operator shall have the capability to continue to step 26) b) (2) (a) by pressing the "START BACKWASH" pushbutton or aborting the backwash by pressing the "RESET" pushbutton. If the "START BACKWASH" pushbutton is depressed, an alarm shall be printed indicating a backwash turbidity override together with the value of the backwash turbidity when the backwash was stopped.

(2) If the backwash turbidity quality option has not been selected:
  (a) Modulate the washwater flow control valve to provide the second low wash rate. Start the selected chemical feed pump.
  (b) Activate second low wash rate timer T-9.

27) After second low wash timer T-9 times out, the washwater rate-of-flow control valve will close.

28) After the washwater rate-of-flow control valve is completely closed:
  a) Stop the chemical feed pump.
  b) The wash valve at the filter will close.
  c) The wash isolation valve will close.
  d) Open the pressure control valve.

29) The above sequence shall then be repeated for filter Cell B beginning at step 9 and the start of the air blower.

30) After completing the backwash of Cell B and closing its wash isolation valve, and the wash valve, the drain valve will begin to close.

31) After the drain valve is completely closed, the program will:
  a) Reset timers T-1 to T-9 and T-15 and all internal timers.
  b) Deactivate lockouts against backwashing other filters.
  c) Open the filter influent valve to its intermediate hold position (requires adjustable internal timer or field set adjustable intermediate limit switch).
  d) Display the "FILTER OFF" message.

32) When filter level rises to "NORMAL" probe level, the influent valve will open fully.

33) After the influent valve is completely open, the program will:
  a) Activate the rinse flow control sequence.
  b) Set filter rinse rate-of-flow control valve to low rinse rate.
  c) Activate low rinse timer (T-11).
  d) Activate the rinse duration timer (T-12).
  e) Display the "RINSING" message.

34) After low rinse timer (T-11) times-out, the program will:
  a) Activate rinse ramp timer (T-13).
  b) Uniformly increase rinse rate from low rate to high rate (established by filter level rate controller).

35) After ramp timer (T-13) times out:
  a) The rinse will continue at high rate until timer (T-12) times out, or turbidity levels fall to acceptable values.

36) If rinse turbidity levels have fallen to acceptable values, the program will proceed to step 37) a) (1).

37) After the rinse timer (T-12) times out:
   a) If rinse turbidity has fallen to an acceptable level:
      (1) The program will activate rinse valve close timer (T-14). The rinse valve shall close at a uniform rate from its current position to full closed in the time period established by timer (T-14). Simultaneously, modulate open the filter effluent valve as the rinse valve closes to maintain the combined filtration/rinse rate at the setpoint established by the filter level control system. Modulate the filter effluent rate-of-flow controller to maintain the setpoint.
      (2) Go to step 38.
   b) If filter effluent turbidities have not fallen to acceptable levels, reset rinse timer (T-12), return to Step 35) a) and indicate an alarm on the CPU monitor and printer that the rinse timer has timed out without achieving the turbidity goal.
      (1) If filter effluent turbidity is satisfactory to the Operator, he may override the rinse timer by depressing the "RESET" pushbutton at the FCC which will allow the program to proceed to step 37) a) (1) to place the filter back on line.
      (2) If filter effluent turbidity level is not satisfactory and the rinse timer has been overridden by an Operator's action, this message shall be printed out and the turbidity level indicated.

38) After the rinse valve is closed, the program will:
   a) Indicate a message on the CRT and print out the message that "Filter No. _X_ is back in Service".
   b) Reset timers (T-10 through T-14).
   c) Display the "FILTER ON" message.
   d) Generate a filter backwash report. NOTE: Filter backwash reports shall be generated automatically after semi-automatic and manual backwashes.

u. The manual backwash sequence control shall be as follows:
   1) In this backwash mode, the control stations and valve selector switches must be operated manually by the operator to duplicate the semi-automatic operation previously described.
   2) The Manual Backwash procedure to be followed by the operator shall be as follows:
      a) Place the backwash mode selector switch in the "MANUAL" position.
      b) Close the filter influent valve and allow the water level to filter down to a level approximately 1 foot above the media.
      c) Close filter effluent rate-of-flow control valve by first placing the controller into the manual mode and setting the flow rate set to 0.
      d) Open the waste (drain) valve.

e) Start the air blower at the auxiliary FCC and open the appropriate filter air wash valve to its intermediate position.
f) After establishing uniform air distribution across the filter bottom fully open the air wash valve and air wash the filter for 3 minutes.
g) Close the air wash valve and shut down the blower.
h) Verify that adequate transfer pump capacity is on-line for backwashing a filter.
i) Open the wash valve and the appropriate wash isolation valve at the filter.
j) Open the washwater rate-of-flow control valve to the low wash position and wash at this rate for approximately 5 minutes.
k) Open the washwater rate-of-flow control valve to the high wash rate and wash at this rate for approximately 10 minutes.
l) Close the washwater rate-of-flow control valve to the second low wash rate, and start the chemical feed pump. Wash at this rate for approximately 5 minutes.
m) Close the washwater rate-of-flow control valve. Stop the chemical feed pump.
n) Close the wash valve and the appropriate wash isolation valves at the filter.
o) Repeat the above for the second cell.
p) Close the drain valve.
q) When drain valve is fully closed, partially open influent valve and allow filter to fill to normal operating level. Open influent valve fully.
r) Open rinse valve, adjust rinse rate-of-flow to desired rate, and filter to waste until effluent turbidity drops below 0.2 NTU (can be adjusted).
s) Close rinse valve, adjust effluent rate-of-flow controller as necessary, check all other filter valves for proper position, and place filter on line (either manually through rate of flow control or DLC by placing manual-auto control switch to proper position.) A selector switch shall be provided in each FCC for use in selecting whether the control of the filter effluent valve is via the DLC or the rate of flow controller at the FCC.

END OF SECTION

ST. JOSEPH WATER TREATMENT PLANT
PREVENTATIVE MAINTENANCE SCHEDULE

ITEM/TAG #	MAINTENANCE DESCRIPTION	FREQUENCY OF MAINTENANCE
HACH Low Range Process Turbidimeter (AE/AIT-260,261,362)	Standardization & calibration	Monthly
	Clean photocell window	Monthly
	Clean and drain body	Semi-Annual
Rosemount Flow Transmitter (FIT-211,212,311,312)	None required	N/A
Streaming Current Detector (AE/AIT-271)	Clean the CCC Cell	As required
	Lubricate the motor ball bearings	Every 5 years
	Lubricate the oil gear motor	Every 4 months or 1000 hours of operation
	Lubricate the motor sleave bearings	Every 6 months or 1000 hours of operation
BIF Float Level Transmitter (LIT-340)	Lubricate shaft bearings	Every 3 months
	Visual Inspection of float shafts and gears	Every 3 months
Solenoid valves (SV-311,312,313)	Clean the units	As required to prevent sluggish valve operation, excessive heating, or unwanted noise.

ST. JOSEPH WTP
SPARE PARTS LIST

PART (TAG) DESCRIPTION	SPARE NAME	PART NUMBER	INVENTORY REQ	INVENTORY REC	MANUFACTURE/DISTRIBUTOR NAME	PHONE	ADDRESS
Float Level	Power Supply	BIF-258-15	1		BIF Products	717-696-3356	2001 Senate Ave
Transmitter	Potentiometer	L&N 407922		1			Harrisburg, Pa 17085
(LIT-340)	Cover Gasket	L&N 408096		2			
	Knurl Knob	L&N 419103		1			
	Truarc Ring 5133-9	L&N 418620		1			
	Fuse	L&N 176768	24				
	Cable (50 ft)	L&N 173786		1			
	Circuit Board	L&N 408828	1				
Low Range	Lamp Assembly	19554		3	HACH Products	215-656-8958	63569 State St
Turbidimeter	Photcell Assembly	44137		1			Chesterfield, Pa 17854
(AE/AIT-361,362)	Calibration Kit	44156		1			
	Microprocessor	44085	1				
	Power Supply	44122	1				
	PreAmp Ckt Bd	43938	1				
	Fuse	10831	24				
Streaming Current	P/C Board (main)	338-0162-200	1		Milton Roy	215-656-9898	56895 High St
Detector	P/C Board (panel)	338-0163-000	1				Killian, Tx. 65236
(AE/AIT-271)	Fuse 1-amp	406-0333-020	24				
	Fuse 3-amp	406-0333-030	24				
Flow Transmitter	Amplifier Ckt Bd	1151-0378-21	1		Rosemount	312-568-9865	737 N. Forrest St
	Calibration Ckt Bd	1151-0377-21	1				Mesa, Az 85236

Chemical Feedroom (DLC-001)

1. Analog Inputs
    a. Rapid Mixer Speed
    b. Slow Mixer Speed
    c. Lime Day Bin No. 1 Weight
    d. Lime Day Bin No. 2 Weight
    e. Sludge Blanket Polymer Weight
    f. Alum Day Tank Weight
    g. Coagulant Aid Polymer Day Tank Weight
    h. Potassium Permanganate Day Tank No. 1 Weight
    i. Potassium Permanganate Day Tank No. 2 Weight
    j. Filter Aid Polymer Day Tank No. 1 Weight
    k. Filter Aid Polymer Day Tank No. 2 Weight
    l. Future Chemical Day Tank Weight
    m. Caustic Soda Day Tank Weight
    n.
    o.
    p.
    q.
    r.

Chemical Feedroom (DLC-001)

1. Analog Outputs
   a. Lime Feeder No. 1 Pacing Signal
   b. Lime Feeder No. 2 Pacing Signal
   c. Sludge Blanket Polymer No. 1 Pacing Signal
   d. Sludge Blanket Polymer No. 2 Pacing Signal
   e. Sludge Blanket Polymer No. 3 Pacing Signal
   f. Sludge Blanket Polymer Spare Pacing Signal
   g. Alum Feed Pump No. 1 Pacing Signal
   h. Alum Feed Pump No. 2 Pacing Signal
   i. Alum Feed Pump No. 3 Pacing Signal
   j. Alum Feed Pump No. 4 Pacing Signal
   k. Coagulant Aid Polymer Feed Pump No. 1 Pacing Signal
   l. Coagulant Aid Polymer Feed Pump No. 2 Pacing Signal
   m. Coagulant Aid Polymer Feed Pump No. 3 Pacing Signal
   n. Coagulant Aid Polymer Feed Pump No. 4 Pacing Signal
   o. Potassium Permanganate No. 1 Pacing Signal
   p. Potassium Permanganate No. 2 Pacing Signal
   q. Filter Aid Polymer Feed Pump No. 1 Pacing Signal
   w. Filter Aid Polymer Feed Pump No. 2 Pacing Signal
   e. Future Chemical Feed Pump No. 1 Pacing Signal
   r. Future Chemical Feed Pump No. 2 Pacing Signal
   u. Caustic Soda Feed Pump No. 1 Pacing Signal
   w. Caustic Soda Feed Pump No. 2 Pacing Signal
   v.
   w.
   x.

Chemical Feedroom (DLC-001)

1. Digital Inputs
   a. Pulsator No. 1 High Level
   b. Pulsator No. 2 High Level
   c. Pulsator No. 3 High Level
   d. Pulsator No. 4 High Level (Future)
   e. Rapid Mix Basin High Level
   f. Pulsator No. 1 Vacuum Pump On
   g. Pulsator No. 1 Vacuum Pump Off
   h. Pulsator No. 2 Vacuum Pump On
   i. Pulsator No. 2 Vacuum Pump Off
   j. Pulsator No. 1 or 2 Spare Vacuum Pump On
   k. Pulsator No. 1 or 2 Spare Vacuum Pump Off
   l. Pulsator No. 3 Vacuum Pump On
   m. Pulsator No. 3 Vacuum Pump Off
   n. Pulsator No. 4 Vacuum Pump On (Future)
   o. Pulsator No. 4 Vacuum Pump Off (Future)
   p. Pulsator No. 3 or 4 Spare Vacuum Pump On
   q. Pulsator No. 3 or 4 Spare Vacuum Pump Off
   r. Lime Feeder No. 1 On
   s. Lime Feeder No. 1 Off
   t. Lime Feeder No. 1 High Level
   u. Lime Feed Bin No. 1 High Level
   v. Lime Feed Bin No. 1 Low Level
   w. Lime Feed Bin No. 2 On
   x. Lime Feed Bin No. 2 Off
   y. Lime Feeder No. 2 High Level
   z. Lime Feed Bin No. 2 High Level
   aa. Lime Feed Bin No. 2 Low Level
   ab. Day Bin Dust Collector On
   ac. Day Bin Dust Collector Off
   ad. Sludge Blanket Polymer Feeder No. 1 On
   ae. Sludge Blanket Polymer Feeder No. 1 Off
   af. Sludge Blanket Polymer Feeder No. 2 On
   ag. Sludge Blanket Polymer Feeder No. 2 Off
   ah. Sludge Blanket Polymer Feeder No. 3 On
   ai. Sludge Blanket Polymer Feeder No. 3 Off
   aj. Sludge Blanket Polymer Feeder No. 4 On
   ak. Sludge Blanket Polymer Feeder No. 4 Off
   al. Alum Feed Pump No. 1 On
   am. Alum Feed Pump No. 1 Off
   an. Alum Feed Pump No. 2 On
   ao. Alum Feed Pump No. 2 Off
   ap. Alum Feed Pump No. 3 On
   aq. Alum Feed Pump No. 3 Off
   ar. Alum Feed Pump No. 4 On

as. Alum Feed Pump No. 4 Off
at. Washwater Alum Feed Pump On
au. Washwater Alum Feed Pump Off
av. Alum Day Tank High Level Alarm
aw. Alum Day Tank Low Level Alarm
ax. Sludge Blanket Polymer/Alum Containment Area Alarm
ay. Coagulant Aid Polymer Feed Pump No. 1 On
az. Coagulant Aid Polymer Feed Pump No. 1 Off
ba. Coagulant Aid Polymer Feed Pump No. 2 On
bb. Coagulant Aid Polymer Feed Pump No. 2 Off
bc. Polymer Batching System On
bd. Polymer Batching System Off
be. Polymer Batching System Trouble
bf. Polymer Feed Pump No. 1 On
bg. Polymer Feed Pump No. 1 Off
bh. Polymer Feed Pump No. 2 On
bi. Polymer Feed Pump No. 2 Off
bj. Coagulant Aid/Polymer Batching System Containment Alarm
bk. Potassium Permanganate Feed Pump No. 1 On
bl. Potassium Permanganate Feed Pump No. 1 Off
bm. Potassium Permanganate Feed Pump No. 2 On
bn. Potassium Permanganate Feed Pump No. 2 Off
bo. Potassium Permanganate Day Tank No. 1 High Level Alarm
bp. Potassium Permanganate Day Tank No. 1 Low Level Alarm
bq. Potassium Permanganate Day Tank No. 2 High Level Alarm
br. Potassium Permanganate Day Tank No. 2 Low Level Alarm
bs. Potassium Permanganate Containment Alarm
bt. Future Feed Pump No. 1 On
bu. Future Feed Pump No. 1 Off
bv. Future Feed Pump No. 2 On
bw. Future Feed Pump No. 2 Off
bx. Future Day Tank High Level Alarm
by. Future Day Tank Low Level Alarm
bz. Future Chemical Containment Alarm
ca. Caustic Soda Feed Pump No. 1 On
cb. Caustic Soda Feed Pump No. 1 Off
cc. Caustic Soda Feed Pump No. 2 On
cd. Caustic Soda Feed Pump No. 2 Off
ce. Caustic Soda Day Tank High Level Alarm
cf. Caustic Soda Day Tank Low Level Alarm
cg. Caustic Soda Containment Area Alarm
ch. Caustic Soda Feed Room Temperature Alarm
ci.
cj.
ck.
cl.
cm.

Chemical Feedroom (DLC-001)

1. Digital Outputs
    a. Start Washwater Alum Feed Pump
    b. Stop Washwater Alum Feed Pump
    c. Start Washwater Coagulant Aid Feed Pump
    d. Stop Washwater Coagulant Aid Feed Pump
    e.
    f.
    g.
    h.
    i.
    j.
    k.
    l.
    m.
    n.
    o.
    p.
    q.
    r.
    s.
    t.
    u.
    v.
    w.
    x.
    y.
    z.
    aa.
    ab.
    ac.
    ad.
    ae.
    af.
    ag.
    ah.
    ai.
    aj.
    ak.
    al.
    am.
    an.
    ao.
    ap.
    aq.
    ar.

Chemical Storage Room (DLC-002)

1. Analog Inputs
   a. Alum Storage Tank No. 1
   b. Alum Storage Tank No. 2
   c. Alum Storage Tank No. 3
   d. Alum Storage Tank No. 4
   e. Caustic Soda Storage Tank
   f. Caustic Soda Level Scrubber System
   g. Fluoride Storage Tank
   h. Fluoride Day Tank Weight
   i. Coagulant Aid Polymer Storage Tank
   j. Spare Chemical Storage Tank
   k. Laboratory Waste Storage Tank
   l. Pre Chlorine Storage Scale No. 1
   m. Pre Chlorine Storage Scale No. 2
   n. Post Chlorine Storage Scale No. 1
   o. Post Chlorine Storage Scale No. 2
   p. Lime Silo Weight
   q. Carbon Silo Weight
   r. Settled Water Turbidity
   s. Settled Water pH
   t. Mixed Water Streaming Current
   u. Mixed Water pH
   v. Combined Filter Effluent Turbidity
   w. Finished Water Turbidity
   x. Finished Water pH
   y. Finished Water Chlorine Residual
   z. Finished Water Temperature
   aa. Raw Water Flow Magnetic Meter No. 1
   ab. Raw Water Flow Magnetic Meter No. 2
   ac. Spill Containment Tank Level
   ad.
   ae.

Chemical Storage Room (DLC-002)

2. Analog Outputs
   a. Pre Chlorine Feed No. 1
   b. Pre Chlorine Feed No. 2
   c. Post Chlorine Feed No. 1
   d. Post Chlorine Feed No. 2
   e. Carbon Feeder No. 1
   f. Carbon Feeder No. 2
   g. Fluoride Feed Pump No. 1 Pacing Signal
   h. Fluoride Feed Pump No. 2 Pacing Signal
   i.
   j.
   k.
   l.
   m.
   n.
   o.
   p.

Chemical Storage Room (DLC-002)

3. Digital Inputs
   a. Carbon Feeder No. 1 On
   b. Carbon Feeder No. 1 Off
   c. Carbon Feeder No. 1 High Level
   d. Carbon Feeder No. 2 On
   e. Carbon Feeder No. 2 Off
   f. Carbon Feeder No. 2 High Level
   g. Dust Collector On
   h. Dust Collector Off
   i. Carbon Silo High Level
   j. Carbon Silo Low Level
   k. Lime Blower No. 1 On
   l. Lime Blower No. 1 Off
   m. Lime Blower No. 2 On
   n. Lime Blower No. 2 Off
   o. Dust Collector On
   p. Dust Collector Off
   q. Lime Silo High Level
   r. Lime Silo Low Level
   s. Air Compressor No. 1 On
   t. Air Compressor No. 1 Off
   u. Air Compressor No. 1 Low Pressure
   v. Air Compressor No. 2 On
   w. Air Compressor No. 2 Off
   x. Air Compressor No. 2 Low Pressure
   y. Alum Storage Tank No. 1 High Level
   z. Alum Storage Tank No. 2 High Level
   aa. Alum Storage Tank No. 3 High Level
   ab. Alum Storage Tank No. 4 High Level
   ac. Alum Storage Transfer Pump No. 1 On
   ad. Alum Storage Transfer Pump No. 1 Off
   ae. Alum Storage Transfer Pump No. 2 On
   af. Alum Storage Transfer Pump No. 2 Off
   ag. Alum Guardian Valve Open
   ah. Alum Guardian Valve Closed
   ai. Alum Containment Area Level Alarm
   aj. Coagulant Polymer Storage Tank High Level
   ak. Coagulant Polymer Transfer Pump No. 1 On
   al. Coagulant Polymer Transfer Pump No. 1 Off
   am. Coagulant Polymer Transfer Pump No. 2 On
   an. Coagulant Polymer Transfer Pump No. 2 Off
   ao. Coagulant Polymer Guardian Valve Open
   ap. Coagulant Polymer Guardian Valve Closed
   aq. Coagulant Polymer Containment Area Level Alarm
   ar. Fluoride Storage Tank High Level Alarm

as. Fluoride Transfer Pump No. 1 On
at. Fluoride Transfer Pump No. 1 Off
au. Fluoride Transfer Pump No. 2 On
av. Fluoride Transfer Pump No. 2 Off
aw. Fluoride Guardian Valve Open
ax. Fluoride Guardian Valve Closed
ay. Fluoride Containment Area Level Alarm
az. Fluoride Feed Pump No. 1 On
ba. Fluoride Feed Pump No. 1 Off
bb. Fluoride Feed Pump No. 2 On
bc. Fluoride Feed Pump No. 2 Off
bd. Fluoride Day Tank High Level Alarm
be. Fluoride Day Tank Low Level Alarm
bf. Spare Chemical Storage Tank High Level Alarm
bg. Spare Chemical Transfer Pump No. 1 On
bh. Spare Chemical Transfer Pump No. 1 Off
bi. Spare Chemical Transfer Pump No. 2 On
bj. Spare Chemical Transfer Pump No. 2 Off
bk. Spare Chemical Guardian Valve Open
bl. Spare Chemical Guardian Valve Closed
bm. Spare Chemical Containment Area Level Alarm
bn. Caustic Soda Storage Tank High Level Alarm
bo. Caustic Soda Transfer Pump No. 1 On
bp. Caustic Soda Transfer Pump No. 1 Off
bq. Caustic Soda Transfer Pump No. 2 On
br. Caustic Soda Transfer Pump No. 2 Off
bs. Caustic Soda Guardian Valve Open
bt. Caustic Soda Guardian Valve Closed
bu. Caustic Soda Containment Area Level Alarm
bv. Caustic Soda Storage Room Temperature Alarm
bw. Chlorine Scrubber Pump No. 1 On
bx. Chlorine Scrubber Pump No. 1 Off
by. Chlorine Scrubber Pump No. 2 On
bz. Chlorine Scrubber Pump No. 2 Off
ca. Chlorine Scrubber Room Containment High Level Alarm
cb. Chlorine Scrubber Room Gas Leak
cc. Chlorine Evaporator No. 1 On
cd. Chlorine Evaporator No. 1 Off
ce. Chlorine Evaporator No. 1 Trouble
cf. Chlorine Evaporator No. 2 On
cg. Chlorine Evaporator No. 2 Off
ch. Chlorine Evaporator No. 2 Trouble
ci. Chlorine Evaporator Room Gas Leak
cj. Chlorine Storage Room Gas Leak
ck. Chlorine Feed Room Pre Chlorinator No. 1 On
cl. Chlorine Feed Room Pre Chlorinator No. 1 Off
cm. Chlorine Feed Room Pre Chlorinator No. 1 Low Vacuum

cn. Chlorine Feed Room Pre Chlorinator No. 1 High Vacuum
co. Chlorine Feed Room Pre Chlorinator No. 2 On
cp. Chlorine Feed Room Pre Chlorinator No. 2 Off
cq. Chlorine Feed Room Pre Chlorinator No. 2 Low Vacuum
cr. Chlorine Feed Room Pre Chlorinator No. 2 High Vacuum
cs. Chlorine Feed Room Post Chlorinator No. 1 On
ct. Chlorine Feed Room Post Chlorinator No. 1 Off
cu. Chlorine Feed Room Post Chlorinator No. 1 Low Vacuum
cv. Chlorine Feed Room Post Chlorinator No. 1 High Vacuum
cw. Chlorine Feed Room Post Chlorinator No. 2 On
cx. Chlorine Feed Room Post Chlorinator No. 2 Off
cy. Chlorine Feed Room Post Chlorinator No. 2 Low Vacuum
cz. Chlorine Feed Room Post Chlorinator No. 2 High Vacuum
da. Chlorine Feed Room Gas Leak
db. Laboratory Waste Transfer Pump No. 1 On
dc. Laboratory Waste Transfer Pump No. 1 Off
dd. Laboratory Waste Transfer Pump No. 2 On
de. Laboratory Waste Transfer Pump No. 2 Off
df. Laboratory Waste Tank High Level Alarm
dg. Laboratory Waste Area Containment Alarm
dh. Spill Containment Tank Leak
di. Spill Containment Tank High Level
dj. Spill Containment Valve Normal
dk. Spill Containment Valve Diverting
dl. Dosing Pump No. 1 On
dm. Dosing Pump No. 1 Off
dn. Dosing Pump No. 2 On
do. Dosing Pump No. 2 Off
dp. Dosing Tank High Level
dq. Presedimentation Basin No. 1 High Level Alarm
dr. Presedimentation Basin No. 2 High Level Alarm
ds. Sump Pump No. 1 On
dt. Sump Pump No. 1 Off
du. Sump Pump No. 2 On
dv. Sump Pump No. 2 Off
dw. High Sump Level Alarm

Chemical Storage Room

4. Digital Outputs
   a.
   b.
   c.
   d.
   e.
   f.
   g.
   h.
   i.
   j.
   k.

Pumproom (DLC-003)

1. Analog Inputs
    a. Transfer Pump Flow
    b. High Service Pump Flow
    c. High Service Pump Suction Pressure
    d. High Service Pump Discharge Pressure
    e. Clearwell Level
    f. Plant Effluent Turbidity
    g. Plant Effluent Chlorine Residual
    h. Plant Effluent pH
    i.
    j.

Pumproom (DLC-003)

1. Analog Outputs
   a. High Service VFD Pump No. Set Point Signal
   b.
   c.
   d.
   e.
   f.
   g.
   h.
   i.
   j.
   k.
   l.
   m.
   n.

Pumproom (DLC-003)

1. Digital Inputs
   a. Transfer Pump No. 1 On
   b. Transfer Pump No. 1 Off
   c. Transfer Pump No. 1 Trouble
   d. Transfer Pump No. 1 KW Usage
   e. Transfer Pump No. 2 On
   f. Transfer Pump No. 2 Off
   g. Transfer Pump No. 2 Trouble
   h. Transfer Pump No. 2 KW Useage
   i. Transfer Pump No. 3 On
   j. Transfer Pump No. 3 Off
   k. Transfer Pump No. 3 Trouble
   l. Transfer Pump No. 3 KW Useage
   m. Transfer Pump No. 4 On
   n. Transfer Pump No. 4 Off
   o. Transfer Pump No. 4 Trouble
   p. Transfer Pump No. 4 KW Useage
   q. High Service Pump No. 1 On
   r. High Service Pump No. 1 Off
   s. High Service Pump No. 1 Trouble
   t. High Service Pump No. 1 KW Usage
   u. High Service Pump No. 1 Ball Valve Open
   v. High Service Pump No. 1 Ball Valve Close
   w. High Service Pump No. 2 On
   x. High Service Pump No. 2 Off
   y. High Service Pump No. 2 Trouble
   z. High Service Pump No. 2 KW Usage
   ac. High Service Pump No. 2 Ball Valve Open
   ab. High Service Pump No. 2 Ball Valve Close
   ac. High Service Pump No. 3 On
   ad. High Service Pump No. 3 Off
   ae. High Service Pump No. 3 Trouble
   af. High Service Pump No. 3 KW Usage
   ag. High Service Pump No. 3 Ball Valve Open
   ah. High Service Pump No. 3 Ball Valve Close
   ai. High Service Pump No. 4 On
   aj. High Service Pump No. 4 Off
   ak. High Service Pump No. 4 Trouble
   al. High Service Pump No. 4 KW Usage
   am. High Service Pump No. 4 Ball Valve Open
   an. High Service Pump No. 4 Ball Valve Close
   ao. Blower On
   ap. Blower Off
   aq. Blower Trouble
   ar. Blower KW Usage

as. Blower High Inlet Filter Alarm
at. In-coming Line No. 1 Open
au. In-coming Line No. 1 Closed
av. In-coming Line No. 1 KW Usage
aw. In-coming Line No. 2 Open
ax. In-coming Line No. 2 Closed
ay. In-coming Line No. 2 KW Usage
az. Bustie Open
ba. Bustie Closed
bb. Transformer Feeder No. 1 Open
bc. Transformer Feeder No. 1 Closed
bd. Transformer Feeder No. 1 KW Usage
be. Transformer Feeder No. 2 Open
bf. Transformer Feeder No. 2 Closed
bg. Transformer Feeder No. 2 KW Usage
bh. Transfer Sump No. 1 High Level
bi. Transfer Sump No. 1 Low Level Alert
bj. Transfer Sump No. 1 Low Level
bk. Transfer Sump No. 2 High Level
bl. Transfer Sump No. 2 Low Level Alert
bm. Transfer Sump No. 2 Low Level
bn.
bo.
bp.
bq.

Pumproom (DLC-003)

1. Digital Outputs
   a. Start Transfer Pump No. 1
   b. Stop Transfer Pump No. 1
   c. Start Transfer Pump No. 2
   d. Stop Transfer Pump No. 2
   e. Start Transfer Pump No. 3
   f. Stop Transfer Pump No. 3
   g. Start Transfer Pump No. 4
   h. Stop Transfer Pump No. 4
   i. Start High Service Pump No. 1
   j. Stop High Service Pump No. 1
   k. Start High Service Pump No. 2
   l. Stop High Service Pump No. 2
   m. Start High Service Pump No. 3
   n. Stop High Service Pump No. 3
   o. Start High Service Pump No. 4
   p. Stop High Service Pump No. 4
   q. Start Blower
   r. Stop Blower
   s.

Filters (DLC-004 thru DLC-009)

1. Analog Inputs
   a. Filter Effluent/Rinse Flow
   b. Loss of Head
   c. Effluent Turbidity
   d. Washwater Turbidity
   e. Effluent Valve Position
   f. Rinse Valve Position

Filters (DLC-004 thru DLC-009)

2. Analog Outputs
   a.
   b.
   c.
   d.
   e.
   f.
   g.
   h.

Filters (DLC-004 thru DLC-009)

3. Digital Inputs
   a. Influent Valve Closed
   b. Influent Valve Intermediate Position
   c. Influent Valve Open
   d. Effluent Valve Closed
   e. Effluent Valve Open
   f. Waste Valve Closed
   g. Waste Valve Open
   h. Wash Valve Closed
   i. Wash Valve Open
   j. Isolation Valve Cell A Closed
   k. Isolation Valve Cell A Open
   l. Isolation Valve Cell B Closed
   m. Isolation Valve Cell B Open
   n. Rinse Valve Closed
   o. Rinse Valve Open
   p. Air Wash Valve Cell A Closed
   q. Air Wash Valve Cell A Intermediate Position
   r. Air Wash Valve Cell A Open
   s. Air Wash Valve Cell B Closed
   t. Air Wash Valve Cell B Intermediate Position
   u. Air Wash Valve Cell B Open
   v. Filter Level High
   w. Filter Level Stop Air Wash Cell A
   x. Filter Level Stop Air Wash Cell B
   y. Filter Level Start Air Wash Cell A
   z. Filter Level Start Air Wash Cell B
   aa. Filter Level Low Cell A
   ab. Filter Level Low Cell B
   ac. Filter Level Normal
   ad. Backwash Mode Auto
   ae. Backwash Mode Manual
   af. Extend Waterwash
   ag. Extend Air Wash
   ah. Start Backwash
   ai. Stop Backwash
   aj. Reset Filter
   ak. Restart Wash Sequence
   al. Lamp Test

Filters (DLC 004 thru DLC 009)

4. Digital Outputs
   a. Close Influent Valve
   b. Open Influent Valve
   c. Close Effluent Valve
   d. Open Effluent Valve
   e. Close Waste Valve
   f. Open Waste Valve
   g. Close Isolation Valve Cell A
   h. Open Isolation Valve Cell A
   i. Close Isolation Valve Cell B
   j. Open Isolation Valve Cell B
   k. Close Wash Valve
   l. Open Wash Valve
   m. Close Rinse Valve
   n. Open Rinse Valve
   o. Close Air Wash Valve Cell A
   p. Open Air Wash Valve Cell A
   q. Close Air Wash Valve Cell B
   r. Open Air Wash Valve Cell B
   s. Filter-On
   t. Filter-Off
   u. Filter Backwashing
   v. Filter Rinsing
   w. Filter Clear for Wash
   x. Backwash Fault
   y. Extend Air Wash Light
   z. Extend Wash Light

Auxiliary Equipped Filter Control Console DLC-010

1. Analog Inputs
   a. Filter Influent Level
   b. Washwater Flow
   c. Airwash Flow
   d. Transfer Pump Discharge Pressure
   e. Transfer Pump Pressure Control Valve Position
   f.
   g.
   h.

Auxiliary Equipped Filter Control Console DLC-010

2. Analog Outputs
   a. Transfer Pump Discharge Header Pressure
   b.
   c.
   d.
   e.
   f.
   g.

Auxiliary Equipped Filter Control Console DLC-010

3. Digital Inputs
    a. Washwater Valve Open
    b. Washwater Valve Close
    c. Auxiliary Wash Control Valve Open
    d. Auxiliary Wash Control Valve Close
    e. Transfer Pump Pressure Control Valve Open
    f. Transfer Pump Pressure Control Valve Close
    g.
    h.
    i.
    j.

Auxiliary Equipped Filter Control Console DLC-010

4. Digital Outputs
   a. Washwater Valve Open
   b. Washwater Valve Close
   c. Auxiliary Wash Control Valve Open
   d. Auxiliary Wash Control Valve Close
   e. Transfer Pump Pressure Control Valve Open
   f. Transfer Pump Pressure Control Valve Close
   g.
   h.
   i.
   j.
   k.
   l.

Pulsator Control (DLC-011)

1. Analog Inputs
   a. Pulsator No. 1 Effluent Turbidity
   b. Pulsator No. 2 Effluent Turbidity
   c. Pulsator No. 3 Effluent Turbidity
   d. Pulsator No. 4 Effluent Turbidity (Future)
   e. Filter Influent Chlorine Residual
   f.
   g.
   h.
   i.

Pulsator Control (DLC-011)

2. Analog Outputs
    a.
    b.
    c.
    d.
    e.
    f.
    g.
    h.
    i.
    j.

Pulsator Control (DLC-011)

3. Digital Inputs
   a. Pulsator No. 1 Blow-down Valve A Open
   b. Pulsator No. 1 Blow-down Valve A Close
   c. Pulsator No. 1 Blow-down Valve B Open
   d. Pulsator No. 1 Blow-down Valve B Close
   e. Pulsator No. 1 Blow-down Valve C Open
   f. Pulsator No. 1 Blow-down Valve C Close
   g. Pulsator No. 1 Blow-down Valve D Open
   h. Pulsator No. 1 Blow-down Valve D Close
   i. Pulsator No. 2 Blow-down Valve A Open
   j. Pulsator No. 2 Blow-down Valve A Close
   k. Pulsator No. 2 Blow-down Valve B Open
   l. Pulsator No. 2 Blow-down Valve B Close
   m. Pulsator No. 2 Blow-down Valve C Open
   n. Pulsator No. 2 Blow-down Valve C Close
   o. Pulsator No. 2 Blow-down Valve D Open
   p. Pulsator No. 2 Blow-down Valve D Close
   q. Pulsator No. 3 Blow-down Valve A Open
   r. Pulsator No. 3 Blow-down Valve A Close
   s. Pulsator No. 3 Blow-down Valve B Open
   t. Pulsator No. 3 Blow-down Valve B Close
   u. Pulsator No. 3 Blow-down Valve C Open
   v. Pulsator No. 3 Blow-down Valve C Close
   w. Pulsator No. 3 Blow-down Valve D Open
   x. Pulsator No. 3 Blow-down Valve D Close
   y. Pulsator No. 4 Blow-down Valve A (Future)
   z. Pulsator No. 4 Blow-down Valve A (Future)
   aa. Pulsator No. 4 Blow-down Valve B (Future)
   ab. Pulsator No. 4 Blow-down Valve B (Future)
   ac. Pulsator No. 4 Blow-down Valve C (Future)
   ad. Pulsator No. 4 Blow-down Valve C (Future)
   ae. Pulsator No. 4 Blow-down Valve D (Future)
   af. Pulsator No. 4 Blow-down Valve D (Future)
   ag.
   ah.
   ai.
   aj.

Pulsator Control (DLC-011)

4. Digital Outputs
   a. Pulsator No. 1 Blow-down Valve A Open
   b. Pulsator No. 1 Blow-down Valve A Close
   c. Pulsator No. 1 Blow-down Valve B Open
   d. Pulsator No. 1 Blow-down Valve B Close
   e. Pulsator No. 1 Blow-down Valve C Open
   f. Pulsator No. 1 Blow-down Valve C Close
   g. Pulsator No. 1 Blow-down Valve D Open
   h. Pulsator No. 1 Blow-down Valve D Close
   i. Pulsator No. 2 Blow-down Valve A Open
   j. Pulsator No. 2 Blow-down Valve A Close
   k. Pulsator No. 2 Blow-down Valve B Open
   l. Pulsator No. 2 Blow-down Valve B Close
   m. Pulsator No. 2 Blow-down Valve C Open
   n. Pulsator No. 2 Blow-down Valve C Close
   o. Pulsator No. 2 Blow-down Valve D Open
   p. Pulsator No. 2 Blow-down Valve D Close
   q. Pulsator No. 3 Blow-down Valve A Open
   r. Pulsator No. 3 Blow-down Valve A Close
   s. Pulsator No. 3 Blow-down Valve B Open
   t. Pulsator No. 3 Blow-down Valve B Close
   u. Pulsator No. 3 Blow-down Valve C Open
   v. Pulsator No. 3 Blow-down Valve C Close
   w. Pulsator No. 3 Blow-down Valve D Open
   x. Pulsator No. 3 Blow-down Valve D Close
   y. Pulsator No. 4 Blow-down Valve A Open (Future)
   z. Pulsator No. 4 Blow-down Valve A Close (Future)
   aa. Pulsator No. 4 Blow-down Valve B Open (Future)
   ab. Pulsator No. 4 Blow-down Valve B Close (Future)
   ac. Pulsator No. 4 Blow-down Valve C Open (Future)
   ad. Pulsator No. 4 Blow-down Valve C Close (Future)
   ae. Pulsator No. 4 Blow-down Valve D Open (Future)
   af. Pulsator No. 4 Blow-down Valve D Close (Future)
   ag.
   ah.
   ai.
   aj.

Raw Water/High Service Pump Station (DLC-012)

1. Analog Inputs
   a. Raw Water Flow Magnetic Meter No. 1
   b. Raw Water Flow Magnetic Meter No. 2
   c. Raw Water Flow Control Valve No. 1 Position
   d. Raw Water Flow Control Valve No. 2 Position
   e. Raw Water Main No. 1 Pressure
   f. Raw Water Main No. 2 Pressure
   g. Raw Water Turbidity
   h. <u>**FUTURE INPUTS TO BE PROVIDED BY AWWSCO**</u>
   i.
   j.
   k.
   l.
   m.
   n.

Raw Water/High Service Pump Station (DLC-012)

1. Analog Outputs
    a. **FUTURE INPUTS TO BE PROVIDED BY AWWSCO**
    b.
    c.
    d.
    e.
    f.
    g.
    h.
    i.
    j.
    k.
    l.
    m.
    n.

Raw Water/High Service Pump Station (DLC-012)

1. Digital Inputs
   a. Raw Water Control Valve No. 1 Open
   b. Raw Water Control Valve No. 1 Closed
   c. Raw Water Control Valve No. 2 Open
   d. Raw Water Control Valve No. 2 Closed
   e. Raw Water Meter Chamber No. 1 High Level
   f. Raw Water Meter Chamber No. 2 High Level
   g. <u>**FUTURE INPUTS TO BE PROVIDED BY AWWSCO**</u>
   h.
   i.
   j.
   k.
   l.
   m.
   n.

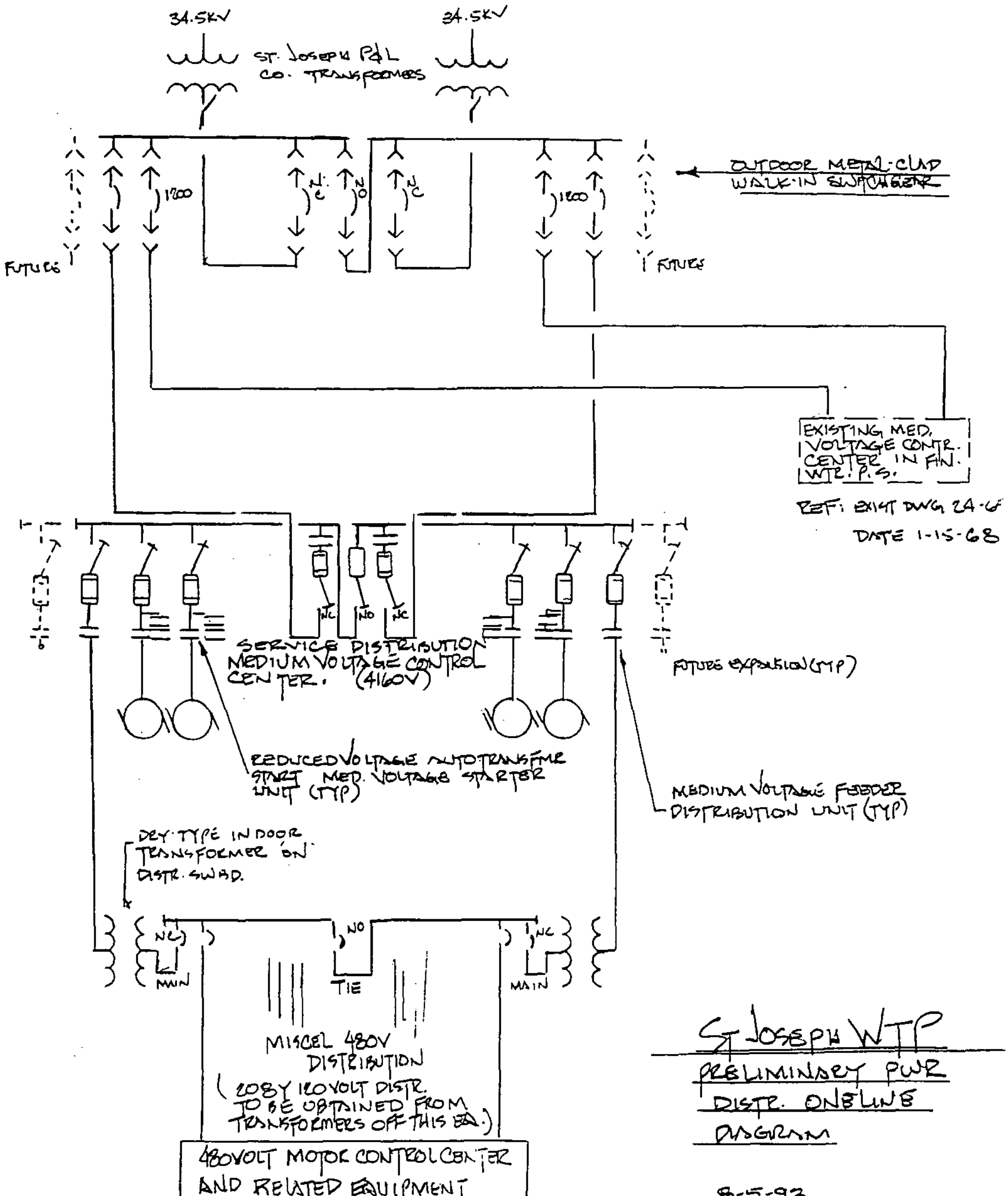
Raw Water/High Service Pump Station (DLC-012)

1. Digital Outputs
   a. Raw Water Control Valve No. 1 Open
   b. Raw Water Control Valve No. 1 Close
   c. Raw Water Control Valve No. 2 Open
   d. Raw Water Control Valve No. 2 Close
   e. <u>**FUTURE INPUTS TO BE PROVIDED BY AWWSCO**</u>
   f.
   g.
   h.
   i.
   j.
   k.
   l.
   m.
   n.

B:Stjolst.720\ssw

APPENDIX C

POWER DISTRIBUTION ONE-LINE DIAGRAM



St Joseph WTP

PRELIMINARY PWR DISTR. ONELINE DIAGRAM

8-5-93

APPENDIX D

INTERIM FOUNDATION RECOMMENDATIONS

MISSOURI-AMERICAN WATER COMPANY
ST. JOSEPH DISTRICT
ST. JOSEPH WATER TREATMENT PLANT IMPROVEMENTS
INTERIM FOUNDATION RECOMMENDATIONS

Pursuant to recommendations presented in the April 1993 Geotechnical Design Memorandum, a second phase of subsurface investigations at the subject site was performed in May and June 1993. The primary purpose of these investigations was to evaluate subsurface conditions within Sedimentation Basins 1 and 3, and to obtain additional soil samples for the laboratory testing needed to evaluate the feasibility of some form of shallow foundation system. Although laboratory testing is currently in progress, sufficient information was obtained from the borings themselves to allow foundation analyses to progress to the point where several conclusions and recommendations can be offered. This interim report presents those recommendations, describes associated construction activities, and discusses geotechnical design work still to be performed.

Foundation Conditions and Recommended Foundation Types

The Phase II investigations encountered varying conditions within the limits of proposed construction. These conditions will be discussed in detail in the final geotechnical report. With regard to foundation recommendations, however, the results of the investigations can be summarized by noting that upper layers of soft materials were encountered across virtually the entire limits of construction, and that these materials in their existing conditions are not suitable for support of structural loads. The depth of these unsuitable soils range from approximately 15 to 30 feet below preliminary foundation elevations, and they are underlain by soils dense enough to accept anticipated loadings without adverse consequence.

In light of the relatively shallow depth to competent bearing strata, and the significant cost of utilizing a deep foundation system extending to bedrock at depths of 55 to 70 feet, various soil improvement techniques were evaluated to determine if the upper soils could be strengthened sufficiently to provide adequate support. Improvement techniques including compaction grouting, jet grouting, vibro-flotation, and vibro-replacement were considered with regard to technical feasibility and cost. As a result of these evaluations, it is believed that the vibro-replacement technique is the most feasible and cost effective improvement technique for site conditions.

Vibro-Replacement Method

The vibro-replacement method of soil improvement incorporates several mechanisms to strengthen existing site soils, as well as to transfer some portion of the applied structure loads down to deeper, more competent bearing strata. Fieldwork basically consists of installing columns of compacted aggregate through the upper weak soil strata, and extending the columns to the underlying bearing strata. The methods used to install the stone columns also tend to densify and improve the soils left between the completed columns. When structure loads are subsequently applied, they are carried by a combination of bearing on the relatively rigid stone columns and the improved soils surrounding them. The relative proportion of applied loads carried by the columns and the soil will vary significantly depending upon the diameter of the columns, the properties of the native soils, and the techniques used during installation of the columns.

Given soil conditions at the subject site it is anticipated that the majority of the applied structure loads will be carried by the stone columns. As load is applied to the foundation subgrade the columns will initially carry almost all of the load, but the columns will settle to some degree as loads increase, thereby transferring load to the surrounding soil. As the soil subsequently settles, a portion of the applied load is reapplied to the columns. An equilibrium condition will eventually be reached where the columns and soil bear the applied loads in proportion to the final relative stiffness of the stone and soil materials. Some structure settlement will therefore occur as loads are applied, however, these settlements will be significantly less than would have occurred without column installation. Design of the treatment program is essentially a matter of selecting the column spacing, depth, and installation method which will limit post-construction settlements to acceptable magnitudes. Based on the available subsurface information, it is believed that 3 foot diameter columns installed on an 8 foot grid spacing will limit post-construction differential settlements to less than 1 inch. It is noted that this value does not reflect any beneficial effects of selective construction sequencing, preloading, or other mitigative measures which could presumably be used to offset to some degree the effects of post-construction settlements.

Installation Procedures

Although final column spacings and depths will depend somewhat upon the results of laboratory testing, the basic installation procedure most suitable to site conditions has been established. Given the presence of soft, cohesive soils through which the columns would be installed, an installation technique known as the "bottom feed" method is the most appropriate method. Heavy torpedo-shaped steel probes, approximately 20 feet long and 18 inches in diameter, would be lowered by crane through the upper soils at each column location until the top of the probe is resting on the underlying bearing strata. Once a probe is at the proper depth, clean coarse aggregate is fed into the top of the probe and forced out through an opening on the probe bottom by a combination of gravity and pneumatic pressure. The probe is raised 3 to 5 feet as each lift of aggregate is placed, and then lowered back through the aggregate to compact the stone as well as force it out into the surrounding soil. The probe is vibrated as it is lowered to enhance compaction and dispersion of the stone. The process of raising the probe, introducing aggregate, and then lowering the probe through the aggregate to densify and disperse the stone is repeated until the desired column diameter is obtained. Column diameter is monitored by measurement of the aggregate quantities placed in the column hole. The mechanical effort required to form the column is also monitored, primarily by observation of the amperage being drawn by the large electric motors used to vibrate the probe as it is lowered through the aggregate.

Field monitoring also includes performing load tests on installed columns, or column groups, to verify the required improvement has been achieved. Load tests would be performed after installation of the first columns to help determine if revision of column spacings or depths is required to achieve the design objective. Additional load tests would also be performed as installation progresses to continue to verify that the required improvement is being achieved.

The existing detention basin slabs at elevations of approximately 815 to 817 should be removed prior to beginning vibro-replacement work. It is anticipated the specialty subcontractor will elect to remove the existing basin subgrade down to within several feet of existing groundwater levels. A working platform of coarse aggregate would be placed to allow installation equipment to travel across the work area. Although structure foundation elevations will vary across the site it is expected that all stone columns would be installed from a working surface at approximately the elevation of the highest foundations. In areas where structure foundations were below the working surface elevation, the stone columns installed in these areas would terminate below the working surface at the appropriate foundation elevation.

Cost of Treatment

Although final column spacings and depths may be adjusted slightly based on the results of laboratory testing, any such revisions would be minor and should not significantly affect the cost of treatment. Based upon several discussions and meetings with representatives of Hayward-Baker, Inc., a vibro-displacement contractor, a construction cost of $900,000 is estimated for the treatment program as described herein. By comparison, the cost of a deep foundation system similar to the type used for the existing chemical building and north clearwell tank is estimated to be on the order of $2.8 million to $3.5 million. While there may be some additional construction cost associated with special structural measures or construction sequencing incorporated to help accommodate the anticipated post-construction settlements, the cost of such measures should not be of such magnitude as to make a deep foundation system economically competitive.

Remaining Geotechnical Design Work

Several significant items remain to be addressed during the remainder of final design. These items are briefly discussed below:

- Performance and Analysis of Laboratory Testing - The final grid spacing and depth of stone columns may be revised as a result of the laboratory testing yet to be performed. It is also possible that particularly favorable test results could warrant reconsidering the feasibility of shallow foundations on native soils with little or no improvement work for all or part of the project.

- Consideration of Hydrostatic Uplift - Depending upon the final foundation elevations and the floodwater elevation for which the structures must be designed, it is possible that some form of vertical restraint will be required to resist hydrostatic uplift forces. These could be in the form of additional slab concrete, or installation of rock anchors.

- Evaluation of Dewatering Requirements and Protection of Existing Structures - Dewatering methods and drawdown elevations, anticipated settlement of adjacent facilities, downdrag forces developed on existing deep foundation, and sheeting and shoring requirements must be evaluated.

- Preparation of Construction Specifications - Several aspects of the proposed construction, including performance of vibro-replacement, dewatering requirements, construction and load application sequencing, protection of existing facilities adjacent to excavations, settlement monitoring, and earthwork, will require attention during preparation of the contract documents.

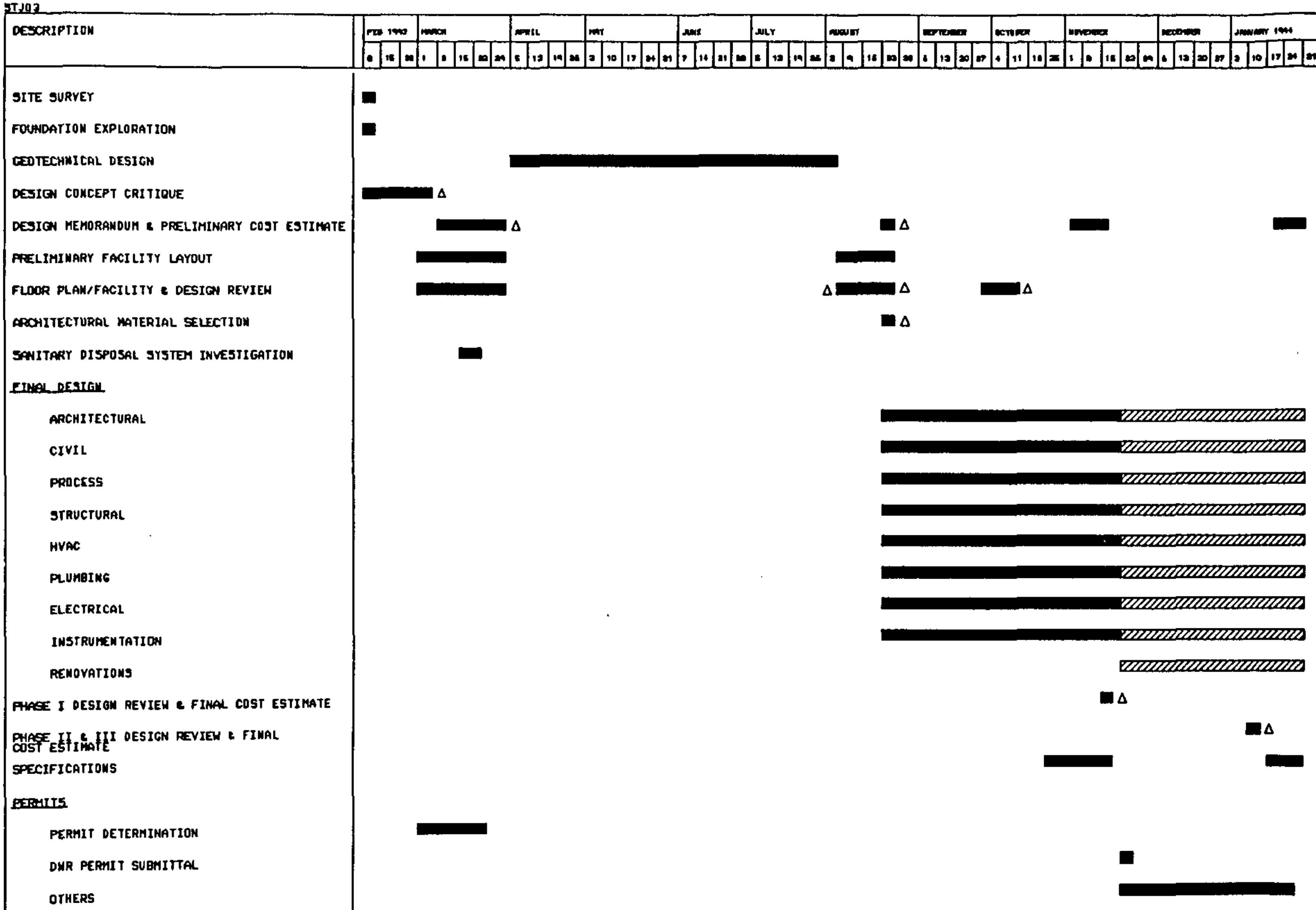
In summary, the proposed facilities can be supported on existing site soils following performance of vibro-displacement treatment of the upper layers of soft silts and clays. Preliminary cost estimates indicate implementation of the vibro-displacement treatment and a shallow foundation system will result in substantial cost savings over use of a deep foundation system. Special structural measures and construction sequencing will be required to mitigate the effects of post-construction settlements. Final design must also address hydrostatic uplift, construction dewatering, and protection of existing facilities adjacent to the construction area.

Gannett Fleming

APPENDIX E

DESIGN SCHEDULE BAR CHART

STJ03



△ SCHEDULED MEETING

PROGRESS

PHASE II

PHASE III & IV

ST. JOSEPH - MISSOURI

WATER TREATMENT PLANT IMPROVEMENTS

PROJECT ASSUMES 40 WEEK SHEDULE TO COMPLETE PHASE I DESIGN

AND 10 WEEKS ADDITIONAL TO COMPLETE PHASE II & III DESIGN.

RUN DATE 10AUG93
START DATE 08FEB93
DATA DATE 10AUG93
FINISH DATE 31JAN94

SURETRAK

MISSOURI-AMERICAN
WATER COMPANY

ST. JOSEPH DISTRICT

ST. JOSEPH

APPENDIX F

PRELIMINARY CONSTRUCION COST ESTIMATE

Gannett Fleming
ENGINEERS AND PLANNERS

GANNETT FLEMING, INC.
P.O. Box 67100
Harrisburg, PA 17106-7100
Location:
207 Senate Avenue
Camp Hill, PA 17011
Fax: (717) 763-1808
Office: (717) 763-7211

May 27, 1993

Mr. Steve Creel
American Water Works Service Company
1025 Laurel Oak Road
Voorhees, NJ 08043

Re: Project No. 28512 - Construction of Water Treatment Plant Improvements for Missouri-American Water Company, St. Joseph District, St. Joseph, MO

Dear Steve:

As a follow-up to our conversation of May 26, 1993, I am providing you with a cost breakdown for the various facilities proposed for this project. As previously noted to you, these summated values reflect a construction cost projected for bidding this project in December of 1993. The costs do not include contingencies, however, we feel that we have estimated this project conservatively so that a large contingency factor need not be added at this time. Should you require additional cost breakdowns for process related equipment, please feel free to contact me.

Very truly yours,

GANNETT FLEMING, INC.
Water Resources and Geotechnical Division

LAURENCE S. ZIMMERMANN
Project Manager, Water Supply Section

cc: File 28512

A Tradition of Excellence Since 1915

Electrical -		$ 2,425,000
HVAC -		776,000
Plumbing -		505,000
Instrumentation		1,550,000

Site Work:

Tank & Fdn.	1,940,000	
Bldg. Fdns.	2,910,000	
Raw Water Main & Meters	190,000	
Settled Water	285,000	
Transfer Pipe/H.S. Suction	402,000	
H.S. Discharge	52,000	
Waste water Line	102,000	
Overflow	37,000	
Sanitary Facilities	24,000	
Pulsator Drain lines/valves	122,000	
Pre Sed Basin Mods.	58,000	
Chem feed lines to intake	92,000	
Spill Containment System	15,000	
Storm Water System	48,000	
Soil Erosion & Control	19,000	
Utility Relocations	48,000	
Paving	37,000	
Curbs	10,000	
Sidewalks	7,000	
Structural Excavation/Backfill	182,000	
Demolition - Basin #1,2,3 + Filter Bldg	493,000	
Topsoil Seeding	10,000	
Landscaping	48,000	
Site Dewatering - Well Pts	194,000	
Puls. temp flume	25,000	
		7,350,000
Total This Page		$ 12,606,000

1. Pulsators

Concrete	1,273,000
Superstructure	754,000
Process	1,600,000
	$ 3,627,000

2. Chemical Bldg

Concrete	836,000
Superstructure	1,051,000
Process	2,448,000
	$ 4,335,000

3. Filter Bldg / Clearwell

Concrete	1,288,000
Superstructure	665,000
Process	2,540,000
	$ 4,493,000

4. Transfer / H.S Pump Station

Concrete	305,000
Superstructure	365,000
Process	899,000
	$ 1,569,000

Total This Page: $ 14,024,000

GRAND TOTAL $ 26,630,000