minimize/avoid spillage of GAC into the reactor collection systems. Follow the steps below for adding GAC to the individual FBRs:

1. Empty the water (assumed to be stabilized lake water from hydro-testing) within the FBRs to the pad sumps; however, see Item #4 below to determine how much water should be emptied.

2. Temporarily cover the top of the collection and effluent system openings and the perforation in the collection header pipes.
3. Isolate all tank valves to the FBRs.
4. The FBRs should be one-third or one-half filled with stabilized lake water.
5. One by one, hoist the super sacks above the top of each vessel and open the bags. Slowly add the carbon to each reactor. As carbon is added, fluid levels within each reactor should increase. Add additional water as needed to ensure the GAC is covered. The GAC will require 24 hours to completely saturate and settle.
6. Approximately 1,730 cubic feet of carbon should be loaded into each FBR to the settled bed height of 11'-3". This is approximately forty-seven (47) 500-kilogram super sacks of carbon. Initially, load only 46 super sacks (50,700 pounds) into each reactor. If necessary, additional carbon can be loaded later. Care must be taken to load or distribute the GAC evenly across each FBR, or uneven fluidization may occur when the fluidization pumps are turned on (i.e., only the shortest portion of the uneven bed will fluidize). It may be necessary to "bump" the fluidization pumps periodically to re-distribute the GAC in each FBR.
7. As the carbon is being loaded, the settled bed height in each FBR should be monitored by dropping a weighted probe down through the liquid at the top of each reactor until the probe reaches the top of the settled bed.
8. Remove temporary covers and plugs from the collection boxes and pipes.

Repeat Items 1 – 8 above with remaining second stage FBRs until all four (4) are complete.

Wash Media and Establish Fluidization Loading for each FBR

It is important to wash out the media fines prior to putting the FBR systems into operation. Fill each fluid bed reactor with stabilized lake water up to the effluent collection pipe. Place a hose in each reactor and continue to add water, allowing the water to overflow the reactor from the effluent pipe. Establish media fluidization to each FBR 1 through 8 sequentially in recycle operating mode. Open the valves around the fluidization pump P-1011. Make sure that FBR-1 is filled with water up to the effluent recycle nozzle; otherwise, loss of FBR fluidization pump prime and pump damage may result. Start the fluidization pump. Set the initial fluidization flow at 800 gpm and increase the fluidization flow in increments of 200 gpm up to approximately 2,000 gpm. The fluidization recycle will cause water to discharge from the reactor to the separator tank where media fines will be removed. These media fines will be collected in the separator tank. Monitor the recycle for fines. Continue washing out fines until a clear visual line of sight can be made through a 6" deep sample. Once the effluent is clear, remove the fines from the separator by letting them settle into the cone and discharging them to the pad sump. Add water to the separator to refill discharged water.

Repeat the procedure above for FBRs 2 – 8.

After the fines are removed, allow the beds to settle for at least 1 hour and record the settled bed heights using weighted probes. For the first stage sand FBRs, the settled bed height should be 13'-1" ± 2". For the second stage GAC FBRs, the settled bed height should be 11'-3" ± 2". Adjust bed height by adding or removing media as necessary. When adding media, pre-wetted media should be used. Add media as described in Section 2.2.4.

Establish the fluidization loading on each FBR bed. Start the fluidization pumps at a recycle flow of 2,000 gpm. Next, monitor bed heights. Record the bed heights, FBR fluidization flows, and water temperatures. Establish the **"normal system fluidization flow"** for each FBR. This is the fluidization flow that results in a clean expanded bed height of 16'-7" to 17'-0" for the first stage FBRs and 14'-2" to 14'-8" for the second stage FBRs (or 1.28 times the clean settled bed heights) when operating at the normal treatment temperature. Increased water temperature requires a higher flow to achieve a given level of media fluidization. The FBR fluidization flow rates should always be maintained at the established **"normal**

system fluidization flows." It is recommended that a mark be placed to indicate the fluidization flow control valve position necessary to achieve this rate for each FBR.

Once the beds are fluidized, the pH of the GAC reactors will likely be greater than 9.0, and will therefore require adjustment. Obtain a media sample and water sample from each GAC FBR vessel and perform titration experiments to determine the required equivalents of sulfuric acid needed to adjust the pH to 7.5 (i.e., the approximate pH of the IX system feed water). Use a total GAC volume of 1,730 cubic feet of GAC (settled) per reactor and a total liquid volume of 75,000 gallons per FBR/separator combination (i.e., FBRs-5&6 and separator T-3011; FBRs-7&8 and separator T-3012). Add 93% sulfuric acid through the nutrient pumps P-725 and P-726 for FBRs-5&6 and nutrient pumps P-727and P-728 for FBRs-7&8 until the required amount of acid has been added. Break the 3/8" plastic feed lines prior to the pumps and insert the lines into a 55-gallon drum of the acid. After adding the acid, insert the feed lines into water to flush the lines of acid for at least 6 hours prior to reinstalling the lines. Monitor the pH and run the FBRs in recycle for at least one hour to thoroughly mix the acid.

Process Feed Startup Plan

The following items are assumed in place prior to initiating startup:

a. All separators (first & second stage), the aeration vessel, both DAFs, and the effluent tank with all associated piping are assembled and full of stabilized lake water.

b. All FBRs (first & second stage) are full of media and stabilized lake water.

c. The flow through system, including the UV system, has been fully tested mechanically and has been accepted by the client for startup.

General Information

NOTE: It is assumed that the ethanol addition, pH control, and nutrient addition systems are set up, primed, and functioning properly.

During this time, microbial growth should be monitored via feed and effluent groundwater quality testing, substrate utilization, and field analytical testing. Adjustments should be made to the initial settings of the biomass separation devices

as needed. Monitor the FBRs as per Table 4-1 and add ethanol and nutrient to the vessels as per our guide in Appendix C.

Inoculation

To expedite start-up, the sand FBRs will be inoculated twice -- once to condition the sand, and then again with the same perchlorate-reducing culture to provide additional microorganisms just prior to startup. The inoculation procedure is the same in both cases, except that prior to introducing the microbial seed to the FBRs the second time, the stabilized lake water in the FBRs should be replaced with contaminated water (i.e., the current feed to the IX system).

To replace the stabilized lake water with IX feed water (TO BE DONE PRIOR TO START_UP ONLY; NOT TO BE DONE PRIOR TO SAND PREPARATION), perform the following:

1. With FBRs 1 – 4 fluidization pumps running, the FBRs will recycle in place. Set the valves so that the effluents from the sand separators T-2011 and T-2012 bypass the GAC FBRs 5 – 8 and go directly to the DAFs.
2. Transfer the water (assumed to be stabilized lake water from hydro-testing) in the DAFs and effluent tank to the thickener, solids conditioning tank, and filtrate tank (to be used for the solids system checkout). After those solids vessels are full, the remaining water (if any) should be dumped to the pad sumps if this water contains no microorganisms. If the water contains microorganisms (i.e., because water from the conditioning step had to be transferred to control temperature), then the water must be discharged through the UV system.
3. With all the FBRs running in recycle (fluidization pumps running), open the valves for the system feed from the current IX system. Set the system to run at 1,000 gpm.
4. The chemical feed systems should also be running and adding chemicals to the feed water.
5. The recommended initial dosage of nutrients is 2 gallons of the 39% urea/diammonium phosphate mix (from Nutrient Tank T-702) PER SAND FBR; the recommended initial dosage of ethanol is 10 gallons (from Ethanol

Substrate Tank T-703) PER SAND FBR. The recommended initial dosage of the trace elements mixture is 0.1 to 0.5 gallons.

6. Run the system with feed until the DAFs and effluent tank are full. Shut down system feed and set valves to run FBRs 1 – 4 in recycle when DAFs and effluent tank are full (i.e., the only equipment in operation is FBRs 1 – 4 and sand separators T-2011 and T-2012).

Perform the following steps to properly seed the sand FBR vessels.

1. Shut off the system feed. The system should be operating in recycle mode.
2. Pump the seed (microorganisms and nutrients) into the top of the separator vessels. The recommended microbial seed is 6,000 gallons of concentrated biological solids from the Aerojet FBR system for each FBR/separator combination (i.e., FBRs-1&2 and separator T-2011; FBRs-3&4 and separator T-2012). The biological solids will need to be screened (1/4" or less recommended) prior to adding the material to the separator. It is easier to screen the sludge as it is being withdrawn from its source into the trucks rather than screen it as it is being added to the FBRs.
3. Allow the system to run in the recycle mode according to Section 2.1.3 if preparing the sand or Section 2.1.7.3 (Phase 1) if initiating startup. This will give the microbes a chance to adhere to the media.

Phase 1

With FBRs 1 – 4 fluidization pumps running, the FBRs will recycle in place. Monitor the FBRs as per Table 4-1 and add ethanol and nutrients as per our guide in Appendix C. It is likely that no additional nutrients or ethanol will be required above those added during inoculation. During this phase, the only equipment in operation is FBRs 1 – 4 and sand separators T-2011 and T-2012.

Continue monitoring for one week. When the nitrate and chlorate are fully degraded, and the perchlorate is almost fully degraded, proceed to Phase 2. This is expected to occur within one week.

Phase 2

Prior to beginning Phase 2, the loading and washing of carbon media in the second stage FBRs 5 – 8 must be complete (see Sections 2.1.5 and 2.1.6).

Set the valves so that the water effluents from the sand separators T-2011 and T-2012 pass through FBRs 5 – 8. Set up the bypass from the effluent pumps to discharge water to the outfall (through the UV system) if 99 percent destruction of perchlorate occurred during Phase 1; otherwise, set up the bypass to send water to GW-11 (i.e., “the pond”).

With all the FBRs 1 – 8 running in recycle (fluidization pumps running), open the valves for the system feed from the temporary IX system and prepare to add water from GW-11 (i.e., “pond water”). Set the system to run at 940 gpm of temporary IX water feed and 60 gpm of pond water. With the system running in recycle at 1,000 gpm, open the valves to the bypass to allow water to be discharged to either the outfall or the pond (see paragraph above). Turn on the chemical feed systems (nutrient, trace elements, and ethanol). Open the valves for the system feed from the temporary IX system and start the GW-11 pump. Feed the system approximately 375,000 gallons of IX water and 25,000 gallons of pond water over approximately 7 hours. The chemical feed systems should also be running and adding chemicals to the feed water according to the guide in Appendix C. DO NOT OPERATE THE AERATION TANK OR DAFs.

After approximately 400,000 gallons have flowed through the complete system, shut down the system feed and set the valves to run all eight FBRs such that the water in the effluent tank is recycled back to the feed to the sand FBRs 1 – 4 (i.e., system recycle). Also shut down the nutrient, trace element, and ethanol chemical feeds (continue to operate the pH control chemical feeds).

Continue to run the system in recycle at 1,000 gpm.

Monitor the FBRs as per Table 4-1 and add ethanol and nutrients manually as needed to maintain residual ammonia-N, phosphate-P and ethanol (as measured by soluble TOC) as per Table 4-1. It is estimated, based on previous analyses of IX and pond water water parameters, that a total of 200 gallons of ethanol and 40 gallons of the 39% urea/di-ammonium phosphate mix will be required to reduce all the oxygen, nitrate, chlorate and perchlorate present in the water within the complete system during Phase 2. A small amount of the trace elements mixture may need to be manually added if perchlorate removal stalls.

Continue monitoring for one week. When the nitrate and chlorate are fully degraded in the first stage sand FBRs and the perchlorate concentration is less than 500 ug/L

in the effluent from the GAC FBRs, continue to Phase 3. This is expected to occur within one week.

Phase 3

Prior to beginning Phase 3, set up the bypass from the effluent pumps to discharge water to the outfall (through the UV system) if 99 percent destruction of perchlorate occurred during Phase 2; otherwise, set up the bypass to send water to the pond. DO NOT OPERATE THE AERATION TANK OR DAFs.

With the system running in recycle, open the valves for the system feed from the temporary IX system and prepare to add water from GW-11 (i.e., “pond water”). Set the system to run at 940 gpm of temporary IX water feed and 60 gpm of pond water. With the system running in recycle at 1,000 gpm, open the valves to the bypass to allow water to be discharged to either the outfall or the pond (see paragraph above). Turn on the chemical feed systems (nutrient, trace element, and ethanol pumps). Open the valves for the system feed from the temporary IX system and start the GW-11 pump. Feed the system approximately 375,000 gallons of IX water and 25,000 gallons of pond water over approximately 7 hours. The chemical feed systems should also be running and adding chemicals to the feed water according to the guide in Appendix C.

Shut down the bypass to the pond discharge line and the system feed. Set the valves to run the system in recycle (i.e., system recycle). Run in system recycle at 1,000 gpm. Also shut down the nutrient, trace element, and ethanol chemical feeds (continue to operate the pH control chemical feeds).

Monitor the FBRs as per Table 4-1 and add ethanol and nutrients manually as needed to maintain residual ammonia-N, phosphate-P and ethanol (as measured by soluble TOC) as per Table 4-1. A small amount of the trace elements mixture may also need to be manually added if performance stalls. When the nitrate and chlorate are fully degraded in the first stage sand FBRs and the perchlorate concentration is less than 100 ug/L in the effluent from the GAC FBRs, continue to Phase 4. This is expected to occur within 6 days.

Phase 4

Prior to beginning Phase 4, if the water cannot be sent to the outfall (i.e., 99 percent destruction of perchlorate during Phase 3), set up the bypass from the effluent

pumps to the sump discharge line to send water to the pond. DO NOT OPERATE THE AERATION TANK OR DAFs.

With the system running in recycle, open the valves for the system feed from the temporary IX system and prepare to add water from GW-11 (i.e., “pond water”). Set the system to run at 940 gpm of temporary IX water feed and 60 gpm of pond water. With the system running in recycle at 1,000 gpm, open the valves to the bypass to allow water to go to either the outfall or the pond (see paragraph above).. Turn on the chemical feed systems (nutrient, trace element, and ethanol pumps). Open the valves for the system feed from the temporary IX system and start the GW-11 pump. Feed the system approximately 375,000 gallons of IX water and 25,000 gallons of pond water over approximately 7 hours. The chemical feed systems should also be running and adding chemicals to the feed water according to the guide in Appendix C.

Shut down the bypass to the pond discharge line (if using) and the system feed. Set the valves to run the system in recycle (i.e., system recycle). Run in system recycle at 1,000 gpm. Also shut down the nutrient, trace element, and ethanol chemical feeds (continue to operate the pH control chemical feeds).

Monitor the FBRs as per Table 4-1 and add ethanol and nutrients manually as needed to maintain residual ammonia-N, phosphate-P and ethanol (as measured by soluble TOC) as per Table 4-1. A small amount of the trace elements mixture may also need to be manually added if performance stalls. After 3 days, the nitrate and chlorate are expected to be fully degraded in the first stage sand FBRs and the perchlorate is expected to be less than 50 ug/L in the effluent from the GAC FBRs.

Phase 5

It is anticipated that prior to beginning Phase 5, levels of perchlorate in the effluent water from the GAC FBRs will be low enough to discharge the water to the outfall on a continuous basis. At this time, the aeration tank and DAFs will be put into service. Therefore, the mechanical checkout of the solids Treatment System must be completed and the solids Treatment System must be accepted by the client for startup.

Reduce the recycle flow from 1,000 gpm to 200 gpm. With the system running in recycle at 200 gpm, open the valves to the discharge to allow water to go to the

outfall. Turn on the chemical feed systems (nutrient, trace element, and ethanol pumps). Open the valves for the system feed from the temporary IX system. Feed the system at 200 gpm. The chemical feed systems should also be running and adding chemicals to the feed water according to the guide in Appendix C.

Monitor the FBRs as per Table 4-1 for 7 days and adjust ethanol and nutrient dosages as needed to maintain residual ammonia-N, phosphate-P and ethanol (as measured by soluble TOC) as per Table 4-1. Increase the dosage of trace elements as needed if performance stalls. The nitrate and chlorate are expected to be fully degraded in the first stage sand FBRs and the perchlorate is expected to be less than 2 mg/L in the effluent from the GAC FBRs. Flow may be increased daily to the system by no more than 10 percent provided less than 2 mg/L of perchlorate is being maintained at the discharge from the FBR system (i.e., overall 99% destruction of perchlorate in the discharge from the combined FBR system and temporary IX system).

Phase 6

With the system running in flow-through mode and meeting less than 2 mg/L of perchlorate on the discharge, increase the flow to 400 gpm.

Monitor the FBRs as per Table 4-1 for 7 days and adjust ethanol and nutrient dosages as needed to maintain residual ammonia-N, phosphate-P and ethanol (as measured by soluble TOC) as per Table 4-1. Increase the dosage of trace elements as needed if performance stalls. The nitrate and chlorate are expected to be fully degraded in the first stage sand FBRs and the perchlorate is expected to be less than 1 mg/L in the effluent from the GAC FBRs. Flow may be increased daily to the system by no more than 10 percent provided less than 1 mg/L of perchlorate is being maintained at the discharge from the FBR system (i.e., overall 99% destruction of perchlorate in the discharge from the combined FBR system and temporary IX system).

Phase 7

With the system running in flow-through mode and meeting less than 1 mg/L of perchlorate on the discharge, increase the flow to 700 gpm.

Monitor the FBRs as per Table 4-1 for 7 days and adjust ethanol and nutrient dosages as needed to maintain residual ammonia-N, phosphate-P and ethanol (as

measured by soluble TOC) as per Table 4-1. Increase the dosage of trace elements as needed if performance stalls. The nitrate and chlorate are expected to be fully degraded in the first stage sand FBRs and the perchlorate is expected to be less than 1 mg/L in the effluent from the GAC FBRs. Flow may be increased daily to the system by no more than 10 percent provided less than 1 mg/L of perchlorate is being maintained at the discharge from the FBR system (i.e., overall 99% destruction of perchlorate in the discharge from the combined FBR system and temporary IX system).

Phase 8

With the system running in flow-through mode and meeting less 1 mg/L of perchlorate on the discharge, increase the flow to 1,000 gpm. This should result in all the flow through the temporary IX system now being processed through the FBRs.

Monitor the FBRs as per Table 4-1 for 7 days and adjust ethanol and nutrient dosages as needed to maintain residual ammonia-N, phosphate-P and ethanol (as measured by soluble TOC) as per Table 4-1. Increase the dosage of trace elements as needed if performance stalls. The nitrate and chlorate are expected to be fully degraded in the first stage sand FBRs and the perchlorate is expected to be less than 50 ug/L in the effluent from the GAC FBRs.

Phase 9

With the system running in flow-through mode at 1,000 gpm, add up to 10 gpm of GW-11 water (i.e., “Pond water”) to the feed water to increase the nitrate-N, chlorate, and perchlorate load to the system. Reduce the flow of pond water if the combined load of nitrate-N, chlorate, and perchlorate exceeds the design load, or if the maximum design concentration of any water quality parameter is exceeded. (

Monitor the FBRs as per Table 4-1 for 7 days and adjust ethanol and nutrient dosages as needed to maintain residual ammonia-N, phosphate-P and ethanol (as measured by soluble TOC) as per Table 4-1. Adjust the dosage of trace elements as needed. The nitrate and chlorate are expected to be fully degraded in the first stage sand FBRs and the perchlorate is expected to be less than 20 ug/L in the effluent from the GAC FBRs.

Phase 10

With the system running in flow-through mode at 1,000 gpm, add up to 30 gpm of GW-11 water (i.e., "Pond water") to the feed water to increase the nitrate-N, chlorate, and perchlorate load to the system. Reduce the flow of pond water if the combined load of nitrate-N, chlorate, and perchlorate exceeds the design load, or if the maximum design concentration of any water quality parameter is exceeded.

Monitor the FBRs as per Table 4-1 for 7 days and adjust ethanol and nutrient dosages as needed to maintain residual ammonia-N, phosphate-P and ethanol (as measured by soluble TOC) as per Table 4-1. Adjust the dosage of trace elements as needed. The nitrate and chlorate are expected to be fully degraded in the first stage sand FBRs and the perchlorate is expected to be less than 4 ug/L in the effluent from the GAC FBRs.

Phase 11

With the system running in flow-through mode at 1,000 gpm, add up to 60 gpm of GW-11 water (i.e., "Pond water") to the feed water to increase the nitrate-N, chlorate, and perchlorate load to the system. Reduce the flow of pond water if the combined\ load of nitrate-N, chlorate, and perchlorate exceeds the design load, or if the maximum design concentration of any water quality parameter is exceeded.

Monitor the FBRs as per Table 4-1 for 7 days and adjust ethanol and nutrient dosages as needed to maintain residual ammonia-N, phosphate-P and ethanol (as measured by soluble TOC) as per Table 4-1. Adjust the dosage of trace elements as needed. The nitrate and chlorate are expected to be fully degraded in the first stage sand FBRs and the perchlorate is expected to be less than 4 ug/L in the effluent from the GAC FBRs.

Process Certification Testing

Startup Equipment, Test Kits, and Chemicals

A number of on-site analyses will be required using simple field test kits. Less routine analyses of alkalinity (EPA 310.1), total hardness (EPA 130.2), total dissolved solids (TDS) (EPA 160.1), and cations (EPA 300.0) will also be periodically required (once every two weeks or after changing the feed water composition). These less frequent analyses should be performed by a certified laboratory. The use

of Hach methods requiring a spectrophotometer is recommended for the on-site analyses rather than the use of simple visual field test kits. The spectrophotometer methods produce much more reliable and quantitative measurements than simple visual “color wheel” test kits. In addition, once the spectrophotometer (and heater block COD reactor for digestions) are purchased, it is relatively inexpensive and simple to purchase reagents for other analyses if they are required in the future.

Hach Equipment and Reagents

Below is a list of recommended equipment and reagents which can be purchased directly from Hach (Loveland, CO) in order to perform the recommended analyses. Additional reagents can be purchased from Hach as needed. In addition to the equipment listed below, a few 250-ml beakers, 5-ml and 10-ml transfer pipets, 100-ml graduated cylinders, and disposable 0.45 mm filters and syringes etc. will also be required.

Equipment

- Pocket Thermometer
- Cat. No. 26763-00 (2003 Catalog, p. 10-66)
- ORP Pocket Pal™ Tester
- Cat. No. 27273-00 (2003 Catalog, p. 4-29)
- Lights Solution Ampules - 20 Count (for checking ORP electrode response)
- Cat No. 26125-20 (2003 Catalog, p. 11-26)
- DR/2500 Spectrophotometer
- Cat. No. 59000-00 (2003 Catalog, p. 3-11)
- COD Reactor
- Cat. No. 45600-00 (2003 Catalog, p. 1-20)
- Laboratory Bench Safety Shield
- Cat No. 50030-00 (2003 Catalog, p. 1-20)
- Test Tube Rack (for cooling)
- Cat. No. 18641-00 (2003 Catalog, p. 1-20)
- Thermometer, dial, 0 to 200 °C
- Cat. No. 45655-00 (2003 Catalog, p. 1-20)
- SensION156 Portable pH/Dissolved Oxygen Meter with Platinum (or Conventional)

- pH and DO Probes
- Cat. Nos. 54650-12 or 54650-13 (2003 Catalog, p. 4-15)

Reagents

Parameter	Analytical Method	DR/2500 2003 Cat. No. and Page #	Range	Approximate Price
Ammonia-N	Hach Method 8038 Colorimetric (Nessler) *	24582-00 p. 3-6	0 – 2.500 mg/l	$36.70 per 100 analyses
Chloride	Hach Method (Mercuric Thiocyanate)	23198-00 p. 3-4	0 – 25.0 mg/l	$36.85 per 100 analyses
Nitrate-N	Hach Method (Cadmium Reduction)	21061-69 p. 3-6	0 – 5.0 mg/l	$25.45 per 100 analyses
Nitrite-N	Hach Method 8507 (Diazotization) *	21071-69 p. 3-6	0 – 0.300 mg/l	$22.55 per 100 analyses
Ortho-phosphate	Hach Method 8048 (Ascorbic Acid) *	21060-69 p. 3-6	0 – 2.500 mg/L	$20.00 per 100 analyses
Sulfate	Hach Method 8051 (SulfaVer® 4) *	12065-99 p. 3-7	0 – 70.0 mg/l	$20.20 analyses per 100

Parameter	Analytical Method	DR/2500 2003 Cat. No. and Page #	Range	Approximate Price
Sulfide	Hach Method 8131 (Methylene Blue) *	22445-00 p. 3-7	0 – 800 ug/l	$42.90 analyses per 100
Total Kjeldahl Nitrogen (TKN)	Hach Method (Nessler)	24953-00 p. 3-6	0 – 150.0 mg/l	$88.65 analyses per 100
Total Organic Carbon (TOC)	Hach Method (Digestion, Persulfate, Sulfuric Acid)	27603-45 p. 11-39 28159-45 p. 11-39	0.3 – 20.0 mg/l 15 – 150 mg/l	$260.05 per 50 analyses $260.05 per 50 analyses

* USEPA-Accepted or USEPA-Approved HACH Methods Used for Wastewater Reporting

Cole-Parmer Equipment and Reagents

Below is a recommended perchlorate probe, sulfide probe, and meter which can be purchased directly from Cole Parmer (Vernon Hills, IL).

- Oakton® Acorn™ Ion 5 Meter
- Cat. No. A-35613-21 (2003/04 Catalog, p. 1179)
- Perchlorate Probe
- Cat. No. A-27504-24 (2003/04 Catalog, p. 1178)
- Perchlorate Standards and Fill Solution Kit
- Cat. No. A-27502-85 (2003/04 Catalog, p. 1179)

- Perchlorate Ion Strength Adjustors/Standard Kit
- Cat. No. A-27503-60 (2003/04 Catalog, p. 1179)
- Silver/Sulfide Probe
- Cat. No. 27504-28 (2003/04 Catalog, p. 1178)
- Silver/Sulfide Standards and Fill Solution Kit
- Cat. No. A-27502-91 (2003/04 Catalog, p. 1179)
- Silver/Sulfide Ion Strength Adjustors/Standard Kit
- Cat. No. A-27503-51 (2003/04 Catalog, p. 1179)

Chemicals

Below are the recommended chemicals and quantities required for FBR startup. The anticipated usage of chemicals will be dictated by the perchlorate loading to the FBRs.

- 20,000 gallons of ethanol
- 4,000 gallons of 39% liquid urea/di-ammonium phosphate nutrient mixture
- Eight (8) 55-gallon drums of nitric acid; for sand media preparation – only need if replacing sand (see above)
- 15 gallons of 85% phosphoric acid; for sand media preparation
- Two (2) 55-gallon drums of 93% sulfuric acid; for GAC neutralization – Only need if replacing GAG
- One (1) 550-gallon tote of 20% caustic soda; for pH control
- One (1) 550-gallon tote of trace elements
- One (1) 550-gallon tote of polymer for thickening (TBD)
- One (1) 550-gallon tote of polymer for the DAF units (TBD)
- 4,000 gallons of 30% ferric chloride
- 1,500 cubic feet of water treatment grade hydrated lime 93% $Ca(OH)_2$

FBR-A Process Feed Start-up Plan

The following items are assumed to be in place prior to initiating start-up:

a. Separator T-1401, the continuous sand filter, and all other additional system components are fully operational.

b. FBR-A is full of media and stabilized lake water.

c. The 39% urea/DAP mix has been replaced with 52% urea and the phosphoric acid system is operating properly.

NOTE: It is assumed that the ethanol addition, pH control, and nutrient (urea and phosphoric acid) addition systems are set up, calibrated, primed, and functioning properly.

Pre-inoculation

Prior to inoculating FBR A, the sand in FBRs 1 through 4 will be will be evened out using the settled bed height data obtained during the system shutdown required for mechanical tie-in and controls upgrade (see Section 3). The transfer of media will be accomplished using an eductor assembly that uses the motive force in the pressurized stabilized lake water. It is anticipated that this assembly will use approximately 30 to 35 gpm of stabilized lake water and will be capable of transferring approximately 15 to 20 gpm of fluidized sand bed. Using these assumptions, the device should be capable of transferring 1 ton of sand (1.5 inches of settled sand; 2.5 inches of expanded sand in FBRs 1 through 4) in 15 to 20 minutes. Assuming no more than 3 feet of expanded bed needs to be exchanged, this process should take 4 to 6 hours to complete.

Inoculation

The inoculation procedure will involve first transferring virgin sand from FBR A to each of FBRs 1 through 4, and then transferring conditioned and inoculated sand from each of FBRs 1 through 4 to FBR A as follows. Before beginning transfers of sand, the bed height control pumps for FBRs 1 through 4 should be turned off. 1. With FBRs 1 through 4 running in normal operating mode, and FBR A running in recycle, record bed heights, fluidization flows, fluidization pressures and fluidization flow valve positions for all FBRs. Begin recording perchlorate concentrations in separators T-2011 and T-2012 at an increased frequency (i.e., every 30 minutes). 2.

With the FBR A fluidization pump running, transfer 1'-8" of expanded FBR A sand (1'-3" of settled FBR A bed) to each of FBRs 1 through 4 (approximately 20,000 lbs or 10 tons of dry sand transferred per reactor) in the following order: FBR 1, 3, 2 and 4. It is suggested that for each FBR, the transfer occur in two stages (i.e., 10,000 lbs per stage) with a 30 to 60 minute waiting period between transfers to make sure everything is stable. Measure perchlorate concentrations, bed heights, fluidization flows and fluidization pressures during and after each transfer. Maintain the "normal system fluidization flow" for FBR A during the transfer process. If perchlorate concentrations begin to increase dramatically (i.e., at a rate that could result in loss of control), stop transfer operations temporarily. This procedure is anticipated to take 3 to 4.5 hours per reactor, and will therefore likely take 1 to 2 days to complete. It is anticipated that the fluidization flow for each of FBRs 1 through 4 will drop by approximately 100 gpm when the full 10-ton amount of sand has been transferred. This will decrease the fluidization flow from 1,650 gpm (as of 3/10/06) to 1,550 gpm, and lower the fluidization velocity from 11 gpm/ft2 to 10 gpm/ft2 (acceptable).

3. With the FBR A fluidization pump running, transfer sand from the TOP of each of FBRs 1 through 4 to FBR A so as to return the expanded bed heights of FBRs 1 through 4 to the values recorded before the initial transfer of sand from FBR A. Perform the transfer in the following order: FBR 1, 3, 2 and 4. Again, it is suggested that for each FBR, the transfer occur in two stages (i.e., 10,000 lbs per stage) with a 30 to 60 minute waiting period between transfers to make sure everything is stable. Measure perchlorate concentrations, bed heights, fluidization flows and fluidization pressures during and after each transfer. Maintain the "normal system fluidization flow" for FBR A during the transfer process. If perchlorate concentrations begin to increase dramatically (i.e., at a rate that could result in loss of control), stop transfer operations temporarily. This procedure is also anticipated to take 3 to 4.5 hours per reactor, and will therefore likely take 1 to 2 days to complete. Since residual ethanol, perchlorate and nutrients will be transferred to FBR A from the operating FBRs along with the sand, no additional ethanol or nutrients should be added to FBR A during the transfer.

Establish Operation at Existing Load

With FBR A running in recycle, and all other first stage FBRs operating normally, reduce the feed flow to FBRs 1 through 4 each by approximately 8% (or 20 gpm each) and re-direct this flow to FBR A (total flow re-directed approximately 80 gpm). Monitor perchlorate concentrations in separator T-1401 every hour (initially) and adjust ethanol and nutrient dosages to FBR A accordingly to maintain target perchlorate concentrations. Monitor ammonia-N (or total-N, if appropriate) and orthophosphate-P concentrations in separator T-1401 (filtered samples) every 4 to 6 hours (initially). The revised "Electron Donor, Trace Elements and Nutrients Addition Spreadsheet" in Appendix C should be used as a guideline for nutrients addition and pump settings to the FBRs.

When performance stabilizes, re-direct additional flow from FBRs 1 through 4 to FBR A in increasing increments until the feed flow to each FBR is equalized at 200 gpm:

1st increment – re-direct 5 gpm from each FBR (i.e., 20 gpm total flow re-directed to FBR A) for a total flow of 100 gpm total feed to FBR A;

2nd increment – re-direct 7.5 gpm from each FBR (i.e., 30 gpm total flow re-directed to FBR A) for a total flow of 130 gpm total feed to FBR A;

3rd increment – re-direct 7.5 gpm from each FBR (i.e., 30 gpm total flow re-directed to FBR A) for a total flow of 160 gpm total feed to FBR A;

4th increment – re-direct 10 gpm from each FBR (i.e., 40 gpm total flow re-directed to FBR A) for a total flow of 200 gpm total feed to FBR A.

Between each change, monitor the system and wait until performance stabilizes until making the next change. It is anticipated that equalizing flow among the FBRs and ramping up FBR A will take approximately 10 days.

Ramp Up to Design Load

NOTE: Prior to ramping up the load, analyses of the water sources for perchlorate, chlorate and nitrate-N is required. The water sources are: (1) Lift Station #1, (2) Lift Station #3, (3) GW-11, and (4) the combined interceptor wells (NOT the GWTP influent tank and NOT the GWTP effluent tank TK-6).

Once the system is operating at the existing load and the flows to the FBRs have been equalized, begin ramping up the load by increasing the amount of GW-11 added to the system. It is recommended that changes in load be made in increments no greater than 5%. The revised "Electron Donor, Trace Elements and Nutrients Addition Spreadsheet" in Appendix C can be used as a guideline to estimate the required changes in GW-11 flow. At some point, it is expected that the alkalinity of the water will become exhausted, and the caustic usage will begin to increase rapidly. The system effluent alkalinity should be monitored daily while ramping up the load in order to estimate when this increase in caustic usage will occur. Monitor caustic usage closely, and when the usage begins to increase rapidly, maintain this loading until the pH and the caustic usage stabilize until the next incremental change. Increase the flow of GW-11 until the combined load of nitrate-N, chlorate, and perchlorate reaches the design load.

It is anticipated that ramping the system up to the new design load will take no longer than 20 days.

FBR A Process Certification Testing

After FBR A has been started up and the Perchlorate Treatment System has been ramped up to the new design load, process certification testing will be performed.
FBR A MONITORING

Monitor FBR A in accordance with the same parameters and monitoring schedule as for the other first stage FBRs. Using the EXCEL spreadsheet in Appendix C, the necessary trace element, electron donor (i.e., ethanol), phosphoric acid (i.e., 75% phosphoric acid) and urea (i.e., 52% urea) dosages can be calculated for various feed flow rate and composition [i.e., the concentrations of dissolved oxygen (DO), nitrate-nitrogen (NO3--N), chlorate (ClO3-), and perchlorate (ClO4-)] conditions. The nutrient and ethanol dosages should be used as a guideline only; actual requirements will be dictated by the concentrations of the target parameters (i.e., nitrate, chlorate, and perchlorate) in the sand and GAC FBR effluents, as well as the residual ammonia-N, TKN (or total-N, if appropriate), and ortho-phosphate in the effluents.

APPENDIX O
SLUDGE CONDITIONING

Sludge Conditioning
Standard Operating Procedure (SOP)

- Turn on the Sludge Conditioning Tank Agitator and thoroughly mix the contents of the Sludge Conditioning Tank for at least 5-minutes.

- Collect a sample from the Sludge Conditioning Tank.

- Pour out a 100 ml portion of the sludge sample into a plastic beaker and add a magnetic stir bar to the beaker.

- Place the beaker onto the stir plate, begin to agitate the contents of the beaker, and insert the pH Probe into the beaker for pH monitoring.

- Add concentrated 39% ferric chloride solution in small increments of 0.25 ml to the beaker. Add increments of ferric chloride solution until the pH of the mixture is at 2.5 Standard Units. (Note: there will be a distinct color change of the sludge from black to tan as the pH drops below 3.0). Total the sum of the individual increments of ferric chloride to determine a dosing rate per 100 ml of sample. Multiply this value 10 to the milliliters of ferric chloride dose for a one-liter volume of sludge. (mL of ferric chloride) x (10) = mL of ferric/L of sludge

- Continue to agitate the contents of the beaker.

- The next step is to add dry lime to raise the pH of the mixture up to 11.5 standard units. Partially fill a container with about 15 grams of the dry powered lime and weigh the container with lime to the nearest milligram. Add portions of the dry lime to the· -pH 2.5 mixture in the beaker. Continue to add dry lime until the pH reaches a value of .11.5 Standard Units. Weigh the lime container again to the nearest milligram and calculate the amount of lime in grams added to the 100 ml sample by the difference in the weights before and after dosing with lime to pH
- 11.5 Standard Units. Multiply this value by 10 to get the grams of dry lime dose for a one-liter volume of sludge. (grams of lime) x 10 = (grams of lime/L of sludge).

- Prepare the vacuum filter apparatus consisting of a vacuum pump with gauges, a filter flask, a buchner filter funnel and either a 7 cm Whatman 4 filter paper media or a piece of actual filter cloth cut to a 7 cm circle. After sealing the inlet to the vacuum pump, adjust the vacuum by turning the bleed valve to 15 inches of mercury. Open the inlet of the sealing restriction.

- Using a stopwatch to measure the filtering time, pour the 100 ml treated mixed sample into the filter apparatus with a vacuum pump running and start the stopwatch. Note how quickly the sludge dewaters and forms a dry cake. If the sludge has been properly

conditioned in the beaker, this should happen in less than 60 seconds and produce a relatively clear filtrate in the flask below.

- The goal with this test is to determine a chemical feed dosage that will enable the filter press to rapidly dewater the treated sludge.

- Once the dosage of each treatment chemical has been determined for the 100 mL sample, the Conditioning Tank must be treated with the same chemical dosages in full scale.

- The Sludge Conditioning Tank has a tank capacity of approximately 13,200 gallons. The cone of the tank hold 4500 gallons and each additional foot above the cone is an additional 1100 gallons of sludge.

- For the 39% ferric chloride dosage, calculate the volume of ferric chloride needed per volume of the Conditioning Tank and the necessary run time to achieve that dosage by using the formulas provided below. (Note: the Ferric Pump has a capacity of approximately 4.4 GPM).

$$\frac{\text{Sludge, gallons}}{\text{Batch}} \times \frac{\text{ml Ferric sol'n}}{\text{Liter}} \times \frac{\text{1 Liter}}{\text{1,000 ml}} = \frac{\text{gallons of Ferric sol'n}}{\text{Batch}}$$

$$\frac{\text{gallons of Ferric sol'n}}{\text{Batch}} \times \frac{\text{minute}}{\text{4.4 gallons}} = \frac{\text{minutes to pump Ferric sol'n}}{\text{Batch}}$$

- For the lime dosage, calculate the run time for the dry lime feeder to equal the quantity of lime required to treat the volume of sludge in the Conditioning Tank by using the formulas provided below. (Note: The Dry Lime Feeder has a feed rate of approximately 1,500 lbs/hour).

$$\frac{\text{Sludge, gallons}}{\text{Batch}} \times \frac{\text{grams lime}}{\text{Liter}} \times \frac{\text{3.785 liters}}{\text{gallon}} \times \frac{\text{pound}}{\text{454 g}} = \frac{\text{lbs lime}}{\text{Batch}}$$

$$\frac{\text{lbs lime}}{\text{Batch}} \times \frac{\text{60 minutes}}{\text{1,500 lbs Lime}} = \frac{\text{minutes to feed lime}}{\text{Batch}}$$

- Use the actual Conditioning Tank sludge volume as the batch size to be treated with first the ferric chloride and then the dry lime. The total manufacturer rated volume of the Conditioning Tank is 13,500 gallons and it has a 14-foot diameter. On the straight wall side area of the Conditioning Tank 1.0 foot of depth is equivalent to 1,150 gallons. The cone section of the Conditioning Tank contains 4,500 gallons. The straight sidewall of the Conditioning Tank above the cone section is 9.5 feet. Take a measurement of the height of empty tank above the sludge level and subtract this from 9.5 feet. The resulting number is the feet of sludge in the tank above the cone line. Multiply this value by 1,150 gallons per foot of straight wall tank and add the 4,500 gallons of the cone section of the Conditioning Tank to get the total volume of sludge in the Conditioning Tank.

- Add the calculated ferric chloride dose to the Conditioning Tank as determined above, mix sufficiently, and determine a pH value for the mixed contents. It should be very close to the 2.5 Standard Units determined through jar testing. If it is not the desired value, add slightly more ferric chloride, mix thoroughly and again determine the pH value. Continue additions of ferric chloride until the desired pH value is reached.

- Add the dry lime to the Conditioning Tank using the dry lime feeder run time determined In the formula above. Following a thorough mixing, collect a portion of the treated mixture and determine the pH value. If the pH is not the desired value, continue additions of dry lime until the desired pH value is reached. (Note: The target pH is 11.5 S.U.).

- After a thorough mix of the Conditioning Tank following both ferric chloride and dry additions, stop the Conditioning Tank Agitator. Leaving the Agitator on could potentially break down the conditioned sludge and result in a "bad" Filter Press run.

- Run the Filter Press using the chemically treated sludge in the Conditioning Tank.

APPENDIX P
EQUIPMENT INSPECTION SHEET

Sub-System	P&ID	Description	Status[1]	Checked	Criticality[2]	Notes
		Main Plant Equipment				
1		**Seep Wells and Lift Station 1**				
1.01		*Seep Well Field, 9 wells*	Running			
1.02		*Lift Station 1 Lift Pump A*	Standby			
1.03		*Lift Station 1 Lift Pump B*	Running			
1.04		*Area in and around Lift Station 1*	Running			
2		**Athens Road Wells and Lift Station** 3				
2.01		*Athens Road Well Field, 9 wells*	Running			
2.02		*Lift Station 3 Lift Pump A*	Standby			
2.03		*Lift Station 3 Lift Pump B*	Running			
2.04		*Area in and around Lift Station 3*	Running			
3		**Lift Station *2* and Transmission Piplines**				
3.01		*Influent Pipline*	In operation			
3.02		*Effluent Pipeline*	Running			
3.03		*Lift Station 2 Lift Pump A*	Running			
3.04		*Lift Station 2 Lift Pump B*	Standby			
3.05		*Area in and around Lift Station 2*	Running			
4		**Interceptor Wells and Cr Treatment Plant**				
4.01		*IWF Well Field, 30 wells*	Running			
4.02		*Ferrous Sulfate Feed System*	Running			
4.03		*Polymer Feed System*	Running			
4.04		*Clarifier*	In operation			
4.05		*Filter Press*	Running			
4.06		*GWTP Effluent Tank*	In operation			
4.07		*Interceptor Booster Pump A*	Maintenance			
4.08		*Interceptor Booster Pump B*	Running			
4.09		*Area In And Around GWTP*	Running			

[1] Status Codes
Running - Unit is in operation
Standby - Spare or duplicate, not currently in operation
Maintenance - Out of service for maintenance
Off - Not currently needed for use, but can be placed in service

Sub-System	P&ID	Description	Status[1]	Checked	Criticality[2]	Notes
5		**Equalization Area and GW-11 Pond**				
5.01	PID10A	*Pond GW-11*	In operation			
5.02	PID10A	*Pond Water Pump - P101A*	Running			
5.03	PID10A	*Pond Water Pump - P101B*	Running			
5.04	PID10A	*Equalization Tanks*	In operation			
5.05	PID10A	*Area in and Around EQ*	In operation			
5.06	PID10A	*Raw Water Feed Pump - P102A*	Running			
5.07	PID10A	*Raw Water Feed Pump - P102B*	Maintenance			
5.08	PID10B	*Carbon Absorber - LGAC 201A*	Running			
5.09	PID10B	*Carbon Absorber - LGAC 201B*	Running			
5.10	PID10B	*Carbon Absorber - LGAC 201C*	Running			
6		**First Stage FBRs A, 1** *& 2*				
6.01	PID14	*FBR A*	Running			
6.02	PID14	*Separator Tank - 1401*	Running			
6.03	PID14	*Media Return Pump - P 1401*	Running			
6.04	PID14	*P1401A*	Standby			
6.05	PID01A	*P1401B*	Running			
6.06	PID01A	*FBR 1*	Running			
6.07	PID02A	*FBR 2*	Running			
6.08	PID01A	*First Stage Separator Tank - T2011*	Running			
6.09	PID01A	*Media Return Pump - P2011*	Running			
6.10	PID01A	*First Stage FBR Pump - P1011*	Standby			
6.11	PID01A	*First Stage FBR Pump - P1012*	Running			
6.12	PID01A	*First Stage FRB Pump - P101A*	Running			
6.13	PID07A	*FBR A pH Feed Pump - P71A*	Standby			
6.14	PID07A	*FBR 1 pH Feed Pump - P711*	Standby			
6.15	PID07A	*FBR 2 pH Feed Pump - P712*	Standby			
6.16	PID07A	*FBR A Nutrient (Urea) Feed Pump - P72A*	Off			
6.17	PID07A	*FBR 1 Nutrient (Urea) Feed Pump - P721*	Off			
6.18	PID07A	*FBR 2 Nutrient (Urea) Feed Pump - P722*	Off			
6.19	PID15	*FBR A Nutrient (Phos Acid) Feed Pump - P1520A*	Running			
6.20	PID15	*FBR 1 Nutrient (Phos Acid) Feed Pump - P1521*	Running			
6.21	PID15	*FBR 2 Nutrient (Phos Acid) Feed Pump - P1522*	Running			
6.22	PID07B	*FBR A Electron Donor Assembly Pump - P73A*	Running			
6.23	PID07B	*FBR 1 Electron Donor Assembly Pump - P731*	Running			
6.24	PID07B	*FBR 2 Electron Donor Assembly Pump - P732*	Running			

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Sub-System	P&ID	Description	Status[1]	Checked	Criticality[2]	Notes
7		**First Stage FBRs 3** & *4*				
7.01	PID01B	*FBR 3*	Off			
7.02	PID01B	*FBR 4*	Off			
7.03	PID02B	*First Stage Separator Tank - T2012*	Off			
7.04	PID01B	*Media Return Pump - P2012*	Off			
7.05	PID01B	*First Stage FBR Pump - P1013*	Off			
7.06	PID01B	*First Stage FRB Pump - P1014*	Off			
7.07	PID01B	*First Stage FBR Pump - P102A*	Off			
7.08	PID07A	*FBR 3 pH Feed Pump - P713*	Off			
7.09	PID07A	*FBR 4 pH Feed Pump - P714*	Off			
7.10	PID07A	*FBR 3 Nutrient (Urea) Feed Pump - P723*	Off			
7.11	PID07A	*FBR 4 Nutrient (Urea) Feed Pump - P 724*	Off			
7.12	PID15	*FBR 3 Nutrient (Phos Acid) Feed Pump - P1523*	Off			
7.13	PID15	*FBR 4 Nutrient (Phos Acid) Feed Pump - P1524*	Off			
7.14	PID07B	*FBR 3 Electron Donor Assembly Pump - P733*	Off			
7.15	PID07B	*FBR 4 Electron Donor Assembly Pump - P734*	Off			
8		**Second Stage FBRs 5** & 6				
8.01	PID03A	*FBR 5*	Off			
8.02	PID03A	*FBR 6*	Off			
8.03	PID03C	*Second Stage Separator Tank - T3011*	Off			
8.04	PID03A	*Media Return Pump - P3011*	Off			
8.05	PID03A	*Second Stage FBR Pump - P3015*	Off			
8.06	PID03A	*Second Stage FBR Pump - P3016*	Off			
8.07	PID03A	*Second Stage FBR Pump - P301A*	Off			
8.08	PID07A	*FBR 5 pH Feed Pump - P715*	Off			
8.09	PID07A	*FBR 6 pH Feed Pump - P716*	Off			
8.1	PID07A	*FBR 5 Nutrient (Urea) Feed Pump - P725*	Off			
8.11	PID07A	*FBR 6 Nutrient (Urea) Feed Pump - P726*	Off			
8.12	PID07B	*FBR 5 Electron Donor Assembly Pump - P735*	Off			
8.13	PID07B	*FBR 6 Electron Donor Assembly Pump - P736*	Off			

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Off - Not currently needed for use, but can be placed in service

Sub-System	P&ID	Description	Status[1]	Checked	Criticality[2]	Notes
9		**Second Stage FBRs 7** & 8				
9.01	PID03B	*FBR 7*	Running			
9.02	PID03B	*FBR 8*	Running			
9.03	PID03D	*Second Stage Separator Tank - T3012*	Running			
9.04	PID03B	*Media Return Pump - P3012*	Running			
9.05	PID03B	*Second Stage FBR Pump - P3017*	Standby			
9.06	PID03B	*Second Stage FBR Pump - P3018*	Running			
9.07	PID03B	*Second Stage FBR Pump - P302A*	Running			
9.08	PID07A	*FBR 7 pH Feed Pump - P717*	Standby			
9.09	PID07A	*FBR 8 pH Feed Pump - P718*	Standby			
9.10	PID07A	*FBR 7 Nutrient (Urea) Feed Pump - P727*	Off			
9.11	PID07A	*FBR 8 Nutrient (Urea) Feed Pump - P728*	Off			
9.12	PID07B	*FBR 7 Electron Donor Assembly Pump - P737*	Running			
9.13	PID07B	*FBR 8 Electron Donor Assembly Pump - P738*	Running			
10		**Aeration and DAF System**				
10.01	PID04	*Aeration Tank*	In operation			
10.02	PID04	*Aeration Blower - B401*	Running			
10.03	PID04	*Biofilter*	In operation			
10.04	PID04	*Nutrient Solution*	Running			
10.05	PID04	*Biofilter Sump*	Running			
10.06	PID04	*Nutrient Pump - P401*	Running			
10.07	PID04	*Biofilter Sump Pump - P402A*	Standby			
10.09	PID04	*Biofilter Blower*	Running			
10.10	PID05	*DAF Pressure Tanks*	In operation			
10.11	PID05	*DAF Vessel - D501*	Running			
10.12	PID05	*DAF Pressure Pump - P501*	Running			
10.13	PID05	*DAF Float Pump - P502*	Running			
10.14	PID05	*DAF Vessel - D551*	Maintenance			
10.15	PID05	*DAF Pressure Pump - P551*	Off			
10.16	PID05	*DAF Float Pump - P552*	Maintenance			
10.17	PID05	*Screw Conveyer Drive*	Standby			
10.18	PID05	*Skimmer Drive*	Running			

[1]Status Codes
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Maintenance - Out of service for maintenance
Off - Not currently needed for use, but can be placed in service

Sub-System	P&ID	Description	Status[1]	Checked	Criticality[2]	Notes
11		**Pumping System (Old Effluent)**				
11.01	PID06	*Effluent Tank 601*	In operation			
11.02	PID06	*Effluent Pump - P601*	Running			
11.03	PID06	*Effluent Pump - P602*	Running			
12		**Sand Filter System**				
12.01	PID17	*Sand Filter*	Running			
12.02	PID17	*Filter Reject Tank*	In operation			
12.03	PID17	*Filter Reject Pump - P1701A*	Running			
12.04	PID17	*Filter Reject Pump - P1701B*	Standby			
13		**Effluent Tank and Pumping**				
13.01	PID10C	*UV Effluent Tank*	Running			
13.02	PID10C	*Effluent Booster Pump - P1302A*	Running			
13.03	PID10C	*Effluent Booster Pump - P1302B*	Running			
13.04	PID10C	*Area Around Effluent and North D-1*	Running			
14		**Solids Collection and Pressing System**				
14.01	PID16	*Sludge Storage Tank*	In operation			
14.02	PID16	*Solids Storage Effluent Pump - P1601*	Running			
14.03	PID16	*Solids Cond. Tank*	In operation			
14.04	PID09	*Sludge Mixer*	Running			
14.05	PID09	*Filter Press Pump - P901*	Running			
14.06	PID09	*Filter Press Pump - P902*	Running			
14.07	PID09	*West Press*	Running			
14.08	PID09	*East Press*	Standby			
14.09	PID09	*Filtrate Tank*	In operation			
14.10	PID09	*Filtrate Tank Effluent (recycle) Pump - P903*	Running			

[1]Status Codes
Running - Unit is in operation
Standby - Spare or duplicate, not currently in operation
Maintenance - Out of service for maintenance
Off - Not currently needed for use, but can be placed in service

Sub-System	P&ID	Description	Status[1]	Checked	Criticality[2]	Notes
		Chemical Systems				
15		**Electron Donor System**				
15.01	PID07B	*Electron Donor Tank*	In operation			
15.02	PID07B	*Booster Pump P739A*	Standby			
15.03	PID07B	*Booster Pump P739B*	Running			
17	PID07C	**Micro Nutrient System**	In operation			
18	PID07C	**Hydrogen Peroxide System**	In operation			
19	PID07C	**De-Foam System**	In operation			
20	PID15	**Nutrient (Phosphoric Acid) System** (Tank only - pumps included in FBRs)	In operation			
21	PID07A	**Nutrient (Urea) System** (Tank only - pumps included in FBRs)	In operation			
22	PID07A	**pH System** (Tank and effluent pH feed pump only - other pumps included in FBRs)	In operation			
23	PID07C	**Ferric Chloride System**	In operation			
24	PID07B	**Polymer Systems - DAF**	In operation			
25	PID09	**Polymer System - Solids Dewatering** (2 tanks, 2 centrifugal pumps, mixer, volumetric feeder)	In operation			
		Utility Systems				
26		**Compressed Air System**				
26.01	PID08	*West Compressor*	Running			
26.02	PID08	*East Compressor*	Running			
26.03	PID08	*O2 Compressor*	Running			
26.04	PID08	*Compressed Air Receiver Tank*	In operation			
26.05	PID08	*Air Dryer*	Running			
26.06	PID08	*Oil Removal Filter*	In operation			
26.07	PID08	*Particulate Filter*	In operation			
27	PID16	**Oxygen System**	In operation			
28		**GWETS Plant Controls/ Siemens Controls**	In operation			
29		**Well Control System/ Allen Bradley Controls**	In operation			
30		**MCC FBR Pad**	In operation			
31		**MCC in D-1**	In operation			
32		**MCC in EQ area**	In operation			

[1]Status Codes
Running - Unit is in operation
Standby - Spare or duplicate, not currently in operation
Maintenance - Out of service for maintenance
Off - Not currently needed for use, but can be placed in service

Sub-System	P&ID	Description	Status[1]	Checked	Criticality[2]	Notes
		Miscellanous Systems				
33		**Operations Office/Network**	In operation			
34		**Laboratory Analyzers**	In operation			
35		**Security Systems**	In operation			
		Shelf Spares				
		Media Return Pump Rebuid Kit	In stock			
		pH Feed Pump	In stock			
		Nutrient Feed Pump	In stock			
		Electron Donor Feed Pump	In stock			
		Phosphoric Acid Feed Pump	In stock			
		Interceptor Well Pumps (4 each)	In stock			
		Seep Well Pump (1 each, same as Athens so total of 2)	In stock			
		Athens Road Well Pump (1 each, same as Seep so total of 2)	In stock			

[1] Status Codes

Equipment

Running	Unit is in operation
Standby	Duplicate or installed spare, not currently operating
Maintenance	Out for repairs or maintenance
Off	Not currently needed, but available

Tanks, Pipelines, Ponds

In operation

Out of service

Spares

In stock

[1] Criticality Codes

1 = Critical	Cannot continue with operation until repairs made
2 = Important	Can still operate safely and in compliance with permits, but risks are increased
3 = Moderate	Work needs to be performed, but plant can still operate with redundancy that is in place
4 = Low	- Tasks performed to either improve the existing equipment (i.e., testing new options) - Minor repairs that in no way alter the performance of the plant

[1] Status Codes

Running - Unit is in operation

Standby - Spare or duplicate, not currently in operation

Maintenance - Out of service for maintenance

Off - Not currently needed for use, but can be placed in service

APPENDIX Q
ALARM TEST LOGSHEET

Autodialer & Alarm Test Sheet						
	Tag number	**Tag Description**				
Weekly			**1st W**	**2nd W**	**3rd W**	**4th W**
1	LAH_621	T_621 High Level Alarm				
2	LAH_1701	Filter Reject Tank High Level				
3	FIT_101	LS 1 Low Flow Alarm				
4	FIT_201	LS 2 Low Flow Alarm				
5	FIT_301	LS 3 Low Flow Alarm				
6	LAH-1202	D-1 Sump High Level				
7	Camera					
8	LAH_1101	Sump pump High Level				
9	LAH_1102	Sump pump High Level				
10	LAH-TK-6	GWTP Holding Tank Alarms				
11	LAH-1203	PDM Sump High Level				
12	LAH-1201	Equalization Sump High Level				
Monthly						
11	LOW INFLUENT FLOW	Low Influent Feed to FBR				
12	FBR A_FEED_SHUTDOWN					
13	FBR 1_FEED_SHUTDOWN					
14	FBR 2_FEED_SHUTDOWN					
15	FBR 3_FEED_SHUTDOWN					
16	FBR 4_FEED_SHUTDOWN					
17	FBR 5_FEED_SHUTDOWN					
18	FBR 6_FEED_SHUTDOWN					
19	FBR 7_FEED_SHUTDOWN					
20	FBR 8_FEED_SHUTDOWN					
21	FBR A_RECYCLE					
22	FBR 1_RECYCLE					
23	FBR 2_RECYCLE					
24	FBR 3_RECYCLE					
25	FBR 4_RECYCLE					
26	FBR 5_RECYCLE					
27	FBR 6_RECYCLE					
28	FBR 7_RECYCLE					
29	FBR 8_RECYCLE					
30	AAH_3027	FBR 7 High ORP				
31	AAH_3028	FBR 8 High ORP				
32	E10_LAL_11	EQ Tank Low Level Alarm				
Quarterly						
33	LAH_707	Ethanol Tank Leaking Alarm				
34						

APPENDIX R
GWETS EMERGENCY RESPONSE PLAN

Revision 1, dated October 7, 2014

Approved by NDEP BCA

Emergency Response Plan
GWETS Plume Containment
Nevada Environmental Response Trust (NERT)

133-20192-14009
October 7, 2014 (Revision 1)

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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
AWF	Athens Road Well Field
ERP	Emergency Response Plan
FBR	Fluidized Bed Reactor
GWETS	Groundwater Extraction and Treatment System
HASP	Health and Safety Plan
IWF	Interceptor Well Field
IX	Ion Exchange
SWF	Seep Well Field

1.0 INTRODUCTION

This emergency response plan (ERP) describes potential emergencies specifically related to the Groundwater Extraction and Treatment System (GWETS) at the Nevada Environmental Response Trust (Trust) site in Henderson, Nevada (Site). General health and safety and emergency response issues such as evacuation routes, medical treatment and first aid, and decontamination procedures are addressed in the site-specific Health and Safety Plan (HASP) established and maintained by the current GWETS operator, Envirogen Technologies, Inc. (Envirogen). Users should refer to the HASP for emergency response procedures not specifically related to potential emergencies impacting the operation of the GWETS.

This ERP describes the scenarios that could impact the operation of the GWETS in regard to plume containment, and the procedures for responding to those emergencies, roles and responsibilities during emergency response, and training that workers must receive to follow emergency procedures.

This emergency response plan provides the following site-specific information related to GWETS:

- Pre-emergency planning
- Contacts
- Roles and responsibilities
- Emergency alerting and response procedures.

GWETS Plume Containment System

The GWETS has been in place in essentially its current configuration since 2006. The GWETS operates by capturing groundwater from three extraction well fields and treating the captured groundwater via aboveground treatment facilities for subsequent discharge to the Las Vegas Wash. Perchlorate in extracted groundwater is treated in the on-site fluidized bed reactor (FBR) process using ethanol as a carbon source. Chromium in extracted groundwater is treated via chemical reduction and precipitation using ferrous sulfate. A map covering the area from the Site to the Las Vegas Wash showing the primary components of the GWETS is included as Figure 1.

Groundwater is captured using a system of extraction wells installed into the shallow water-bearing zone of the alluvium at three strategic locations: (1) on-site at the IWF; (2) approximately 8,200 feet downgradient of the IWF at the AWF; and (3) approximately 4,500 feet beyond the AWF near the Las Vegas Wash at the SWF. The locations of the three well fields are shown on Figure 1 in relation to other GWETS features.

The IWF consists of 30 active extraction wells. The main purpose of this well field is mass removal of contaminants. The AWF has 9 extraction wells which serve to contain the contaminant plume. The SWF has 9 wells which contain the plume and keep it from reaching Las Vegas Wash. If for any reason all of the IWF and AWF cease operation, there will be minimal intermediate interception of the plume by the slurry wall before the plume reaches the SWF.

If the SWF ceases operation, plume water will migrate toward Las Vegas Wash. The groundwater velocity in the vicinity of the SWF ranges from 20 to 85 feet per day (based on a tracer study done by J.M. Montgomery in 2000). The approximate distance from the SWF to the Las Vegas Wash likely ranges from 600 feet to 3,000 feet when considering the total width of the stream at all times. Until more information is available and the velocity and distance are confirmed, a groundwater velocity of 60 feet per day and distance of 1,500 feet will be used to calculate a travel time of 25 days. The critical objective of this ERP is to limit the downtime of SWF extraction to 25 days in the event of an emergency impacting the operation of the GWETS. Please note that this value does not account for the time required for the water table to re-equilibrate after the SWF were to be shut down, which would increase the allowable downtime.

In the event that this downtime objective cannot be met, this ERP establishes alternate treatment of the SWF using an IX plant installed at Lift Station #1.

2.0 ROLES AND RESPONSIBILITIES

The GWETS Plant Manager will have the responsibility to notify the Trust's Emergency Response Leader of any situation as described in Section 3.0 of the ERP. These individuals will be available by phone at all times, or will designate an alternate and inform all operational personnel. The Emergency Response Leader will assess the emergency, inform the Trust, and direct the response, including contacting off-site emergency personnel, if necessary. Additional contacts are those of suppliers of equipment that may be required to respond to emergencies (see Section 6). Contacts are listed in Table 1. Alternate contacts are provided for key positions in case the primary is not available

It is the obligation of the Emergency Response Leader to ensure that all compliance, notification and reporting obligations are satisfied for all applicable permitting associated with the GWETS operation.

Table 1 Contact List

Title	Primary Contact (Telephone)	Alternate Contact (Telephone)
GWETS Plant Manager	Wendy Prescott (702-371-9037)	Jeff Lambeth (702-236-1740) Mike Delvecchio (908-963-0651)
Emergency Response Leader	Frank Johns (303-810-0132)	Steven Bradley (619-961-8349)
Emergency Services	911	
NDEP Bureau of Water Pollution Control	Joe Maez (775-687-9435)	Nikita Lingenfelter (702-286-4850 x246)
NDEP Bureau of Corrective Actions	Weiquan Dong (702-486-2850 x252)	James (JD) Dotchin (702-486-2850 x235)
Temporary Power Supply	Curtis Mercurio (702-429-8487) Power Plus 3131 Olive Street Las Vegas, NV 89104	
Pipelines	Alan Nish (702-561-0193) Rafael Construction 5870 Construction Ave. Las Vegas, NV 89122	
Ion Exchange Supplier	Envirogen Technologies, Inc. (877-312-8950)	

3.0 ACTIVATION OF THE EMERGENCY ACTION PLAN

The Emergency Response Leader or their designee will be available at all times during field activities and will serve the emergency coordinator. The Emergency Response Leader activates the ERP based upon information

provided by the GWETS Plant Manager. The Emergency Response Leader implements the ERP when at least one of the following trigger conditions is met:

1. Any cause that could potentially require extraction at the SWF to be discontinued for a period of 24 hours or more for a reason other than scheduled maintenance;
2. Any cause that could potentially require the diversion of GWETS influent or effluent to GW-11 for a period of time that would cause levels to exceed 85% of permitted capacity; or
3. Any catastrophic failure that creates an immediate loss of GWETS operations.

Through consultation with the Trust, the Emergency Response Leader shall have the authority to direct GWETS operations until it has been determined that operations have returned to normal. Upon activation of the ERP, the Emergency Response Leader shall provide regular updates to NDEP BWPC and BCA until it has been determined that operations have returned to normal.

Certain incidents may not trigger activation of the ERP, but may trigger reporting under the Site Management Plan (SMP). Refer to the current version of the SMP for those reporting requirements.

4.0 GENERAL EMERGENCY RESPONSE ACTIVITIES

The following steps are common to all emergency response activities:

Notification—The person discovering the incident immediately reports the incident to their respective field supervisor, who will notify the GWETS Plant Manager. The GWETS Plant Manager notifies the Emergency Response Leader and the Emergency Response Leader notifies the Trust and the NDEP, as required, and notifies the on-site personnel, as necessary. The GWETS Plant Manager, in coordination with the Emergency Response Leader, will ensure that responding agencies (fire, police or medical (911) or regulatory agencies are notified, as required based on the respective emergency.

Assess the Nature and Extent of Incident—The GWETS Plant Manager determines the nature and extent of the incident and reports their findings to the Emergency Response Leader. Each incident has specific factors requiring action to effectively mitigate the incident. This plan discusses several types of anticipated incidents.

Identify Immediate Response Activities—The Emergency Response Leader, though communication with the GWETS Plant Manager, ensures that immediate response activities are initiated. Immediate response activities include:

- ETI will implement any required emergency response actions per their HASP to remove or rescue injured or exposed employees and ensuring appropriate medical treatment is provided;
- Stopping all repair activities until a determination can be made regarding current conditions;
- Implementing measures to identify and address any hazardous condition; and
- Assess the issue that triggered the ERP.

Coordinate Activities— At the direction of the Emergency Response Leader, the GWETS Plant Manager will coordinate all on-site activities. The Emergency Response Leader ensures the use of appropriate technical procedures to mitigate the incident and to minimize environmental impacts.

Maintain Site Security—The GWETS Plant Manager ensures control of all personnel entering and leaving the site during an emergency. The GWETS Plant Manager may direct other employees to assist with securing the site.

Follow-up Activities—The Emergency Response Leader ensures that all required notifications, especially to regulatory agencies are made. The Emergency Response Leader ensures the preparation of documentation and other reports regarding the incident are completed. The Emergency Response Leader conducts a post incident

review to ensure completion of all requirements, to evaluate the incident, to plan and prevent future reoccurrence, and to ensure appropriate start-up procedures.

5.0 PROCEDURES FOR MINIMIZING IMPACT OF EMERGENCIES

The GWETS has been evaluated for potential emergency occurrences that could prevent containment of the plume at the Las Vegas Wash. The potential reasons that SWF would be down are presented in Table 2.

Table 2 Potential Emergencies

Source of Emergency	Location of Source	Type of Emergency
Well field down	SWF	Extraction well down, pump down, power loss
Lift stations down	Lift Station #1 or #2	Pump down, power loss
Pipeline break	Pipelines from SWF to Lift Station #1, from Lift Station #1 to Lift Station #2, or from Lift Station #2 to WTP	Minor leak, major break
FBR (or biological treatment)	Plant Site	Multiple at Plant Site
Plant down		

The response to each type of emergency and the steps that need to be taken to prepare for these emergencies are provided in Table 3.

Table 3 Emergency Response Activities

Type of Emergency	Response	Preparation
Extraction well(s) down	Repair or replace well(s)	None
Extraction pump(s) down	Repair or replace pump(s)	Shelf spares are maintained on site
SWF loses power	Emergency generator	Vendor for temporary power supply identified in Section 2, above
Lift Stations #1 or # 2 pump down	Use standby pump	Ensure standby pump is available
Lift Stations #1 or # 2 power failure	Emergency generator	Vendor for temporary power supply identified in Section 2, above
Pipeline down - minor	Re-route with temporary pipeline	Vendor for temporary pipeline installation identified in Section 2, above
Pipeline down - major	Treat SWF with ion exhange	Install IX plant
WTP down	Divert to GW-11	Maintain adequate storage volume in GW-11
WTP down and GW-11 out of service	Treat SWF with ion exhange	Install IX plant

The sections below describe the activities that will be undertaken in the case of each emergency listed in Table 3.

Extraction Well(s) Down

If any of the SWF extraction wells get plugged or for some other reason stop producing water, the system will continue to operate using the remaining wells. Attempts will be made to repair the broken well. If these fail, a replacement well will be drilled and connected to the extraction system.

If a catastrophe impacts all of the extraction wells and the plume water is no longer intercepted, water will continue toward Las Vegas Wash until new extraction wells can be installed and the system repaired.

Problems with Extraction Pumps

If a pump at any of the well fields breaks down, that pump will be repaired or replaced as soon as possible.

If a catastrophe impacts all of the pumps, all pumps will be repaired or replaced as soon as possible. During this time, the plume will not be contained until some of the pumps can be reinstated.

Power Failure at SWF

In case of a power failure at SWF, a generator will provide the required power until the system can be repaired.

Lift Station Pump Down

Lift Stations #1 and #2 are critical to operation of the SWF and plume containment. If a pump is down in either of these lift stations, there are standby pumps installed that can be operated. If it is not possible to operate either pump for a period of more than 25 days, the Emergency Response Leader shall have the authority to procure, install, and begin the treatment of the SWF using an IX plant installed at Lift Station #1.

Power Failure at Lift Station

In case of a power failure at Lift Stations #1 and #2, a generator or generators will provide the required power until the system can be repaired.

Pipe Leak or Break

In case of a small break or leak in the pipeline that transports the impacted water from the SWF to the WTP, the spill will be contained as soon as possible. Operation of the SWF will stop while the pipe is repaired, if the repair can be completed within 24 hours. Once the repair is complete, the system will be restarted.

In case of a major break in the pipeline, the leaked water will be contained as soon as possible. New pipe will be ordered, attached to the existing pipe around the break and impacted water conducted to the WTP through this temporary pipeline. Once the system is running using the temporary pipeline, the main pipeline will be repaired and the system returned to normal operations.

If a catastrophe impacts a large length of the pipeline that would discontinue extraction for a period of more than 25 days, the Emergency Response Leader shall have the authority to procure, install, and begin the treatment of the SWF using an IX plant installed at Lift Station #1.

Shut down of FBR Plant

If the FBR (or biological) plant ceases to operate because of equipment failure or catastrophe, impacted water will be pumped to and stored in GW-11 until it can be treated. Once the volume remaining in GW-11 falls below 15% without a viable plan to return the system to operation, the Emergency Response Leader shall have the authority to procure, install, and begin the treatment of the SWF using an IX plant installed at Lift Station #1.

6.0 EMERGENCY RESPONSE EQUIPMENT

The lift stations are equipped with redundant, standby pumps that can be placed into service should one pump go down. Spare pumps for the extraction wells will be kept on site in case a pump in an extraction well goes down. The types of pumps in each of the extraction wells will be determined and one spare of each type of pump will be stored on site.

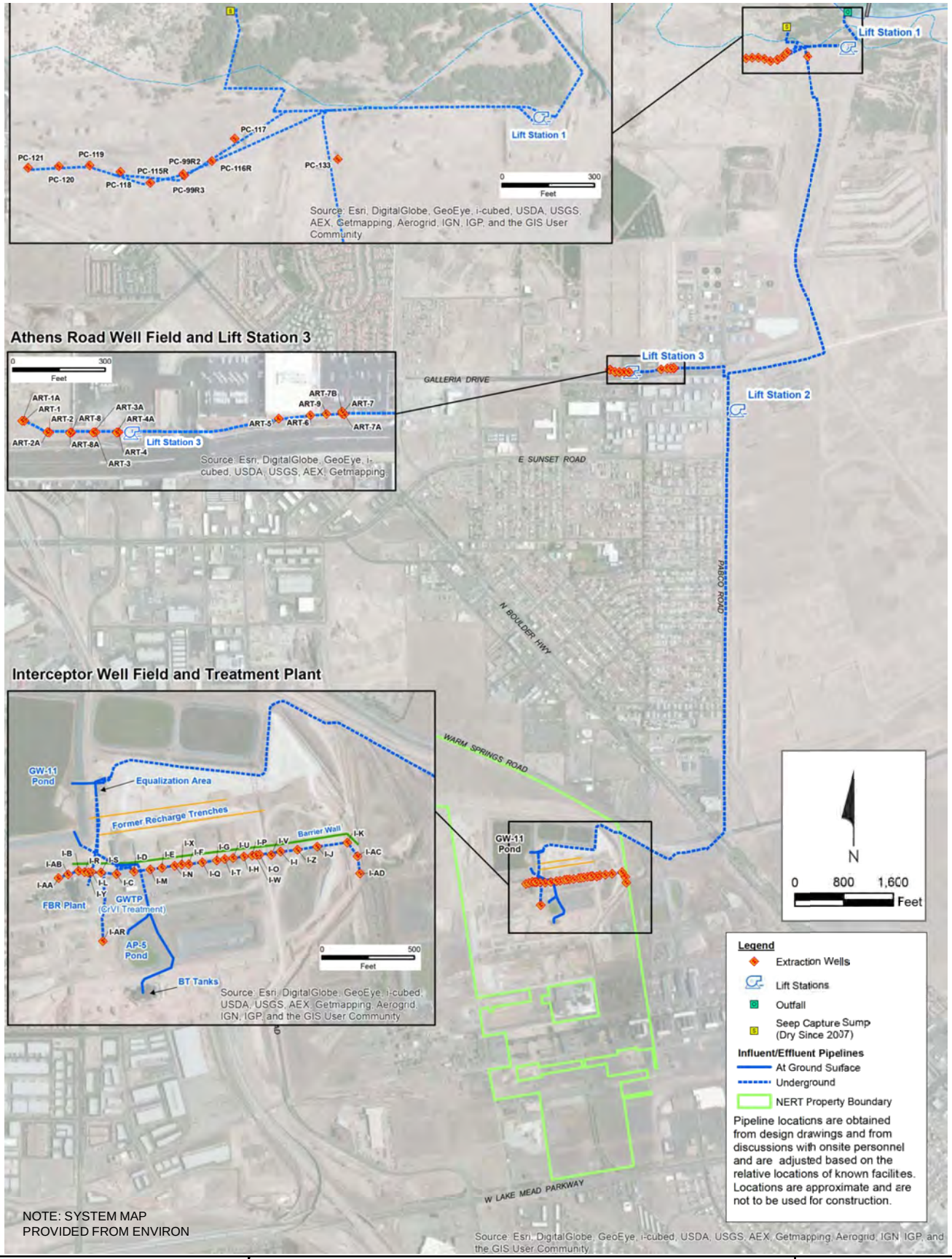
Two companies in the Henderson / Las Vegas area that rent generators adequate to meet the power requirements are listed in the contacts in Table 1. The emergency generation equipment can be rented in case of a long-term power outage impacting the SWF, Lift Station #1, or Lift Station #2.

In the event the Emergency Response Leader orders the deployment of an IX plant at Lift Station #1, NERT has established terms with ETI for the delivery, installation and operation of related equipment.

7.0 EMERGENCY RESPONSE TRAINING

All personnel working on the site will undergo training to respond to an emergency related to the GWETS. This training will be in addition to any health and safety training required under ETI's HASP. The training specific to the ERP will include:

- Knowledge of the ERP plan;
- ERP roles and responsibilities;
- Location of spare pumps and their use; and
- Contact information for vendors for temporary power, temporary pipeline, and IX system.



NOTE: SYSTEM MAP
PROVIDED FROM ENVIRON

TETRA TECH
www.tetratech.com
1576 Sherman St.
Denver, CO 80203
Phone: 303-825-5999

NEVADA ENVIRONMENTAL RESPONSE TRUST

GROUNDWATER EXTRACTION AND TREATMENT MAP

Project No.:	133-20192-14009
Date:	06-20-2014
Designed By:	TD

FIGURE
1

Bar Measures 1 inch

EMERGENCY VENDOR LIST

THIS LIST CONTAINS VENDORS THAT CAN RESPOND TO SPECIFIC EMEGENCY REPAIRS OR SERVICES WHICH MAY BE REQUIRED BY THE GWETS PLANT DUE TO AN EMERGENCY SITUATION. THESE VENDORS HAVE BEEN APPROVED BY ENVIROGEN PURCHASING BUT WILL REQUIRE A SPICIFIC WORK ORDER OR PUCHASE ORDER AT THE TIME WORK IS REQUESTED..

Vendor List

Vendor Work Specialty	Primary or Alternate	Vendor	Contact and Telephone #
Pipeline, Above Ground	Primary	Rafael Construction 5870 Construction Ave. Las Vegas, NV 89122	Alan Nish 702-561-0193
Pipeline, Below Ground	Primary	Rafael Construction 5870 Construction Ave. Las Vegas, NV 89122	Alan Nish 702-561-0193
High Voltage Electrical/MCC	Primary	Hampton Tedder Technical Services 4113 Wagon Trail Ave. Las Vegas, NV 89118	Roger Cates 702-234-8177
Instrumentation & Controls/PLC	Primary	Matrix Technologies 1760 Indian Wood Circle Maumee, OH 43537	Nicole Hughes 303-466-5800
Electrical Contracting	Primary	Rosedin Electrical 7470 Dean Marin Drive suite 112 Las Vegas, NV 89139	Shawn McClone 705-208-4371
Temporary Power Supply	Primary	Power Plus 3131Olive Street Las Vegas, NV 89104	Curtis Mercurio 702429-8487
Spill Clean Up	Primary	Logistical Solutions 4560 Werdco Ct. Las Vegas, Nv 89115	Ty Salazar 702-376-2344
Wells	Primary	Eagle Drilling 7150 Placid Street Las Vegas, NV 89119	Shawn Sears 702-341-5873

APPENDIX S
SAMPLE SPILL REPORT

XXXXX YY, 20ZZ

Compliance Coordinator
Nevada Division of Environmental Protection
Bureau of Water Pollution Control
901 South Stewart Street, Suite 4001
Carson City, Nevada 89701-5249

RE: Report of Spill of XXXXXX
NPDES Permit NV0023060
Incident No. xxxxxxx

Dear Compliance Coordinator:

The Nevada Environmental Response Trust ("NERT" or the "Trust") maintains a National Pollutant Discharge Elimination System (NPDES) Permit NV0023060 for discharge of treated water to the Las Vegas Wash as part of their on-going effort to capture and treat groundwater containing perchlorate and other contaminants of concern at the NERT site in Henderson, Nevada (the "Site"). ETI is submitting this letter on behalf of the Trust to provide written documentation of a spill from XXXXXXXX.

A written paragraph describing the spill

Tetra Tech reported this incident via telephone at approximately xx:xx PM PST on XXXX YYth, 201Z, to the NDEP Spill Notification Line. This incident was assigned Spill Incident No. xxxxxxx. The Bureau of Corrective Actions was notified by email immediately following the call to the Spill Notification Line.

Per Section II.A.3.b. of the NPDES permit, a written report shall be submitted within 5 days of the spill and include the following information.

i. Time and date of discharge

Fill in

ii. Exact location and estimated amount of discharge

Fill in

iii. Flow path and any bodies of water which the discharge reached

Fill in

iv. The specific cause of the discharge

The root cause of this incident was attributable to the following:

1) *Fill in*

v. The preventive and/or corrective actions taken

In response to this spill and to minimize their reoccurrence, preventive measures that will be undertaken include:

1. *Fill in*.

Please let me know if you have any questions. I can be reached at xxxxxxxx or via email at xxxxxxxxxxxx.

Envirogen Technologies
700 Rockmead Drive, Suite 105
Kingwood, TX 77339
Tel (877) 312-8950 Fax (909) 980-4732

Sincerely,

Copies: Regional Administrator, USEPA Region 9

Copies: (electronic)
Cliff Lawson, Bureau of Water Pollution Control, NDEP
Joe Maez, Bureau of Water Pollution Control, NDEP
Greg Lovato, Bureau of Corrective Actions, NDEP
James Dotchin, Bureau of Corrective Actions, NDEP
Weiquan Dong, Bureau of Corrective Actions, NDEP
Jay Steinberg, Nevada Environmental Response Trust
Andrew Steinberg, Nevada Environmental Response Trust
Tanya O'Neill, Foley and Lardner LLP
Michael Delvecchio, Envirogen Technologies, Inc.
Todd Webster, Envirogen Technologies, Inc.
Allan DeLorme, ENVIRON International Corporation