DISTRIBUTION SHEET

To	From	Page 1 of 1	
Distribution	Equipment Engineering	Date 11/09/94	
Project Title/Work Order		EDT No. 608185	
SNFP/K Basin Engineering Project		ECN No. N/A	

Name	MSIN	Text With All Attach.	Text Only	Attach./Appendix Only	EDT/ECN Only
C. J. Alderman	N1-21	X			
S. C. Anglesey	X2-15	X			
A. E. Bridges	L5-01	X			
S. A. Brisbin	N1-21	X			
J. B. Crystal	R3-86	X			
J. I. Dearing	N1-32	X			
J. I. Diehl	X3-71	X			
L. V. Feigenbutz	N1-21	X			
J. R. Frederickson	R3-86	X			
M. A. Jensen	X3-77	X			
M. J. Langerin	X3-74	X			
J. D. Mathews	X3-61	X			
L. M. McWethy	N1-21	X			
M. J. Packer (2)	N1-21	X			
K. L. Pearce	L6-37	X			
D. R. Precechtel	N1-21	X			
J. P. Schmidt	X3-78	X			
D. W. Smith	R3-85	X			
M. J. Wiemers	R3-86	X			
SNF Project File	N1-31	X			
Central Files (Original +2)	L8-04	X			
OSTI (2)	L8-07	X			
Station 11	N1-33 *				X
* IRR, EDT, SD Cover Sheet only					

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

2. To: (Receiving Organization) Distribution		3. From: (Originating Organization) Equipment Engineering		4. Related EDT No.: N/A	
5. Proj./Prog./Dept./Div.: SNFP		6. Cog. Engr.: M. J. Packer		7. Purchase Order No.: N/A	
8. Originator Remarks: Transmitted for approval and release.				9. Equip./Component No.: Sludge pumping system	
				10. System/Bldg./Facility: 105-KE Basin/100K	
11. Receiver Remarks:				12. Major Assm. Dwg. No.: N/A	
				13. Permit/Permit Application No.: N/A	
				14. Required Response Date: 11/18/94	

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	Approval Designator	Reason for Transmittal	Originator Disposition	Receiver Disposition
1	WHC-SD-SNF-TRP-001		0	Cold Test Data for Equipment Acceptance into 105-KE Basin	Q,S	1,2	1	

16. KEY					
Approval Designator (F)		Reason for Transmittal (G)		Disposition (H) & (I)	
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)		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 Approval Designator for required signatures)										(G)	(H)
(G)	(H)	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	Reason	Disp.
1,2	1	Cog.Eng. M. J. Packer	<i>[Signature]</i>	11/11/94	N1-21						
1,2	1	Cog. Mgr. C. J. Alderman	<i>[Signature]</i>	11/12/94	N1-21						
1,2	1	QA D. W. Smith	<i>[Signature]</i>	11/11/94	R3-85						
1,2	1	Safety M. A. Jensen	<i>[Signature]</i>	11/16/94	X3-77						
		Env.									
3		M. J. Wiemers			R3-86						
1,2	1	K-Basin Cog. Eng. M. J. Langevin	<i>[Signature]</i>	11/17/94	X3-74						

18. M. J. Packer <i>[Signature]</i> 11/11/94 Signature of EDT Originator		19. <i>[Signature]</i> 11/12/94 Authorized Representative for Receiving Organization		20. C. J. Alderman <i>[Signature]</i> 11/12/94 Supervising Manager		21. DOE APPROVAL (if required) Ctrl. No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments	
---	--	--	--	---	--	---	--

SUPPORTING DOCUMENT		1. Total Pages 46
2. Title Cold Test Data for Equipment Acceptance into 105-KE Basin	3. Number WHC-SD-SNF-TRP-001	4. Rev No. 0
5. Key Words 105-KE Basin, Test Traveler	6. Author Name: M. J. Packer Signature Organization/Charge Code 2C130/LL23A	
7. Abstract This document provides acceptance testing of equipment to be installed in the 105-KE Basin for pumping sludge to support the discharge chute barrier doors installation.		
		8. RELEASE STAMP <div data-bbox="1079 1480 1502 1711" style="border: 1px solid black; padding: 5px;"> OFFICIAL RELEASE 43 BY WHC DATE NOV 21 1994 Ste 11 </div>

RELEASE AUTHORIZATION

**Document
Number:**

WHC-SD-SNF-TRP-001, Revision 0

Document Title:

Cold Test Data for Equipment Acceptance into
105-KE Basin

Release Date:

November 10, 1994

**This document was reviewed following the
procedures described in WHC-CM-3-4 and is:**

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

M. Boston

M.N. Boston

11/10/94

TRADEMARK DISCLAIMER. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.

This report has been reproduced from the best available copy. Available in paper copy and microfiche. Printed in the United States of America. Available to the U.S. Department of Energy and its contractors from:

U.S. Department of Energy
Office of Scientific and Technical Information (OSTI)
P.O. Box 62
Oak Ridge, TN 37831
Telephone: (615) 576-8401

Available to the public from:

U.S. Department of Commerce
National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161
Telephone: (703) 487-4650

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

ym

CONTENTS

	<u>Page</u>
RECOMMENDATIONS	ii
1.0 INTRODUCTION	1
2.0 DESCRIPTION OF TESTS	1
3.0 TEST RESULTS	2
4.0 CONCLUSIONS AND RECOMMENDATIONS	4
5.0 DISPOSITION OF TEST ITEM	5
6.0 REFERENCES	6
APPENDIX A	A-1
APPENDIX B	B-1
APPENDIX C	C-1

ACCEPTANCE TESTING REPORT OF SLUDGE PUMPING EQUIPMENT TO BE INSTALLED IN THE 105-KE BASIN

RECOMMENDATIONS

It is recommended that the existing sludge pumping equipment in the 105-KE Basin be replaced as follows:

1. The old 3.8 cm (1½ inch) diameter fire hose with a new 5.1 cm (2 inch) diameter plastic hose.
2. The old stainless steel "vacuum cleaner" head with a new redesigned stainless steel "cleaner" head.
3. The old 6.1 m (20 ft) section of 5.1 cm (2 inch) diameter vacuum hose and mechanical diversion valve with a new 15.2 m (50 ft) section of plastic hose and pneumatically actuated diversion valve.
4. The old "cleaner" head pole with a new 2.4-3.0 m (8-10 ft) Cam-Lok™ sections of 3.8 cm (1½ inch) diameter aluminum poles.

**ACCEPTANCE TESTING REPORT
OF SLUDGE PUMPING EQUIPMENT
TO BE INSTALLED IN THE 105-KE BASIN**

1.0 INTRODUCTION

The Spent Nuclear Fuel (SNF) Equipment Engineering group cold-tested old components of the existing 105-KE sludge pumping system and compared their performances with cold-tested results of newly introduced equipment. The new equipment was introduced into the existing sludge pumping system to optimize sludge removal to support the discharge chute barrier doors installation activity. The cold-testing took place from October 11, 1994 through November 1, 1994 at the simulated basin in the 305 Building in the 300 Area.

The test basin dimensions are 4.6 m wide x 18.5 m long x 4.6 m deep (15' x 60' x 15') which contains approximately 390 m³ (100,000 gallons) of chlorinated water. Clean sand was introduced into the basin water to simulate the 105-KE basin sludge during pumping operations. The sand was contained in one 122 cm x 122 cm x 30.5 cm high (4' x 4' x 1') steel box for pumping into an identical box with a neoprene "window" which the discharge hose passed through to simulate the weasel pit isolation screen barrier. The Wilden™ pump was suspended under water approximately ten feet from the basin floor. Compressed air was supplied to the pump by a mobile diesel-powered air compressor.

The cold testing procedure was based on the released documents, *Test Plan for Sludge Retrieval and Packaging* (WHC-SD-SNF-TP-007) and *Test Procedure Forms for Sludge Retrieval and Packaging* (WHC-SD-SNF-TC-001).

2.0 DESCRIPTION OF TESTS

Two test travelers were required to complete the testing, (1) No. SLUDGE-ATP-001, *Cold Test Procedure For "Vacuum Cleaner" Heads With Wilden™ Pumping System* and (2) No. SLUDGE-ATP-002, *Cold Test Procedure for Pneumatic Diversion Valve, Plastic Discharge Hose, and Aluminum Pool Poles Used With Wilden™ Pumping System*.

The first test (SLUDGE-ATP-001) equipment emulated the existing 105-KE basin sludge pumping system with the exception of the experimental "vacuum cleaner" heads. Three different "vacuum cleaner" or "cleaner" heads of two design types were tested over three dynamic air pressures (276, 379, 469 kPa or 40, 55, and 68 psig, respectively) to the Wilden™ M-8 pump. The two redesigned heads are actually spinoffs of the existing "cleaner" head. The angle where the vacuum hose fits into the "cleaner" head was changed along with the directing pole attachment. Also, one head was made from 6.35 mm

($\frac{1}{2}$ inch) thick aluminum and the other was made from 3.18 mm ($\frac{1}{4}$ inch) thick stainless steel. The third "cleaner" head was constructed of a 61 cm (2 ft) long straight section of 3.8 cm ($1\frac{1}{2}$ inch) diameter aluminum pipe with a 6.35 mm ($\frac{1}{4}$ inch) screened end.

A liquid-filled pressure gauge was installed at the immediate discharge side of the pump and a regulator with a pressure gauge was used to control air to the pump. The source or service air used was supplied by a 185 SCFM rated diesel-powered air compressor. Sixty-one meters (200 ft) of 19 mm ($\frac{3}{4}$ inch) diameter air hose was required to span the distance from the compressor to the regulator. The static pressure to the regulator, supplied by the compressor, was approximately 862 kPa (125 psig).

The immersed sand was pumped from one area in the basin to another using the different "vacuum cleaner" heads at the three different dynamic air pressures. Measurements were recorded of the pump flow rate and the discharge pressure at the pump per the specific air pressure supplied to the pump, both in clear water and in clean sand.

The second test (SLUDGE-ATP-002) equipment replaced:

1. the 3.8 cm ($1\frac{1}{2}$ inch) diameter discharge fire hose with 5.1 cm (2 inch) diameter rigid, plastic hose
2. the 5.1 cm (2 inch) diameter 6.1 m (20 ft) section of suction hose and mechanical diversion valve with a 5.1 cm (2 inch) diameter 15.2 m (50 ft) section of rigid, plastic hose and a pneumatically actuated diversion valve

Also tested were new 2.4-3.0 m (8-10 ft) Cam-Lok™ sections of 3.8 cm ($1\frac{1}{2}$ inch) diameter aluminum poles for directing the "cleaner" head in the sludge. The top pole was adapted for use in the immediate framework area of the modified basin grating. The bottom section can be passed under the framework while the top section can be detached from the bottom section and reattached above the framework. This obviates taking the pole out of the water or using an additional pole within an immediate framed area.

The two different "cleaner" head types were used over the three different air pressures supplied to the pump. As in the previous test, measurements were recorded of the pump flow rate and the discharge pressure per the specific air pressure supplied to the pump, both in clear water and in sand. Cleaning rags were sucked up into the two "cleaner" heads to test the operation of the pneumatic diversion valve.

3.0 TEST RESULTS

The initial test utilized the main components of the current Wilden™ pump system in the 105-KE basin. The primary components examined were the discharge hose [3.8 cm ($1\frac{1}{2}$ inch) diameter fire hose] used with the new "vacuum cleaner" heads at different dynamic air pressures supplied to the pump. Discharge pressures at the pump were recorded at three different dynamic air

pressures (276, 379, and 469 kPa or 40, 55, and 68 psig, respectively) along with corresponding flow rates for each "cleaner" head. These results are as follows:

Pumping Clean Sand and Water With Existing System (w/Fire hose)						
Equipment	Dynamic Air Pressure		Discharge Pressure		Flow Rate	
	(kPa)	(psig)	(kPa)	(psig)	(liter/min)	(gpm)
3.8 cm (1½ inch) diameter nozzle	276	40	172	25	185	49
	379	55	207	30	231	61
	469	68	207-291	30-35	265	70
Aluminum Head	276	40	83-110	12-16	246	65
	379	55	110-138	16-20	295	78
	469	68	110-138	16-20	314	83
SS Head	276	40	83-110	12-16	246	65
	379	55	110-138	16-20	280	74
	469	68	110-138	16-20	314	83

Ten buggy springs, twenty small clips, and twenty spacers were also included in the clean sand to determine if they would pass through the "cleaner" head screens. After completing the tests over the three air pressures, the buggy springs, clips, and spacers were counted in the empty sand box (suction side) to determine what had passed through the "cleaner" heads. For the redesigned aluminum head, all ten buggy springs and all twenty spacers remained in the box; however, 16 of the small clips were sucked up through the screen. For the 3.8 cm (1½ inch) nozzle, one buggy spring, one small clip, and two spacers had been sucked up through the screen.

The second test replaced: 1) the fire hose (discharge hose) with rigid, plastic hose, and 2) the 6.1 m (20 ft) section of suction hose and mechanical diversion valve with a 15.2 m (50 ft) section of rigid, plastic hose and pneumatically actuated diversion valve. The redesigned aluminum head and the 3.8 cm (1½ inch) diameter nozzle were tested at different dynamic air pressures supplied to the pump. Again, discharge pressures at the pump were recorded at the three different air pressures along with the corresponding flow rate for each "cleaner" head. These results are as follows:

Pumping Clean Sand and Water With New Plastic Hose (Discharge and Suction)						
Equipment	Dynamic Air Pressure		Discharge Pressure		Flow Rate	
	(kPa)	(psig)	(kPa)	(psig)	(liter/min)	(gpm)
3.8 cm (1½ inch) diameter nozzle	276	40	14	2	314	83
	379	55	28	4	348	92
	469	68	14-41	2-6	363	96
Aluminum Head	276	40	14	2	314	83
	379	55	14	2	348	92
	469	68	28	4	363	96

The sectioned, aluminum "cleaner" head directing pole was tested for practicality performance when pumping sludge within the removed grating framework in the 105-KE basin. A special "passing" pole was used to move the bottom pole sections under the framework where the bottom sections could easily be reattached to the top telescopic pole section.

The test travelers, numbers SLUDGE-ATP-001 and SLUDGE-ATP-002, with actual test data are included in Appendix A.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The paramount goal of sludge transfer in the 105-KE basin is to provide the transfer of sludge as efficiently as possible and to minimize operations exposure to reduce worker dose. Therefore, to reach valid improvement recommendations, the existing system was compared against replaced components of this system. Both systems were tested with identical parameters such as using the same dynamic air pressure supplied to the Wilden™ pump and using the same "vacuum cleaner" heads immersed in the clean sand. Since the redesigned aluminum and stainless steel heads were of identical design with the exception of the building material and thickness, only the aluminum "cleaner" head was used with the nozzle head for the second test (new system).

There are two ways to control the flow rate of the Wilden™ pump. One is to provide more or less air to the pump. This is limited by the size of the air supply system - compressor, air hoses, and regulator. The other way to control pump flow is by controlling the discharge side of the pump - in-line valve and discharge hose. As expected, the 3.8 cm (1½ inch) diameter fire hose produced considerable head loss due to friction losses and hose kinking, whereas the 5.1 cm (2 inch) diameter rigid, plastic hose produced minimal head loss since friction was minimized and kinking was absent with the rigid hose.

The pneumatic diversion valve eliminated the cumbersome activity of mechanically removing "sucked up" cleaning rags from the "cleaner" head.

The pneumatic diversion valve operates in a fail mode. In other words, a minimum of 60 psig air must be supplied to the valve for the "cleaner" head suction side to operate. If a foreign object, such as a cleaning rag, occludes the regular suction flow, the air to the valve is shut off so it "fails" to the diverted position. Once the suction is released from the occluded "cleaner" head, the object or rag falls off immediately and air can be quickly returned to the valve and suction is once again returned to the "cleaner" head.

The redesigned "vacuum cleaner" heads worked very well for pumping sludge from directly above the sludge cleaning area of the basin floor. The "cleaner" head directing poles are Cam-Loc™ fitted to the head which eliminates head-to-pole play. The 3.8 cm (1½ inch) diameter aluminum nozzle worked well for vacuuming up sludge but it required some design changes such as a recessed 6.35 mm (¼ inch) screen with a crenelated head for breaking up clay-like sludge without destroying the screen. In addition, the redesigned stainless steel and aluminum heads performed well; however, minor changes were recommended by operators. The new designs for the nozzle and redesigned heads are shown in Appendix C.

The 3.8 cm (1½ inch) diameter, 2.4-3.0 m (8-10 ft) sectioned aluminum poles for directing the "cleaner" head are Cam-Loc™ fitted together. It is suggested all pole Cam-Loc™ fitted unions be secured with plastic tie-wraps and the union between the pole and "cleaner" head be secured with stainless steel wire. The latter union came apart several times during testing when it was not secured.

The recommended modified system with all components is shown in Appendix B.

5.0 DISPOSITION OF TEST ITEM

All new equipment shall be provided, or arranged to be provided, to the 105-KE basin by the originator of this document. This includes a new Wilden™ M-8 pump, suction and discharge hose, pneumatic diversion valve, air hose, "vacuum cleaner" heads, and "cleaner" head directing poles. Also, additional or supplemental compressed air shall be arranged to be provided by the originator of this document, if required.

6.0 REFERENCES

WHC-IP-1026, *Engineering Practice Guidelines*, Appendix K, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-SNF-TC-001, *Test Procedure Forms for Sludge Retrieval and Packaging*, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-SNF-TP-007, *Test Plan for Sludge Retrieval and Packaging*, Westinghouse Hanford Company, Richland, Washington.

APPENDIX A
TEST TRAVELERS

ATTACHMENT 1

PERFORMANCE CRITERIA

SCOPE

The purpose for further cold testing the Wilden pump system, which is the sludge pumping system currently in use in the K-East Basin, is to identify and resolve existing problems to optimize the efficiency of this system. Optimization goals include minimizing worker exposure in the basin during sludge pumping activities while increasing the quantity of sludge being removed.

This system is planned for use in the overall sludge mitigation efforts for the removal of deep sludge concentrations in basin areas such as the Weasel Pit, Tech View Pit, and Discharge Chute. The double diaphragm Wilden pump is recommended for pumping thicker sludge slurries at reduced flows (50-100 GPM) to the Weasel Pit. Of course, all testing is to take place in a non-radiation zone to reduce worker exposure.

Information has been gathered by talking with K-Basin personnel who have taken part in past sludge cleanup with this system. Common complaints when using the existing system include (1) poor visibility from the surging suction side, (2) 'vacuum cleaner' head constantly clogging up during pumping, (3) eventual sludge migration of sludge discharge from the Weasel Pit throughout the basin, (4) difficulty in maneuvering bulky 'vacuum cleaner' head, (5) slowness of sludge vacuuming operation, and (6) the continual collapse and kinking of the discharge hose.

Performance criteria would, therefore, include optimization activities such as seeking maximum sludge pumping without increasing 'cleaner' head occlusion and reducing basin water visibility.

The main components of the existing sludge pumping system in the K-East Basin are a 'vacuum cleaner' head, 20' long 2" diameter Goodyear Spiraflex suction (rigid) hose, double-diaphragm Wilden M8 pump, and 50-200 ft. long 1-1/2" diameter standard discharge fire hose. The Wilden pump is pneumatically powered by K-East Basin service air. A mechanically actuated diversion valve (ball valve) is installed (tee) into the suction side of the pump for relieving pressure on the 'vacuum cleaner' head to facilitate the removal of objects stuck in the cleaner head. The 'vacuum cleaner' head was specially designed for sludge mitigation efforts in the K-East Basin.

It is recommended that the existing system initially be copied and set up in a cold test facility and operated, using a sludge simulant, at the current K-East Basin operating parameters (i.e., air and water/sludge flow rates) for this system. Basin debris, such as cleaning rags, "buggy springs", etc., should also be included in the test basin for inspection of its pumping behavior. Different ranges of service air pressure are to be tested with resulting vacuum and discharge pressures recorded along with behavior of pumping action visually noted.

The separate components of the existing system are to be replaced with improved design components and tested while pumping sludge and debris. The operating parameters for each system change are to be recorded and the pumping behavior visually noted. New components and ideas to be tested to resolve existing problems are as follows:

- (1) Replace the specially designed 'vacuum cleaner' head with revised existing designs and new commercial heads with 1/4" SS screens. The revised designs eliminate the approximately 45 degree angle where the suction hose fits into the 'cleaner' head, thus facilitating operator accessibility around canister racks when pumping sludge in front of the Discharge Chute openings. One redesign is made of 1/4" aluminum and the other is made of 1/8" stainless steel. Also included are simple commercial designs for testing efficiency.
- (2) Replace the mechanically actuated diversion valve on the suction side of the pump with a pneumatically actuated valve. The existing 'vacuum cleaner' head constantly plugs up with debris larger than 1/4-inch in diameter at higher flow rates. At low flows progress is too cumbersome and slow. When the 'cleaner' head plugs up, the diversion valve is opened with a long pole to relieve the suction on the occluded 'cleaner' head. Sometimes the pump air is also turned off. A pneumatic diversion valve would obviate the use of a cumbersome and time-consuming valve pole.
- (3) Replace the existing discharge fire hose with a rigid and flexible plastic discharge hose. The fire hose tends to collapse and kink easily, thus preventing any progressive sludge flow.
- (4) Replace the existing 'vacuum cleaner' head poles with modified poles for worker accessibility between grating frame structure during sludge pumping activities. The new components shall be tested through several ranges of flow parameters. When the new components have been tested with visual flow behavior and flow parameters recorded, these results will be discussed with the K-Basin engineers and operations personnel, and the most efficient design will be recommended for use in the K-East Basin mitigation efforts specific for this system.

ATTACHMENT 2

EQUIPMENT LIST - TEST 1

1. Wilden M8 Pump
2. 20 ft long 2 in. diameter Goodyear SpiraFlex suction hose
3. Five 1/4 in. screened 'vacuum cleaner' heads
 - a. 1-1/2 in. diameter suction nozzle
 - ~~b. Small plastic commercial head (no wheels)~~
 - ~~c. Low profile plastic commercial head (with wheels)~~
 - d. 1/8 in. SS redesigned head
 - e. 1/4 in. aluminum redesigned head
4. 50 ft long 1-1/2" diameter standard firehose
5. Two sand box containers (one fitted with detachable neoprene guide for discharge hose) - one empty, the other sand-filled.
6. Five cleaning rags
7. Ten buggy springs
Twenty small clips
Twenty spacers

M.P.
10/13/99

M.P.
10/11/99

TEST CONTROL COPY

WILDEN PUMP SYSTEM OVERHEAD VIEW

TEST TRAVEL. 0.0.
ATTACHMENT 3 1 of 2

MHC-SD-SNF-TRP-001, REV. 0

TEST TRAVELEK J.
ATTACHMENT 3 2 of 2

TEST CONTROL COPY

WILDEN PUMP SYSTEM SIDE VIEW

TEST TRAVELER				Page 1 of 15	Number SLUDGE-ATP-1
Job Description Cold Test Procedure for 'Vacuum Cleaner' Heads with Wilden Pumping System			Work Order No.		Prepared by M. J. Packer
System Engineer Approval	Phone 6-6625	Date Required 10/5/94	Approval Designator 3Q	QA Approval <i>DW Smith</i>	Date 10/6/94
System Manager Approval C. J. Alderman <i>C. J. Alderman</i>	Phone 6-1796	305 Bldg Manager Approval G. L. Neer	Date	Safety Approval	Date
Operation Number	Test Instruction	Ref., Dwg., Proc., Spec.	Completion Sig/Stamps	Date	Notes
1.0	Pre-Operational Checkout		Q <i>[Stamp]</i> T <i>[Stamp]</i> N NA E <i>[Signature]</i> C NA	10/7/94 10/7/94 10/7/94	TEST CONTROL COPY
1.1	Verify all test performer blanks in Section 8.0 and Appendixes A,B,C, and D. are completed. Also stamp "TEST CONTROL COPY" per Section 4.4 on entire procedure.		Q <i>[Stamp]</i> T <i>[Stamp]</i> N NA E <i>[Signature]</i> C NA	10/18/94 10/18/94 10/18/94	
1.2	Conduct a "pre-job briefing" of operations, including a review of all procedures, drawings and other engineering documents required to complete the test. Signoff Appendix G.		Q <i>[Stamp]</i> T <i>[Stamp]</i> N NA E <i>[Signature]</i> C NA	10/7/94 10/7/94 10/7/94	
1.3	Verify that performance criteria are included as Attachment 1 to this traveler. <i>This traveler addresses point 1 in attachment 1. glb 10/7/94</i>		Q <i>[Stamp]</i> T <i>[Stamp]</i> N NA E <i>[Signature]</i> C NA	10/7/94 10/7/94 10/7/94	<i>This traveler addresses point 1) on attachment 1. [Signature] 10/7/94</i>
2.0	Calibration Checks: Verify that all instruments and equipment have current calibration stickers.		Q <i>[Stamp]</i> T <i>[Stamp]</i> N NA E <i>[Signature]</i> C NA	10/7/94 10/7/94 10/7/94	1) Vacuum Gauge, <i>Broken - not to be recal'd</i> Marshalltown 30" Hg Vac, Ref #385109 2) Pressure Gauge, Noshok 0-160 psi, Ref #385107

E = Engineer

Q = QA Inspector

T = Technician

C = Craft

N = NDE Inspector

TEST TRAVELER (Continuation Sheet)			Page 2 of 15	Number SLUDGE-ATP-001	
Operation Number	Test Instruction	Ref., Dwg., Proc., Spec.	Completion Sig/Initials	Date	Notes
3.0	Issue and verify the equipment list (Attachment 2).		Q <u>NA</u> T <u>NA</u> N <u>NA</u> E <u>NA</u> C <u>NA</u>	10/17/94 10/17/94 10/17/94	
4.0	Complete and verify the test layout/schematic (Attachment 3).		Q <u>NA</u> T <u>NA</u> N <u>NA</u> E <u>NA</u> C <u>NA</u>	10/17/94 10/17/94 10/17/94	
5.0	Set up the test equipment per the test layout/schematic.		Q <u>NA</u> T <u>NA</u> N <u>NA</u> E <u>NA</u> C <u>NA</u>	10/17/94 10/17/94 10/17/94	
6.0	Record amount (volume) of clean sand in 'sand box' container prior to submergence in pool. (The sand containers or boxes will be immersed in the 305 basin at least one day prior to cold test.) Include cleaning rags and buggy springs with sand.		Q <u>NA</u> T <u>NA</u> N <u>NA</u> E <u>NA</u> C <u>NA</u>	10/11/94 10/11/94	
	12/3-94 for test ④ we included in the basin the following: 1) 10 buggy springs } from 2) 20 spacers } fuel elements 3) 20 clips }				
7.0	Attach one of five untested 'vacuum cleaner' heads. Record type of head used by the number and description in equipment list in Attachment 2.		① Q <u>NA</u> T <u>NA</u> N <u>NA</u> E <u>NA</u> C <u>NA</u>	10/11/94 10/11/94	① 3a (Nozzle) ② 3e (Aluminum 1/4" head) ③ 3d (SS 1/8" head) ④ 3e (Aluminum 1/4" head) ⑤ 3a (Nozzle)

A-8

④ T NA 10/13/94
E NA 10/13/94
⑤ T NA 10/13/94
E NA 10/13/94

② T NA 10/12/94
E NA 10/12/94
③ T NA 10/12/94
E NA 10/12/94

TEST CONTROL COPY

TEST TRAVELER (Continuation Sheet)		Page 3 of 15	Number SLUDGE-ATP-001
Operation Number	Test Instruction	Ref., Dwg., Proc., Spec.	Completion Sig/Stamps Date Notes
8.0	Pump from submerged sand box to discharge box on basin floor per steps 9.0 through 13.0.		
9.0	Run pump with service air at 40 psig in clear pool water prior to pumping sand.	① Q T N NA E C NA	10/11/94 10/11/94 10/11/94 10/12/94 ② Q 10/12/94 T 10/12/94 E 10/12/94
	④ Q 10/13/94 ⑤ Q 10/13/94 T 10/13/94 T 10/13/94 E 10/13/94 E 10/13/94		③ Q 10/12/94 T 10/12/94 E 10/12/94
10.0	Count pump strokes over one minute during clear water pumping. Record the number of strokes per minute and record flow rate (0.725 gal/stroke). Record vacuum pressure and discharge pressure.	① Q T N NA E C NA	10/11/94 10/11/94 10/11/94 ① 66 strokes/min (706mm) 23 psig discharge ② 46 strokes/min (706mm) 12-16 psig discharge ③ 34 strokes/min (616mm) 12-16 psig discharge
	10.0 ② Q 10/12/94 T 10/12/94 E 10/12/94	③ Q 10/12/94 T 10/12/94 E 10/12/94	10/12/94 10/12/94 10/12/94
11.0	Immerse 'vacuum cleaner' head in submerged sand pile. Continue pumping in deep sand (keep 'cleaner' head moving to deep sand) for five minutes. For Tests ④, ⑤, and ⑥ immerse head in busy springs, rzs, etc.	① Q NA T N NA E C NA	10/11/94 10/11/94 ④ ~ 4 min ⑤ ~ 5 min ⑥ ~ 4 min TEST CONTROL COPY

④ T 10/13/94 ⑤ T 10/13/94
E 10/13/94 E 10/13/94

② T 10/12/94
E 10/12/94
③ T 10/12/94
E 10/12/94

TEST TRAVELER (Continuation Sheet)				Page	4 of 15	Number
Operation Number	Test Instruction	Ref., Dwg., Proc., Spec.	Completion Sig./Stamps	Date	Notes	
12.0	Count pump strokes over one minute during sand pumping. Record the number of strokes per minute and record flow rate (0.725 gal/stroke). Record vacuum pressure and discharge pressure.		<div>① Q <u>10/13/44</u> <u>10/13/44</u> N <u>NA</u> E <u>10/13/44</u> C <u>NA</u></div>	10/11/44 10/11/44 10/11/44 10/11/44	NOTE: Cam Loc poles/struts comes loose and releases with use. Need to wire to hold in place. ① 68 strokes/min. 12-16 psi at good suction around immediate area of 1 1/2" pipe. ② 90 strokes/min. 12-16 psi - good suction within reach of 12-16 psi. ③ 90 strokes/min. 12-16 psi - good suction within reach of 12-16 psi. ④ 84 strokes/min. 12-14 psi - reg closed head. Danced diversion valve w/ pump and -bur could not shake off. Had to turn off air to pump and run up pole several feet below the surface before the reg fell off. ⑤ 84 strokes/min. 12-16 psi - reg closed up at 12-16 psi by activating diversion before with air to pump	
13.0	When the discharge box is relatively full, use the overhead crane to raise the sand boxes to the surface to remove and transfer the neophrene guide from the newly filled sand box to the empty box.		<div>② Q <u>10/13/44</u> <u>10/13/44</u> N <u>NA</u> E <u>10/13/44</u> C <u>NA</u></div>	10/11/44 10/11/44 10/11/44 10/11/44		

TEST CONTROL COPY

A-10

TEST TRAVELER (Continuation Sheet)

Page

5 of 15

Number

SL0066-APT-001

TEST TRAVELER (Continuation Sheet)				Page	5 of 15	Number	SLUDGE-APT-001
Operation Number	Test Instruction	Ref., Dwg., Proc., Spec.	Completion Sig./Stamps	Date	Notes		
14.0	Pump from submerged sand box to discharge box on basin floor per steps 15.0 through 19.0.						
15.0	Run pump with service air at 55 psig in clear pool water prior to pumping sand.		<div>① Q NA T NA E NA C NA</div>	<div>10/11/94 10/11/94</div>			
	<div>② Q <u>10/13/94</u> T <u>10/13/94</u> E <u>10/13/94</u></div>	<div>③ Q <u>10/13/94</u> T <u>10/13/94</u> E <u>10/13/94</u></div>	<div>10/12/94 10/12/94 10/12/94</div>	<div>③ Q <u>10/13/94</u> T <u>10/13/94</u> E <u>10/13/94</u></div>	<div>10/12/94 10/12/94 10/12/94</div>		
16.0	Count pump strokes over one minute during clear water pumping. Record the number of strokes per minute and record flow rate (0.725 gal/stroke). Record vacuum pressure and discharge pressure.		<div>① Q NA T NA E NA C NA</div>	<div>10/11/94 10/11/94 10/11/94</div>	<div>① 84 strokes/min (25.32 gpm) ② 105 strokes/min (28.60 gpm) ③ 102 strokes/min (27.60 gpm)</div>		
	<div>② Q <u>10/12/94</u> T <u>10/12/94</u> E <u>10/12/94</u></div>	<div>③ Q <u>10/12/94</u> T <u>10/12/94</u> E <u>10/12/94</u></div>	<div>10/12/94 10/12/94 10/12/94</div>	<div>③ Q <u>10/13/94</u> T <u>10/13/94</u> E <u>10/13/94</u></div>	<div>10/12/94 10/12/94 10/12/94</div>		
17.0	Immerse 'vacuum cleaner' head in submerged sand pile. Continue pumping in deep sand (keep 'cleaner' head moving to deep sand) for five minutes.		<div>① Q NA T NA E NA C NA</div>	<div>10/11/94 10/11/94 10/11/94</div>	<div>① 5 minutes ② 5 minutes ③ 5 minutes</div>		

TEST CONTROL COPY

TEST TRAVELER (Continuation Sheet)		Page 6 of 15	Number SLVDS6-ATP-001	
Operation Number	Test Instruction	Ref., Dwg., Proc., Spec.	Completion Sig/Stamps Date Notes	
18.0	Count pump strokes over one minute during sand pumping. Record the number of strokes per minute and record flow rate (0.725 gal/stroke). Record vacuum pressure and discharge pressure. During pumping, note sand dispersion on suction side, discharge side, and overall visibility in basin. Also, record suction ability of 'cleaner' head (i.e., visual estimate of sand pumped). Record visual observances and record time to unclog 'cleaner' head (if needed).	<p>(1) Q T N NA E C NA</p> <p>(2) Q T E </p> <p>(3) Q T E </p>	<p>10/11/94 10/11/94 10/11/94</p> <p>10/12/94 10/12/94 10/12/94</p> <p>10/12/94 10/12/94 10/12/94</p>	<p>(1) 84 strokes/min (vol 16cm) 3 = 80.5 - good suction in immediate area of 1 1/2" nozzle Basin visibility not good (780mm)</p> <p>(2) 103 strokes/min (16-20 psi) - very good suction - quick sand almost empty in box</p> <p>(3) 102 strokes/min (16-20 psi) - very good suction - quick</p> <p>(4) 90 strokes/min (16-20 psi) - res clogged head. was only able to release when diversion valve opened and pump air turned off. (or)</p> <p>(5) 102 strokes/min (16-18 psi) - res clogged head.</p>
	<p>(1) Q T E 10/13/94</p> <p>(2) Q T E 10/13/94</p>	<p>10/13/94 10/13/94 10/13/94</p>	<p>only able to release when diversion valve opened and pump air turned off. (or)</p> <p>(5) 102 strokes/min (16-18 psi) - res clogged head.</p>	
19.0	When the discharge box is relatively full, use the overhead crane to raise the sand boxes to the surface to remove and transfer the neophrene guide from the newly filled sand box to the empty box.	<p>Q NA T NA N NA E NA C NA</p>	<p>10/11/94 10/11/94 10/11/94</p>	<p>3 sand box empty after B-sections used. M.J.P. only was removed 10/11/94 when diversion valve opened and air to pump turned off.</p>

TEST CONTROL COPY

TEST TRAVELER (Continuation Sheet)		Page 7 of 15	Number SLUDGE-ATP-001
Operation Number	Test Instruction	Ref., Dwg., Proc., Spec.	Completion Sig/Stamp Date Notes
20.0	Pump from submerged sand box to discharge box on basin floor per steps 21.0 through 25.0.		
21.0	Run pump with service air at 70 psig in clear pool water prior to pumping sand.		<div>Q </div> <div>T </div> <div>N NA</div> <div>E </div> <div>C NA</div> <div>10/11/94</div> <div>10/11/94</div> <div>10/11/94</div>
	<div>④ Q </div> <div>T </div> <div>E </div> <div>10/13/94</div> <div>10/13/94</div> <div>10/13/94</div>	<div>⑤ Q </div> <div>T </div> <div>E </div> <div>10/13/94</div> <div>10/13/94</div> <div>10/13/94</div>	<div>③ Q </div> <div>T </div> <div>E </div> <div>10/12/94</div> <div>10/12/94</div> <div>10/12/94</div>
22.0	Count pump strokes over one minute during clear water pumping. Record the number of strokes per minute and record flow rate (0.725 gal/stroke). Record vacuum pressure and discharge pressure.		<div>Q </div> <div>T </div> <div>N NA</div> <div>E </div> <div>C NA</div> <div>10/11/94</div> <div>10/11/94</div> <div>10/11/94</div>
		<div>② Q </div> <div>T </div> <div>E </div> <div>10/12/94</div> <div>10/12/94</div> <div>10/12/94</div>	<div>⑤ Q </div> <div>T </div> <div>E </div> <div>10/12/94</div> <div>10/12/94</div> <div>10/12/94</div>
23.0	Immerse 'vacuum cleaner' head in submerged sand pile. Continue pumping in deep sand (keep 'cleaner' head moving to deep sand) for five minutes. For Tests ④, ⑤, and ⑥ immerse head		<div>Q NA</div> <div>T </div> <div>N NA</div> <div>E </div> <div>C NA</div> <div>10/11/94</div> <div>10/11/94</div>

A-13

④ T 10/13/94
E 10/13/94

⑤ T 10/13/94
E 10/13/94

② T 10/12/94
E 10/12/94

③ T 10/12/94
E 10/12/94

TEST CONTROL COPY

① 5-10 minutes
② ~ 9 minutes
③ ~ 5 minutes

TEST TRAVELER (Continuation Sheet)

Page

8 of 15

Number

SLUDGE-ATP-001

Operation Number

Test Instruction

Ref., Dwg., Proc., Spec.

Completion Sig/Stamp

Date

Notes

24.0

Count pump strokes over one minute during sand pumping. Record the number of strokes per minute and record flow rate (0.725 gal/stroke). Record vacuum pressure and discharge pressure.

During pumping, note sand dispersion on suction side, discharge side, and overall visibility in basin. Also, record suction ability of 'cleaner' head (i.e., visual estimate of sand pumped). Record visual observances and record time to unclog 'cleaner' head (if needed)

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 ㉛ ㉜ ㉝ ㉞ ㉟ ㊱ ㊲ ㊳ ㊴ ㊵ ㊶ ㊷ ㊸ ㊹ ㊺ ㊻ ㊼ ㊽ ㊾ ㊿

25.0

When the discharge box is relatively full, use the overhead crane to raise the sand boxes to the surface to remove and transfer the neophrene guide from the newly filled sand box to the empty box.

For Tests ④, ⑤, and ⑥, raise the empty box to count what bugsy springs, clips, and spacers are left and record.

④ T ⑤ T ⑥ T ⑦ T ⑧ T ⑨ T ⑩ T ⑪ T ⑫ T ⑬ T ⑭ T ⑮ T ⑯ T ⑰ T ⑱ T ⑲ T ⑳ T ㉑ T ㉒ T ㉓ T ㉔ T ㉕ T ㉖ T ㉗ T ㉘ T ㉙ T ㉚ T ㉛ T ㉜ T ㉝ T ㉞ T ㉟ T ㊱ T ㊲ T ㊳ T ㊴ T ㊵ T ㊶ T ㊷ T ㊸ T ㊹ T ㊺ T ㊻ T ㊼ T ㊽ T ㊾ T ㊿

⑤ COUNT RUNN BUGGY SPRINGS 19 CLIPS

TEST CONTROL COPY

TEST TRAVELER (Continuation Sheet)			Page 15 of 15	Number SLUDGE-TRP-001	
Operation Number	Test Instruction	Ref., Dwg., Proc., Spec.	Completion Sig/Stamps	Date	Notes
44.0	Verify that all steps in this traveler have been completed.		<div style="display: flex; flex-direction: column; align-items: center;"> <div>Q <i>[Signature]</i></div> <div>T <i>[Signature]</i></div> <div>N NA</div> <div>E <i>[Signature]</i></div> <div>C NA</div> </div>	10/13/99 10/13/99 10/18/99	Initially planned 21- pressures of BS, 100, and 115 PSIG to be tested were cancelled due to inadequate compressor. (Logs 9-14)
List of Required Attachments: 1. Performance Criteria 2. Equipment List 3. Test Layout/Schematic Optional Attachment: 4. Acceptance Criteria for K Basin Equipment					

E = Engineer

Q = QA Inspector

T = Technician

C = Craft

N = NDE Inspector

A-15

TEST CONTROL COPY

ATTACHMENT 1

PERFORMANCE CRITERIA

SCOPE

The purpose for further cold testing the Wilden pump system, which is the sludge pumping system currently in use in the K-East Basin, is to identify and resolve existing problems, to optimize the efficiency of this system. Optimization goals include minimizing worker exposure in the basin during sludge pumping activities while increasing the quantity of sludge being removed.

This system is planned for use in the overall sludge mitigation efforts for the removal of deep sludge concentrations in basin areas such as the Weasel Pit, Tech View Pit, and Discharge Chute. The double diaphragm Wilden pump is recommended for pumping thicker sludge slurries at reduced flows (50-100 GPM) to the Weasel Pit. Of course, all testing is to take place in a non-radiation zone to reduce worker exposure.

Information has been gathered by talking with K-Basin personnel who have taken part in past sludge cleanup with this system. Common complaints when using the existing system include (1) poor visibility from the surging suction side, (2) 'vacuum cleaner' head constantly clogging up during pumping, (3) eventual sludge migration of sludge discharge from the Weasel Pit throughout the basin, (4) difficulty in maneuvering bulky 'vacuum cleaner' head, (5) slowness of sludge vacuuming operation, and (6) the continual collapse and kinking of the discharge hose.

Performance criteria would, therefore, include optimization activities such as seeking maximum sludge pumping without increasing 'cleaner' head occlusion and reducing basin water visibility.

The main components of the existing sludge pumping system in the K-East Basin are a 'vacuum cleaner' head, 20' long 2" diameter Goodyear Spiraflex suction (rigid) hose, double-diaphragm Wilden M8 pump, and 50-200 ft. long 1-1/2" diameter standard discharge fire hose. The Wilden pump is pneumatically powered by K-East Basin service air. A mechanically actuated diversion valve (ball valve) is installed (tee) into the suction side of the pump for relieving pressure on the 'vacuum cleaner' head to facilitate the removal of objects stuck in the cleaner head. The 'vacuum cleaner' head was specially designed for sludge mitigation efforts in the K-East Basin.

It is recommended that the existing system initially be copied and set up in a cold test facility and operated, using a sludge simulant, at the current K-East Basin operating parameters (i.e., air and water/sludge flow rates) for this system. Basin debris, such as cleaning rags, "buggy springs", etc., should also be included in the test basin for inspection of its pumping behavior. Different ranges of service air pressure are to be tested with resulting vacuum and discharge pressures recorded along with behavior of pumping action visually noted.

TEST CONTROL COPY

The separate components of the existing system are to be replaced with improved design components and tested while pumping sludge and debris. The operating parameters for each system change are to be recorded and the pumping behavior visually noted. New components and ideas to be tested to resolve existing problems are as follows:

- (1) Replace the specially designed 'vacuum cleaner' head with revised existing designs and new commercial heads with 1/4" SS screens. The revised designs eliminate the approximately 45 degree angle where the suction hose fits into the 'cleaner' head, thus facilitating operator accessibility around canister racks when pumping sludge in front of the Discharge Chute openings. One redesign is made of 1/4" aluminum and the other is made of 1/8" stainless steel. Also included are simple commercial designs for testing efficiency.
- (2) Replace the mechanically actuated diversion valve on the suction side of the pump with a pneumatically actuated valve. The existing 'vacuum cleaner' head constantly plugs up with debris larger than 1/4-inch in diameter at higher flow rates. At low flows progress is too cumbersome and slow. When the 'cleaner' head plugs up, the diversion valve is opened with a long pole to relieve the suction on the occluded 'cleaner' head. Sometimes the pump air is also turned off. A pneumatic diversion valve would obviate the use of a cumbersome and time-consuming valve pole.
- (3) Replace the existing discharge fire hose with a rigid and flexible plastic discharge hose. The fire hose tends to collapse and kink easily, thus preventing any progressive sludge flow.
- (4) Replace the existing 'vacuum cleaner' head poles with modified poles for worker accessibility between grating frame structure during sludge pumping activities. The new components shall be tested through several ranges of flow parameters. When the new components have been tested with visual flow behavior and flow parameters recorded, these results will be discussed with the K-Basin engineers and operations personnel, and the most efficient design will be recommended for use in the K-East Basin mitigation efforts specific for this system.

TEST CONTROL COPY

ATTACHMENT 2

EQUIPMENT LIST - TEST 1

1. Wilden M8 Pump
2. ~~a. 20 ft long 2 in. diameter Goodyear SpiraFlex suction hose~~ *MJP-11/1/94*
b. 50 ft long 2 in. diameter plastic suction hose (Cam Loc ends)
3. Two 1/4 in. screened 'vacuum cleaner' heads
 - a. 1-1/2 in. diameter suction nozzle
 - b. 1/4 in. aluminum redesigned head
4. 50 ft long 2" diameter plastic discharge hose (Cam Loc ends)
5. Two sand box containers (one fitted with detachable neoprene guide for discharge hose) - one empty, the other sand-filled
6. New aluminum 1-1/2" diameter 8-10 ft section poles (Tri-Nuc) with one section telescopic
7. Canister Rack
8. Pneumatic-activated diversion valve on suction side

TEST CONTROL COPY

TEST CONTROL COPY

TEST TRAVELER				Page 1 of 9	Number SLUDGE-TRP-002
Job Description Cold Test Procedure for Plastic Discharge Hose, Diversion Valve, & Aluminum Pool Poles used with Wilden Pumping System			Work Order No.		Prepared by M. J. Packer
System Engineer Approval		Phone 6-6625	Date Required 10/20/94	Approval Designator	QA Approval <i>D.W. Smith</i> Date 10/25/94
System Manager Approval C. J. Alderman <i>C. J. Alderman</i> 10/24/94		Phone 6-1796	305 Bldg Manager Approval		Date Safety Approval Date

Operation Number	Test Instruction	Ref., Dwg., Proc., Spec.	Completion Sig/Stamps	Date	Notes
1.0	Pre-Operational Checkout		Q <i>JAT</i> T <i>[Signature]</i> N <i>NA</i> E <i>[Signature]</i> C <i>NA</i>	10-26-94 10-26-94 10-26-94	
1.1	Verify all test performer blanks in Section 8.0 and Appendixes A,B,C, and D are completed. Also stamp "TEST CONTROL COPY" per Section 4.4 on entire procedure.		Q <i>JAT</i> T <i>[Signature]</i> N <i>NA</i> E <i>[Signature]</i> C <i>NA</i>	10-26-94 10-26-94 10-26-94	
1.2	Conduct a "pre-job briefing" of operations, including a review of all procedures, drawings and other engineering documents required to complete the test. Signoff Appendix G.		Q <i>JAT</i> T <i>[Signature]</i> N <i>NA</i> E <i>[Signature]</i> C <i>NA</i>	10-26-94 10-26-94 10-26-94	
1.3	Verify that performance criteria are included as Attachment 1 to this traveler. This traveler addresses points 2, 3 and 4 in attachment 1.		Q <i>JAT</i> T <i>[Signature]</i> N <i>NA</i> E <i>[Signature]</i> C <i>NA</i>	10-26-94 10-26-94 10-26-94	
2.0	Calibration Checks: Verify that all instruments and equipment have current calibration stickers.		Q <i>JAT</i> T <i>[Signature]</i> N <i>NA</i> E <i>[Signature]</i> C <i>NA</i>	10-26-94 10-26-94 10-26-94	1) Pressure Gauge, ^{WATS} Noshok 0-160 psi, Ref #385107 2) Pressure Gauge ASHCROFT 0-100 psi, Ref #363035

E = Engineer

Q = QA Inspector

T = Technician

C = Craft

N = NDE Inspector

TEST CONTROL COPY

A-21

TEST TRAVELER (Continuation Sheet)			Page 2 of 2	Number SLUDGE-ATP-002	
Operation Number	Test Instruction	Ref., Dwg., Proc., Spec.	Completion Sig/Stamps	Date	Notes
3.0	Issue and verify the equipment list (Attachment 2).		Q JAT T OC N NA E OC C NA	10-26-94 10-26-94 10-26-94	
4.0	Complete and verify the test layout/schematic (Attachment 3).		Q JAT T OC N NA E OC C NA	10-26-94 10-26-94 10-26-94	
5.0	Set up the test equipment per the test layout/schematic.		Q JAT T OC N NA E OC C NA	10-26-94 10-26-94 10-26-94	
6.0	Place approximately 500# of sand in submerged box with canister rack.		Q NA T OC N NA E OC C NA	10-26-94 10-26-94	
7.0	Attach one of two 'vacuum cleaner' heads. Note: The type of head used is listed by the number and description in equipment list in Attachment 2.				32 - head - nozzle 35 - aluminum redesigned head
8.0	Pump from submerged sand box to discharge box on basin floor per steps 9.0 through 11.3 at 40 psig.				

TEST CONTROL COPY

A-22

TEST TRAVELER (Continuation Sheet)			Page 3 of 9	Number SLUDGE-ATP-002	
Operation Number	Test Instruction	Ref., Dwg., Proc., Spec.	Completion Sig/Stamp	Date	Notes 10/28/94 COMPRESSOR
			Q JAT T OCK E [Signature] M.J.P. 11-1-94	10-28-94 10-28-94 10-28-94	DUAL AIR SUPPLY: POWER AIR TO WIDEN PUMP; PLANT TO DIVERTE VALVE. RUN WIDEN PUMP AT PRES. INTERVALS.
9.0	Run pump with service air at 40 psig in clear pool water prior to pumping sand. M.J.P. Q JAT 11-1-94 T OCK 11-1-94 E [Signature] 11-1-94	Q JAT T OCK N NA E [Signature] C NA	10-26-94 10-26-94 10-26-94	40 psig is not enough to operate diversion valve. Went to 55 psig where it did operate.	
9.1	Pump immersed cleaning rag into 'cleaner' head and actuate pneumatic diversion valve to clear. Record results. 11-1-94 11-1-94	Q JAT T OCK E [Signature] M.J.P. 11-1-94	Q JAT T OCK N NA E [Signature] C NA 10-26-94 10-26-94 M.J.P. 11-1-94	'Vacuum Cleaner' Head No. 3a Results: Activated pneumatic valve using ~90 psig service air - rags fell off easily.	
9.2	Repeat step 9.0 using second 'cleaner' head. 10/28/94 10/28/94	Q JAT T OCK E [Signature] 10/28/94	Q JAT T OCK N NA E [Signature] C NA 10-26-94 M.J.P. 11-1-94	'Vacuum Cleaner' Head No. 3b	
9.3	Pump immersed cleaning rag into 'cleaner' head and actuate pneumatic diversion valve to clear. Record results.	Q JAT T OCK E [Signature] 10/28/94	Q JAT T OCK N NA E [Signature] C NA 10/28/94 10/28/94 10/28/94	Results: 10/28/94 Rag dropped off after bled off the air pressure. Used service air.	

A-23

TEST CONTROL COPY

TEST TRAVELER (Continuation Sheet)			Page 4 of 9	Number SLUDGE-ATP-002	
Operation Number	Test Instruction	Ref., Dwg., Proc., Spec.	Completion Sig/Stamps	Date	Notes
10.0	Count pump strokes over one minute during clear water pumping. Record the number of strokes per minute and record flow rate (0.725 gal/stroke). Record discharge pressure.		Q JAT T ECR N NA E MDR C NA	11-1-94 11-1-94 11-1-94	'Cleaner' Head No. 3a Strokes per minute <u>126</u> Flow Rate <u>83 GPM</u> Discharge Pressure <u>2 psi</u>
10.1	Repeat step 10.0 using second 'cleaner' head.		Q JAT T ECR N NA E MDR C NA	10-28-94 10-28-94 10/28/94	'Cleaner' Head No. 3b Strokes per minute <u>126</u> Flow Rate <u>91.35</u> Discharge Pressure <u>0-2</u>
11.0	Immerse 'vacuum cleaner' head in submerged sand pile. Continue pumping in deep sand (keep 'cleaner' head moving to deep sand) for up to five minutes.		Q JAT T ECR N NA E MDR C NA	11-1-94 11-1-94 11-1-94	'Cleaner' Head No. 3a
11.1	Count pump strokes over one minute during sand pumping. Record the number of strokes per minute and record flow rate (0.725 gal/stroke). Record discharge pressure.		Q JAT T ECR N NA E MDR C NA	11-1-94 11-1-94 11-1-94	Strokes per minute <u>114</u> Flow Rate <u>83 GPM</u> Discharge Pressure <u>2 psi</u>
11.2	Repeat step 11.0 using second 'cleaner' head.		Q JAT T ECR N NA E MDR C NA	10-28-94 10-28-94 10/28/94	'Cleaner' Head No. 3b
11.3	Repeat step 11.1 using second 'cleaner' head.		Q JAT T ECR N NA E MDR C NA	10-28-94 10-28-94 10/28/94	Strokes per minute <u>126</u> Flow Rate <u>82.65 GPM</u> Discharge Rate <u>0-2 psi</u>

A-24

TEST CONTROL COPY

TEST TRAVELER (Continuation Sheet)			Page 5 of 9	Number SLUDGE-ATP-002	
Operation Number	Test Instruction	Ref., Dwg., Proc., Spec.	Completion Sig/Initials	Date	Notes
			Q JAT T OCK E MDP	10-28-94 10-28-94 10/28/94	DUAL AIR SUPPLY: COMP. AIR TO WILSON PUMP; PLANT AIR TO DIVERTER VALVE. RUN WILSON PUMP AT PRES. INTERVALS
12.0	Pump from submerged sand box to discharge box on basin floor per steps 13.0 through 15.3 at 55 psig.	Q JAT T OCK E MDP			
				MDP 11-1-94	
13.0	Run pump with service air at 55 psig in clear pool water prior to pumping sand. 11-1-94 11-1-94	Q JAT T OCK E MDP	Q JAT T OCK N NA E MDP C NA	26 Oct 94 26 Oct 94 26 Oct 94 MDP 11-1-94	Compressor - "puked out"
13.1	Pump immersed cleaning rag into 'cleaner' head and actuate pneumatic diversion valve to clear. Record results. MDP 11-1-94 11-1-94 11-1-94	Q JAT T OCK E MDP	Q JAT T OCK N NA E MDP C NA	26 Oct 94 26 Oct 94 26 Oct 94 MDP 11-1-94	'Cleaner' Head No. 32 Results: Diverter valve actuated, but air compressor would not continue to work.
13.2	Repeat step 13.0 using second 'cleaner' head. MDP 11-1-94	Q JAT T OCK N NA E MDP C NA	Q JAT T OCK N NA E MDP C NA	10/28/94 MDP 11-1-94	'Cleaner' Head No. 36 Due to air compressor could not continue at 55 psig.
13.3	Pump immersed cleaning rag into 'cleaner' head and actuate pneumatic diversion valve to clear. Record results. 11-1-94 11-1-94 11-1-94	Q JAT T OCK E MDP	Q JAT T OCK N NA E MDP C NA	MDP 11-1-94	Results: Pneumatic valve 36 actuated with service air - r25 early falls off (service ~ 90 psig)
	32 Pneumatic valve actuated with service air (~90 psig) - r25 early falls off.				

TEST CONTROL COPY

TEST TRAVELER (Continuation Sheet)			Page 6 of 9	Number SLV05E-ATP-002	
Operation Number	Test Instruction	Ref., Dwg., Proc., Spec.	Completion Sig/Stamp	Date	Notes
14.0	Count pump strokes over one minute during clear water pumping. Record the number of strokes per minute and record flow rate (0.725 gal/stroke). Record discharge pressure.		Q JAT T <u>DCR</u> N NA E <u>MJP</u> C NA	11-1-94 11-1-94 11-1-94	'Cleaner' Head No. <u>3a</u> Strokes per minute <u>126</u> Flow Rate <u>92 GPM</u> Discharge Pressure <u>2 PSIG</u>
14.1	Repeat step 14.0 using second 'cleaner' head.		Q JAT T <u>DCR</u> N NA E <u>MJP</u> C NA	11-1-94 11-1-94 11-1-94	'Cleaner' Head No. <u>3b</u> Strokes per minute <u>126</u> Flow Rate <u>92 GPM</u> Discharge Pressure <u>2 PSIG</u>
15.0	Immerse 'vacuum cleaner' head in submerged sand pile. Continue pumping in deep sand (keep 'cleaner' head moving to deep sand) for up to five minutes.		Q JAT T <u>DCR</u> N NA E <u>MJP</u> C NA	11-1-94 11-1-94 11-1-94	'Cleaner' Head No. <u>3a</u>
15.1	Count pump strokes over one minute during sand pumping. Record the number of strokes per minute and record flow rate (0.725 gal/stroke). Record discharge pressure.		Q JAT T <u>DCR</u> N NA E <u>MJP</u> C NA	11-1-94 11-1-94 11-1-94	Strokes per minute <u>32</u> <u>126</u> Flow Rate <u>92 GPM</u> Discharge Pressure <u>2 PSIG</u> (9 PSIG)
15.2	Repeat step 15.0 using second 'cleaner' head.		Q JAT T <u>DCR</u> N NA E <u>MJP</u> C NA	11-1-94 11-1-94 11-1-94	'Cleaner' Head No. <u>3b</u>
15.3	Repeat step 15.1 using second 'cleaner' head.		Q JAT T <u>DCR</u> N NA E <u>MJP</u> C NA	11-1-94 11-1-94 11-1-94	Strokes per minute <u>32</u> <u>126</u> ³⁵ Flow Rate <u>92 GPM</u> Discharge Pressure <u>2 PSIG</u>

TEST CONTROL COPY

A-26

TEST TRAVELER (Continuation Sheet)					Page 7 of 9	Number SLUDGE-TRP-002
Operation Number	Test Instruction	Ref., Dwg., Proc., Spec.	Completion Sig/Stamps	Date	Notes	
16.0	Pump from submerged sand box to discharge box on basin floor per steps 17.0 through 19.3 at 68 psig.		<u>0 JAT</u> <u>T JAT</u> <u>N NA</u> <u>E JAT</u> <u>C NA</u>	10-26-94 10-26-94	Only compressor air used to run pump and actuate diversion valve	
17.0	Run pump with service air at 68 psig in clear pool water prior to pumping sand.		<u>0 JAT</u> <u>T JAT</u> <u>N NA</u> <u>E JAT</u> <u>C NA</u>	10-26-94 10-26-94		
17.1	Pump immersed cleaning rag into 'cleaner' head and actuate pneumatic diversion valve to clear. Record results.		<u>0 JAT</u> <u>T JAT</u> <u>N NA</u> <u>E JAT</u> <u>C NA</u>	10-26-94 10-26-94	'Cleaner' Head No. 32 Results: Valve actuated. Rag dropped off of head to pool floor.	
17.2	Repeat step 17.0 using second 'cleaner' head.		<u>0 JAT</u> <u>T JAT</u> <u>N NA</u> <u>E JAT</u> <u>C NA</u>	10-26-94 10-26-94	'Cleaner' Head No. 36	
17.3	Pump immersed cleaning rag into 'cleaner' head and actuate pneumatic diversion valve to clear. Record results.		<u>0 JAT</u> <u>T JAT</u> <u>N NA</u> <u>E JAT</u> <u>C NA</u>	10-26-94 10-26-94	Results: Valve actuated. Rag dropped off of head to pool floor.	
TEST CONTROL COPY						

TEST TRAVELER (Continuation Sheet)		Page 8 of 9	Number SLUDGE-ATP-002		
Operation Number	Test Instruction	Ref., Dwg., Proc., Spec.	Completion Sig/Initials	Date	Notes
18.0	Count pump strokes over one minute during clear water pumping. Record the number of strokes per minute and record flow rate (0.725 gal/stroke). Record discharge pressure.		Q JAT T DCR N NA E DCR C NA	10-26-94 10-26-94 10-26-94	'Cleaner' Head No. 32 Strokes per minute 144 Flow Rate 26 104.4 GPM Discharge Pressure 2-6
18.1	Repeat step 18.0 using second 'cleaner' head.		Q JAT T DCR N NA E DCR C NA	10-26-94 10-26-94 10-26-94	'Cleaner' Head No. 36 Strokes per minute 144 144 Flow Rate 104.4 GPM Discharge Pressure 0-4
19.0	Immerse 'vacuum cleaner' head in submerged sand pile. Continue pumping in deep sand (keep 'cleaner' head moving to deep sand) for up to five minutes.		Q JAT T DCR N NA E DCR C NA	10-26-94 10-26-94 10-26-94	'Cleaner' Head No. 32
19.1	Count pump strokes over one minute during sand pumping. Record the number of strokes per minute and record flow rate (0.725 gal/stroke). Record discharge pressure.		Q JAT T DCR N NA E DCR C NA	10-26-94 10-26-94 10-26-94	Strokes per minute 132 132 Flow Rate 95.7 GPM Discharge Rate 2-6
19.2	Repeat step 19.0 using second 'cleaner' head.		Q JAT T DCR N NA E DCR C NA	10-26-94 10-26-94 10-26-94	'Cleaner' Head No. 36
19.3	Repeat step 19.1 using second 'cleaner' head.		Q JAT T DCR N NA E DCR C NA	10-26-94 10-26-94 10-26-94	Strokes per minute 132 Flow Rate 95.7 GPM Discharge Rate 0-4 36

TEST CONTROL COPY

A-28

TEST TRAVELER (Continuation Sheet)		Page 9 of 9	Number SLUDGE-ATP-002		
Operation Number	Test Instruction	Ref., Dwg., Proc., Spec.	Completion Sig/Stamp	Date	Notes
20.0	Move the 'cleaner' head pole to the modified grating section of the basin.				
20.1	Test the function of transferring or passing the bottom section of pole under the framework beam and reattaching to the top pole section. Report results.		Q JAT T LOCK N NA E <i>[Signature]</i> C NA	10-26-94 10-26-94 10-26-94	Transferred pole via "passing pole" from one side to another with relative ease.
21.0	Verify that all steps in this traveler have been completed.		Q JAT T LOCK N NA E <i>[Signature]</i> C NA	11-1-94 11-1-94 11-1-94	
List of Required Attachments: 1. Performance Criteria 2. Equipment List 3. Test Layout/Schematic Optional Attachment: 4. Acceptance Criteria for K-Basin Equipment					

A-29

E = Engineer

Q = QA Inspector

T = Technician

C = Craft

N = NDE Inspector

TEST CONTROL COPY

APPENDIX B
MODIFIED SYSTEM AND EQUIPMENT LIST

Item	Qty	Description	Specification
1	8	Speedaire Industrial Interchange Quick Coupler (6X421-Female Plug)	Brass or Steel
2	4	2" SS Hose Clamp	Stainless
3	8	Dixon MS-6; 3/4" MNPT x 3/4" ID hose Fitting	Stainless
4	9	Dixon BU 9 Clamp	Galvanized
5	2	3/4" x 3/4" x 3/4" Tee	Brass
6	1	Pressure Gauge	0-160 psi
7	15	3/4" Nipple, close	Brass
8	1	2040 Amflo Air Filter	
9	1	2240 Amflo Airline Lubricator	
10	1	2145 Amflo Airline Regulator	
11	3	3/4" Ball Valve	Brass
12	1	3/4" Vented Ball Valve	Brass
13	1	Pressure Gauge	0-100 psi
14	1	Wilden M-8/WW/A/NE/NE/NE/Pump	
15	1	2" Male Kam-Lok x 2" MNPT	Stainless
16	1	Muffler	
17	1	Stand	Stainless
18	1	1/4" Street Elbow	Stainless
19	1	3/4" x 1/4" Bushing	Brass
20	8	Speedaire Industrial Interchange Quick Coupler (6X417-Female Coupler)	Brass or Steel
21	2	3/4" - 1/4" Bell Reducer	Stainless
22	3	1/4" x 2" Nipple NPT	Stainless
23	1	2" SS 3-Way Multi-Port Ball Valve	
24	1	Dual Spring Return Actuator (3D)	Pneumatic
25	2	2" x 4" Nipple	Stainless
26	2	2" Male Kam-Lok to 2" FNPT	Stainless
27	3	2" x close Nipple	Stainless
28	1	1/2" - 3/4" Bell Reducer	Stainless
29	1	1/2" x 3" Nipple	Stainless

30	1	2" Ball Valve	Brass
31	1	1/2" Street Elbow	Stainless
32	1	Screen; 1/8"	Stainless
33	50'	2" diameter, 50' PVC S&D (Rigid Plastic Hose)	
34	2	2" Female Kam-Lok Coupler x Hose Shank	Stainless
35	800'	3/4" ID Air Hose	
36	1	2" Female Kam-Lok x 2" FNPT	Stainless
37	1	1/4" 90° Elbow	Stainless

APPENDIX C
NEW "CLEANER" HEAD DESIGNS

Side view

Front view

Weld 1/4" SS screen between
nozzle and tip.

Notes:
Cut 1/4" SS screen to $\square$ of pipe.
All welds: field category: 3

1.5" of thread
for attachment of
SS 2" Female Kam-Lok

2" SCH 40 SS
pipe 24" long

1/2" SS rod 20" long
Weld rod to pipe
and to body
at the corner of
top plate.
4 rods req'd at
each corner.

SECTION A-A

ALL WELDS:
FIELD WELD
CATEGORY: 3

C-3

SK 002582 B/H
PAGE 2 OF 2

⑥ LIFT
2" x 2" x 1/8" SS PL
QTY: 1

⑦ TUBE
1.5" SS SCH 40
Pipe @ 3" long
QTY: 1

⑤ FEET
1/2" X 8" X 1/8" SS PL
QTY: 2

④ TOP
3-1/8" X 8" X 1/8" PL
QTY: 1

③ INSIDES
3" X 8" X 1/8" SS PL
QTY: 2

① END
4" X 4" X 1/8" SS PL
QTY: 2

② FRONT/BACK
4" X 8" X 1/8" SS PL
QTY: 2

ALL LINEAR DIMENSIONS +/- .125" (1/8")
ALL ANGULAR DIMENSIONS +/- 5 DEGREES

SK 092582 BKH
PAGE 1 OF 2