

2. To: (Receiving Organization) Distribution	3. From: (Originating Organization) 200/300 Area Projects	4. Related EDT No.: NA
5. Proj./Prog./Dept./Div.: 200-UP-1 TREATABILITY TEST	6. Cog. Engr.: J. W. Green	7. Purchase Order No.: NA
8. Originator Remarks: For release/distribution		9. Equip./Component No.: NA
		10. System/Bldg./Facility: NA
11. Receiver Remarks:		12. Major Assm. Dwg. No.: NA
		13. Permit/Permit Application No.: NA
		14. Required Response Date: NA

15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Impact Level	Reason for Transmittal	Originator Disposition	Receiver Disposition
1	WHC-SD-EN-SPP-004	NA	0	Pilot-scale Groundwater Treatment System Acceptance Test/Operational Test Procedure	4	1,3	/	

16. KEY		
Impact Level (F)	Reason for Transmittal (G)	Disposition (H) & (I)
1, 2, 3, or 4 (see MRP 5.43)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Impact Level for required signatures)													
(G)	(H)	(J) Name (K) Signature (L) Date (M) MSIN					(J) Name (K) Signature (L) Date (M) MSIN					(G)	(H)
Reason	Disp.											Reason	Disp.
1	/	Cog. Eng. J. W. Green <i>JWGreen</i> 3/30/94											
1	/	Cog. Mgr. R. A. Carlson <i>RACarlson</i> 3/30/94											
3		QA R. R. True											
3		Safety D. B. Tullis											
		Env.											



18. <i>JWGreen</i> Signature of EDT Originator Date: 3/30/94	19. _____ Authorized Representative Date for Receiving Organization	20. <i>RACarlson</i> Cognizant/Project Engineer's Manager Date: 3/30/94	21. DOE APPROVAL (if required) Ltr. No. <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/comments <input type="checkbox"/> Disapproved w/comments
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Date Received  
**3/30/94**

**INFORMATION RELEASE REQUEST**

Reference:  
 WHC-CM-3-4

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Title: Pilot-Scale Groundwater Treatment System Acceptance Test/Operational Test Procedure	Unclassified Category <b>UC-</b>	Impact Level <b>NA</b>
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New or novel (patentable) subject matter? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes If "Yes", has disclosure been submitted by WHC or other company? <input type="checkbox"/> No <input type="checkbox"/> Yes Disclosure No(s).	Information received from others in confidence, such as proprietary data, trade secrets, and/or inventions? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (Identify)
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Date(s) of Conference or Meeting	City/State	Will proceedings be published? <input type="checkbox"/> Yes <input type="checkbox"/> No Will material be handed out? <input type="checkbox"/> Yes <input type="checkbox"/> No
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Title of Journal  
**N/A**

**CHECKLIST FOR SIGNATORIES**

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			Name (printed)	Signature	Date
Classification/Unclassified Controlled Nuclear Information	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
Patent - General Counsel	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<i>OGC Memo 2/4/93 - G. Stone</i>	<i>G. Stone</i>	<i>3/30/94</i>
Legal - General Counsel	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<i>" " - G. Stone</i>	<i>G. Stone</i>	<i>3/30/90</i>
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Publication Services	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<i>L. S. Hermann</i>	<i>L. S. Hermann</i>	<i>3/30/94</i>
Other Program/Project	<input type="checkbox"/>	<input checked="" type="checkbox"/>			

Information conforms to all applicable requirements. The above information is certified to be correct.

References Available to Intended Audience Transmit to DOE-HQ/Office of Scientific and Technical Information <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Author/Requester (Printed/Signature) Date <b>J. W. Green</b> <i>J. W. Green</i> <b>3/30/94</b>
Intended Audience <input type="checkbox"/> Internal <input type="checkbox"/> Sponsor <input checked="" type="checkbox"/> External	Responsible Manager (Printed/Signature) Date <b>R. A. Carlson</b> <i>RA Carlson</i> <b>3/30/94</b>

<b>INFORMATION RELEASE ADMINISTRATION APPROVAL STAMP</b>	
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SUPPORTING DOCUMENT

1. Total Pages 18

2. Title

Pilot-Scale Groundwater Treatment System  
Acceptance Test/Operational Test Procedure

3. Number

WHC-SD-EN-SPP-004

4. Rev No.

0

5. Key Words

testing, water treatment system

6. Author

Name: J. W. Green

Signature

Organization/Charge Code  
8C100/PU4GA

APPROVED FOR  
PUBLIC RELEASE

3/30/94 N. S. O. W.

7. Abstract

Green, J. W., 1994, *Pilot-Scale Groundwater Treatment System Acceptance Test/Operational Test Procedure*, WHC-SD-EN-SPP-004, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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10. RELEASE STAMP

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Station # 12

9. Impact Level 4

PILOT-SCALE GROUNDWATER TREATMENT SYSTEM  
ACCEPTANCE TEST/OPERATIONAL TEST PROCEDURE

Revision No. 0

Issue Date 3-30-94

Impact Level 4

Prepared by: J. W. Green

Approved by: \_\_\_\_\_

Approved by: \_\_\_\_\_

INDEX

- 1.0 General
- 2.0 Equipment Set-Up
- 3.0 Component Inspection and Documentation
- 4.0 Acceptance Test Procedure
- 5.0 Operational Test Procedure
- 6.0 Instrument and Process Control Test
- 7.0 Fail-Safe Motor Operated Valves

**PILOT-SCALE GROUNDWATER TREATMENT SYSTEM  
ACCEPTANCE TEST/OPERATIONAL TEST PROCEDURE**

1.0 General

- 1.1 The purpose of this procedure is to outline the various steps necessary to verify the operability and completeness of the treatment system equipment, and that the system is installed in accordance with the design drawings. The procedure will also define steps to be taken to simulate various design parameters (e.g., pressure drop, level, etc.) for verification of responses.
- 1.2 Prior to the Functional Acceptance Test, all available instrumentation, wiring, and controls will have been installed and tested for loop integrity.
- 1.3 The Pilot-Scale Treatment System will start up in two phases: Phase 1 will be manual operation where flows will be established under manual control, and pressure gages and available installed instrumentation will be used for process and analytical monitoring of the system. The system will be operated on an 8 hour/day basis. Therefore, performance of the Phase 1 Acceptance Test Procedure (ATP)/Operational Test Procedure (ATP/OTP) will not check Phase 2 equipment. Phase 2 operations will be initiated after installation of all instrumentation and interlocks. Phase 2 operation will commence operation of the well pumps for filling and emptying of influent and effluent storage tanks on a 24 hour/day basis. Therefore, the Phase 2 ATP/OTP will be performed after all equipment is installed, and prior to initiation of Phase 2 operations.
- 1.4 Phase I system operation is a manual operated system, as shown by WHC (Westinghouse Hanford Company) drawing number 122893-D. It omits the following components:
  - Level Interlocks
  - Fail-Safe Motor Automated Valves
  - Acid Adjustment System
  - pH Adjustment System
  - Pressure Differential Instrumentation (pressure gages will be installed at the inlets and outlets of filters and IX Columns to monitor differential pressure).
  - Oxygen Scavenging System (includes sodium sulfite feed system and control system based on oxidation/reduction potential [ORP] monitors).

2.0 Equipment Set-Up

Set up the influent and effluent pump skids, and the process system skid for performing the acceptance and operational tests per the following.

- 2.1 Position the skids approximately as shown on the site plan and connect between the skids with quick disconnect hoses as follows:
  - 2.1.1 - Connect the extraction well pump discharge to the influent storage tank inlet;
  - 2.1.2 - Connect the influent storage tank outlet to the influent pump skid suction;
  - 2.1.3 - Connect the influent pump skid discharge to the process system skid inlet;
  - 2.1.4 - Connect the process system skid discharge to the effluent storage tank inlet;
  - 2.1.5 - Connect the effluent storage tank outlet to the effluent pump skid suction; and
  - 2.1.6 - Connect the effluent pump skid discharge to the disposal well.
  
- 2.2 For Phase 1, verify that the temporary pressure gauges for monitoring differential pressures of the influent and effluent filters, and the IX columns are operable. In addition, verify that the influent and effluent storage tank sight gages are operable.

Acceptable \_\_\_\_\_ Not Acceptable \_\_\_\_\_
  
- 2.3 Verify that all instrument cables between sensors and monitors are connected.

Acceptable \_\_\_\_\_ Not Acceptable \_\_\_\_\_
  
- 2.4 Verify that all electrical supply and interface connections are connected per drawings WHC292A, WHC292B, WHC292C, and WHC292D (Attachment 1).

Acceptable \_\_\_\_\_ Not Acceptable \_\_\_\_\_
  
- 2.5 Verify that filter cartridges are installed in each filter housing.

Acceptable \_\_\_\_\_ Not Acceptable \_\_\_\_\_

2.6 Verify that ion exchange resin is loaded in IX columns. Note: Proper fill depth is to the bottom edge of the manway.

Acceptable \_\_\_\_\_ Not Acceptable \_\_\_\_\_

3.0 Component Inspection and Documentation

3.1 Mechanical

Refer to process flow diagram, drawing number 122893-A, or for Phase 1 - drawing number 122893-D, and the process and instrument diagram drawing number 122293-K and 122293-L. After the equipment has been set-up, perform an equipment inspection and verify that all components are installed according to drawings. If the drawings do not represent the actual installation, as-built the drawings. Utilize the equipment listed under Section 3.2 below for equipment component check.

Acceptable \_\_\_\_\_ Not Acceptable \_\_\_\_\_

3.2 Documentation

Verify that vendor information is available for the following equipment. The vendor information will be placed in the project files.

- |        |  |                   |
|--------|--|-------------------|
| 3.2.1  | Extraction Well Pump   |                   |
| 3.2.2  | Feed Pumps   |                   |
| 3.2.3  | Acid Metering Pump   | Phase 1 N/A _____ |
| 3.2.4  | Caustic Metering Pump  | Phase 1 N/A _____ |
| 3.2.5  | Oxygen Scavenging Chemical Metering Pump                                   | Phase 1 N/A _____ |
| 3.2.6  | Effluent Pumps   |                   |
| 3.2.7  | Filters, Influent and Effluent   |                   |
| 3.2.8  | Ion Exchange Columns   |                   |
| 3.2.9  | Influent/Effluent Storage Tanks  |                   |
| 3.2.10 | Acid Storage Tank  | Phase 1 N/A _____ |
| 3.2.11 | Caustic Storage Tank   | Phase 1 N/A _____ |
| 3.2.12 | Oxygen Scavenger Chemical Storage Tank                                     | Phase 1 N/A _____ |
| 3.2.13 | Fail-Safe Motor Operated Ball Valve  | Phase 1 N/A _____ |
| 3.2.14 | Air Release Valves   |                   |
| 3.2.15 | Flowmeters   |                   |
| 3.2.16 | Flow Switches  |                   |
| 3.2.17 | Level Indicators/Controls  | Phase 1 N/A _____ |
| 3.2.18 | Pressure Indicator/Transmitters<br>(substitute pressure gages for Phase 1) | Phase 1 N/A _____ |

3.2.19	Differential Pressure Indicator/Transmitter (substitute pressure gages - Phase 1)	Phase I N/A _____
3.2.20	Temperature Indicator/Transmitter	Phase I N/A _____
3.2.21	Dissolved Oxygen Monitor	
3.2.22	Turbidity Monitor	
3.2.23	Oxidation/Reduction Potential Monitor	Phase I N/A _____
3.2.24	pH Indicator/Transmitter	
3.2.25	Flex Hose	
3.2.26	Flexible Connectors	
3.2.27	Static Mixers	Phase I N/A _____

Acceptable \_\_\_\_\_ Not Acceptable \_\_\_\_\_

3.3 Electrical Refer to electrical power drawing EDJB004 (Attachment 2). Verify that electrical installation is complete. Verification includes checking for installation in accordance with the National Electrical Code (NEC).

3.3.1 Verify installation of power feed from generator to main control panel.

Acceptable \_\_\_\_\_ Not Acceptable \_\_\_\_\_

3.3.2 Verify installation of 480 VAC, 3 phase power feed from main control panel to the following pumps:

- Extraction well pump
- Influent pump station
- Effluent pump station

Acceptable \_\_\_\_\_ Not Acceptable \_\_\_\_\_

3.3.3 Verify 120 VAC auxiliary/control wiring to:

- Extraction well pump
- Influent storage tank
- Influent pumping station
- Process treatment system
- Effluent storage tank
- Effluent pumping station

- Recirculation well

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_

3.3.4 Verify installation of 240 VAC, single phase power feed

- Acid metering pumpPhase I N/A \_\_\_\_\_
- Caustic metering pump Phase I N/A \_\_\_\_\_
- Oxygen scavenger metering pumpPhase I N/A \_\_\_\_\_
- Receptacle for Air Compressor

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_

3.3.5 Verify signal wiring from transmitters to main control panel.

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_

3.3.6 Grounding system

- Verify that the process system skid is properly grounded.

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_

- Verify that the influent pumping station is properly grounded

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_

- Verify that the effluent pumping station is properly grounded

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_

- Verify that the power generator is properly grounded

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_

- 3.3.7 Power source check, generator - (Note: the generator is not new to this system and has previously been operated at other locations, but it is prudent to verify that the generator output is 480 VAC, 3 phase, 60 HZ to assure compatibility with load).

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_

- 3.3.8 Instrument panel - test annunciators, alarms, and reset for proper operation.

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_

#### 4.0 Acceptance Test Procedure

This portion of the test procedure will establish flow through process components to verify operability. This test will verify operability of pumps, verify interlocks and their shutdown capabilities, test fail-safe motor operated valves for closure on power failure, and test emergency shutdown switch.

#### 4.1 Pumps (Prior to starting pumps, verify proper rotation)

##### 4.1.1 Extraction Well Pump

- Open motor operated ball valve, MBV-1 (for Phase 1 open ball valve next to MBV-1).
- Start extraction well pump.
- Watch for flow at FIT-1.

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_

##### 4.1.2 Influent Pump (Note: The influent storage tank must have liquid in the tank for this test).

- Open MBV-2 (outlet from the influent storage tank) and MBV-5 (inlet to the effluent storage tank). Note: For Phase 1 open manual ball valves at the outlet of the influent tank and the inlet of the effluent tank.
- Start influent pump.
- Watch for flow at FIT-2

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_

4.1.3 Effluent pump (Note: The effluent storage tank must have liquid in the tank for this test).

- Open MBV-6 (outlet from the effluent storage tank).  
For Phase 1 open the manual ball valve next to MBV-6.
- Start effluent pump.
- Watch for flow at FIT-3.

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_

4.1.4 Metering pump, acid

- Open valve on discharge side of pump
- Start pump.
- Verify pump operation by correct rotation of pump or motor shaft.

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_ Phase I N/A\_\_\_\_\_

4.1.5 Metering pump, caustic

- Open valve on discharge side of pump
- Start pump
- Verify pump operation by correct rotation of pump or motor shaft

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_ Phase I N/A\_\_\_\_\_

4.1.6 Metering pump, oxygen scavenger chemical

- Open valve on discharge of pump.
- Start pump.
- Verify pump operation by correct rotation of pump or motor shaft

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_ Phase I N/A\_\_\_\_\_

4.2 Level switches

The level switches will be functionally checked by shorting out the input to the level control relay and checking for actuation of the appropriate level control relay.

	Accept	Not Accept	Phase 1 N/A
LSL-1	_____	_____	_____
LSL-2	_____	_____	_____
LSL-3	_____	_____	_____
LSL-4	_____	_____	_____
LSL-5	_____	_____	_____
LSL-6	_____	_____	_____
LSH-1	_____	_____	_____
LSH-2	_____	_____	_____
LSL-3	_____	_____	_____
LSHH-1	_____	_____	_____
LSHH-2	_____	_____	_____

4.3 Flow switches

The flow switches will be functionally tested by manually retracting the paddle to represent a flowing condition and checking for actuation of the associated control relay.

	Accept	Not Accept
FS-1	_____	_____
FS-2	_____	_____
FS-3	_____	_____
FS-4	_____	_____
FS-5	_____	_____
FS-6	_____	_____

5.0 Operational Test Procedure

In this portion of the test procedure, the process treatment system will be configured and flow established to verify operability. Align valves to allow establishing flow from the extraction well pump to the influent storage tank, then from either of the influent pumps through either of the filters and two IX columns in series flow and on to the effluent storage tank. Then when the effluent storage tank contains sufficient water establish flow via the effluent pumps to the disposal well.

Note: Phase 1 will establish flow by manually aligning valves, starting pumps, monitoring the level of storage tanks via sight glasses and differential pressure of filters and IX columns via pressure gages.

5.1 Starting Extraction Well Pump

5.1.1 Open motorized ball valve, MBV-1 in "Manual" mode.

5.1.2 Start the extraction well pump by holding in the "Start" pushbutton until flow is established. Watch for flow on FIT-1 and makeup of Flow Switch FS-1, then release the pushbutton.

Acceptable \_\_\_\_\_ Not Acceptable \_\_\_\_\_ Phase I N/A \_\_\_\_\_

5.1.3 Set MBV-1 selector switch to "Auto" which brings in the Interlocks for shutting off the pump as described in the Logic Description (Appendix).

Acceptable \_\_\_\_\_ Not Acceptable \_\_\_\_\_ Phase I N/A \_\_\_\_\_

5.1.4 Verify that the following lights on the annunciator panel are not illuminated:

- Influent Storage Tank Level, "High"
- Extraction Well Level, "Low"
- FS-1
- Influent Storage Tank Level, "High High"

Acceptable \_\_\_\_\_ Not Acceptable \_\_\_\_\_ Phase I N/A \_\_\_\_\_

5.2 Establishing Flow from the Influent Storage Tank

5.2.1 When the influent storage tank is at an appropriate level, open MBV-2 in the "Manual" mode and start either influent pump P-2A or P-2B by holding in the "Start" pushbutton until flow is established. Watch for flow on FIT-2 and makeup of FS-2 and FS-3.

Acceptable \_\_\_\_\_ Not Acceptable \_\_\_\_\_ Phase I N/A \_\_\_\_\_

5.2.2 Switch MBV-2 to "Auto" when the flow is established and open MBV-5 in the "Manual" mode to allow flow from the influent pumps through the filters and IX columns to the effluent storage tank. When flow starts to fill the effluent storage tank, switch MBV-5 to "Auto".

Acceptable \_\_\_\_\_ Not Acceptable \_\_\_\_\_ Phase I N/A \_\_\_\_\_

5.2.3 Verify that the following lights on the annunciator panel are not illuminated.

FS-2

FS-3

FS-4

Influent Storage Tank Level, "Low"

Effluent Storage Tank Level, "High"

Effluent Storage Tank Level, "High High"

Acceptable \_\_\_\_\_ Not Acceptable \_\_\_\_\_ Phase I N/A \_\_\_\_\_

5.2.4 When flow has been established for a time, take readings of: flow, pressure and pressure differential, on filters and IX columns.

Phase I N/A \_\_\_\_\_ (substitute pressure gages)

Flow Readings: \_\_\_\_\_

Pressure Readings: \_\_\_\_\_

Differential Pressure Readings: \_\_\_\_\_

\_\_\_\_\_

Acceptable \_\_\_\_\_ Not Acceptable \_\_\_\_\_ Phase I N/A \_\_\_\_\_

5.3 Starting effluent pump

- 5.3.1 Open MBV-6 in the "Manual" mode
- 5.3.2 Start either Pump P-5A or P-5B by holding in the "Start" pushbutton until flow is established. Watch for flow on FIT-3 and makeup of FS-5. After flow is established, switch MBV-6 to the "Auto" position.
- 5.3.3 Verify that the following annunciator lights on the annunciator panel are not illuminated:  
  
Disposal Well Level, "High"  
Effluent Storage Tank Level, "Low"  
FS-5  
FS-6
- 5.3.4 When flow has been established for a time, take readings of: flow, pressure and pressure differential, on the filters.

Flow Readings: \_\_\_\_\_

Pressure Readings: \_\_\_\_\_

Differential Pressure Readings: \_\_\_\_\_

\_\_\_\_\_

Phase I N/A \_\_\_\_\_ (substitute pressure gages)

Acceptable \_\_\_\_\_ Not Acceptable \_\_\_\_\_ Phase I N/A \_\_\_\_\_

6.0 Instrument and Process Control Test

- 6.1 This portion of the test procedure will test the control system interlocks.
- 6.2 Each interlock will be tested by shorting out the appropriate relays and verify that the each will stop the appropriate pump or close the appropriate valve (see Logic Description).

6.3 Start extraction well pump, restart after each test.

	Action	Acceptable	Not Acceptable
LSL-1 (Low Level, Extraction Well)	Stop P-1	_____	_____
LSH-1 (High Level, Influent Tank)	Stop P-1	_____	_____
LSHH-1 (High-High Level, " " )	Stop P-1	_____	_____
FS-1 (Low Flow, Extraction Pump)	Stop P-1	_____	_____

6.4 Start Influent Pumps P-2A or P-2B, restart after each test.

	Action	Acceptable	Not Acceptable
LSL-2 (Low Level, Influent Tank)	Stop P-2A/B	_____	_____
LSH-2 (High Level, Effluent Tank)	Stop P-2A/B	_____	_____
LSHH-2 (Level, Effluent Tank)	Stop P-2A/B	_____	_____
FS-2 (Low/No Flow, Influent Pumps)	Stop P-2A/B	_____	_____
FS-3 (No Flow, Hose to Process Skid)	Stop P-2A/B	_____	_____
FS-4 (No Flow, Hose to Effluent Tank)	Stop P-2A/B	_____	_____

6.5 Start Effluent Pumps P-2A or P-2B, restart after each test.

	Action	Acceptable	Not Acceptable
LSH-3 (High Level, Return Well)	Stop P-5A	_____	_____
FS-5 (No Flow, Hose to Effluent Skid)	Stop P-5A	_____	_____
FS-6 (No Flow, Hose to Well)	Stop P-5A	_____	_____

7.0 Fail-Safe Motor Operated Valves

The fail-safe motor operated ball valves will be tested to verify the capability of closing on loss of power, and for the ability to be actuated via the battery pack after a power failure. The battery pack consists of a 24 VDC battery that is the backup power source for the 24 VDC motor that operates the valve, and has a charger that keeps the battery charged when normal power (120 VAC) is on.

Note: These valves will not be used during Phase 1 operations.

7.1 The fail-safe feature of motor operated ball valves MBV-1, MBV-2, MBV-5 and MBV-6 will be tested for closure on loss of power. These valves are located at the influent and effluent tanks, and are to prevent spilling of tank contents to the ground in the event of a power failure. These valves will be checked in the manual and automatic modes.

7.2 MBV-1, Manual Mode

- 7.2.1 Set MBV-1 "Manual-Auto" switch to "Manual", then set the "Open-Off-Close" switch to "Open" to open valve.
- 7.2.2 Verify that valve is open, then close panelboard circuit breaker for MBV-1.
- 7.2.3 Verify closure of valve on loss of power.

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_ Phase I N/A\_\_\_\_\_

7.3 MBV-1, Automatic Mode

- 7.3.1 Set MBV-1 "Manual-Auto" switch to "Auto", then set the "Open-Off-Close" switch to "Open".
- 7.3.2 Start Pump P-1 (Well Pump) and watch for valve to open.
- 7.3.3 Close panelboard circuit breaker for MBV-1 and verify closure of valve on loss of power.
- 7.3.4 Open panelboard circuit breaker to open valve, then shut off Well Pump P-1 and verify that valve closes when P-1 shuts down.

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_ Phase I N/A\_\_\_\_\_

7.4 MBV-2, Manual Mode

- 7.4.1 Set MBV-2 "Manual-Auto" switch to "Manual", then set the "Open-Off-Close" switch to "Open" to open valve.
- 7.4.2 Verify that valve is open, then close panelboard circuit breaker for MBV-2.
- 7.4.3 Verify closure of valve on loss of power.

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_ Phase I N/A\_\_\_\_\_

7.5 MBV-2, Automatic Mode

- 7.5.1 Set MBV-2 "Manual-Auto" switch to "Auto", then set the "Open-Off-Close" switch to "Open".
- 7.5.2 Start Influent Pump P-2A, or P-2B (Note: These pumps are wired so that both cannot be started at the same time) and watch for valve to open.
- 7.5.3 Close panelboard circuit breaker for MBV-2 and verify closure of valve on loss of power.
- 7.5.4 Open panelboard circuit breaker to open valve, then shut off whichever pump is running, P-2A or P-2B, and verify that valve closes when pump shuts down.

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_ Phase I N/A\_\_\_\_\_

7.6 MBV-5, Manual Mode

- 7.6.1 Set MBV-5 "Manual-Auto" switch to "Manual", then set the "Open-Off-Close" switch to "Open" to open valve.
- 7.6.2 Verify that valve is open, then close panelboard circuit breaker for MBV-5.
- 7.6.3 Verify closure of valve on loss of power.

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_ Phase I N/A\_\_\_\_\_

7.7 MBV-5, Automatic Mode

- 7.7.1 Set MBV-5 "Manual-Auto" switch to "Auto", then set the "Open-Off-Close" switch to "Open".
- 7.7.2 Start Influent Pump P-2A, or P-2B (Note: These pumps are wired so that both cannot be started at the same time) and watch for valve to open.
- 7.7.3 Close panelboard circuit breaker for MBV-5 and verify closure of valve on loss of power.
- 7.7.4 Open panelboard circuit breaker to open valve, then shut off whichever pump is running, P-2A or P-2B, and verify that valve closes when pump shuts down.

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_ Phase I N/A\_\_\_\_\_

7.8 MBV-6, Manual Mode

- 7.8.1 Set MBV-6 "Manual-Auto" switch to "Manual", then set the "Open-Off-Close" switch to "Open" to open valve.
- 7.8.2 Verify that valve is open, then close panelboard circuit breaker for MBV-6.
- 7.8.3 Verify closure of valve on loss of power.

Acceptable\_\_\_\_\_ Not Acceptable\_\_\_\_\_ Phase I N/A\_\_\_\_\_

7.9 MBV-6, Automatic Mode

- 7.9.1 Set MBV-6 "Manual-Auto" switch to "Auto", then set the "Open-Off-Close" switch to "Open".
- 7.9.2 Start Effluent Pump P-5A, or P-5B (Note: These pumps are wired so that both cannot be started at the same time) and watch for valve to open.
- 7.9.3 Close panelboard circuit breaker for MBV-6 and verify closure of valve on loss of power.
- 7.9.4 Open panelboard circuit breaker to open valve, then shut off whichever pump is running, P-5A or P-5B, and verify that valve closes when pump shuts down.

Acceptable \_\_\_\_\_ Not Acceptable \_\_\_\_\_ Phase I N/A \_\_\_\_\_

8.0 Emergency Shutdown Switches

- 8.1 The emergency shutdown switch (or switches) will shutdown the treatment system in case of an emergency. Items included in this emergency shutdown include the well pump, influent pumps, effluent pumps, chemical metering pumps and mixer motors, and fail-safe motor operated valves (MBV-1, MBV-2, MBV-5 & MBV-7).
- 8.2 Verify system is operating: well pump (P-1), influent pump (P-2A or 2B), and effluent pump (P-5A or 5B), and chemical metering pumps and mixers (if applicable) are running, and that fail-safe motor operated valves are open.
- 8.3 Actuate emergency shutdown switch(es) and verify shutdown of pumps and closure of valves.

	Acceptable	Not Acceptable
P-1	_____	_____
P-2A/2B	_____	_____
P-5A/5B	_____	_____
MBV-1	_____	_____
MBV-2	_____	_____
MBV-5	_____	_____
MBV-7	_____	_____

