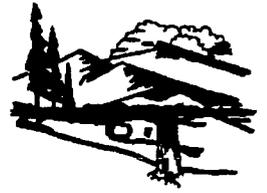




# Department of Environmental Quality



To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.

Matthew H. Mead, Governor

Todd Parfitt, Director

January 31, 2014

Mr. Jon Winter  
Uranium One USA, Inc.  
907 N. Poplar Street, Suite 260  
Casper, WY 82601

**RE: Uranium One, Willow Creek ISR Operations, Header House 5-5 Spill Inspection Report, Permit No. 478**

Dear Mr. Winter:

Enclosed is a copy of the Spill Inspection Report for the inspection of the production fluid release from the Willow Creek, Christensen Ranch, Mine Unit 5, Module 5-5 Header House conducted on January 21, 2014. This inspection was conducted with your assistance and that of Mr. Tim McCullough of Uranium One.

A copy of this report will be placed in the permanent inspection file for Permit #478, Willow Creek Irigaray-Christensen ISR Operations, as will any written comments you may have.

Uranium One's cooperation and assistance are greatly appreciated. If you have any questions or comments, please contact me at 307-675-5619.

Sincerely,

Luke McMahan P.G.  
Project Geologist

Attachment: Spill Inspection Report

cc: Cheyenne LQD file w/attach.  
WDEQ/WQD: Jim Eisenhauer w/attach.  
✓ Mr. Ron Linton, US Nuclear Regulatory Commission, Mail Stop T-8F5,  
11545 Rockville Pike, Rockville, MD 20852 w/attach.



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**SPILL INSPECTION REPORT**

**COMPANY/MINE:** Uranium One, Willow Creek ISR Uranium Mine, PT478

**INSPECTION DATE:** January 21, 2014

**INSPECTORS:** LM Luke McMahan, Mark Taylor (LQD District 3)

**COMPANY REP.:** Jon Winter, Tim McCullough (Uranium One)

**SUBJECT:** Inspection of Christensen Ranch Mine Unit 5, Module 5-5 Header House Spill

**Introduction**

On January 16, 2014 LQD received verbal notification from Mr. Jon Winter of Uranium One that there had been a spill of pregnant lixiviant (production fluid) from the Module 5-5 header house located in Mine Unit 5. At the time of the initial notification, Uranium One (U1) was still assessing the extent of the spill and did not yet have an estimated volume. The spill had issued from a broken manifold pipe located in the Module 5-5 header house. The fluid flowed from the header house into a dry ephemeral drainage which leads to Willow Creek. The fluid had frozen along the drainage channel and had not reached Willow Creek. On January 17, 2014 Mr. Winter notified LQD that the spill volume had been estimated to be approximately 77,000 gallons. Per Mr. Winter's request, LQD (Luke McMahan) agreed that U1 would be allowed to submit the written spill report after the 5-day reporting time frame to facilitate the time needed to thoroughly conduct an internal investigation and provide a more detailed spill report. A pdf copy of the written spill report was received by Luke McMahan (LQD) via email on January 24, 2014. The hard copy report was received at the WDEQ District 3 office on January 27, 2014.

**Field Inspection**

On January 21, 2014, LQD District 3 personnel Luke McMahan and Mark Taylor conducted an inspection of the spill site. Mr. Jon Winter and Mr. Tim McCullough of Uranium One (U1) were on site for the inspection and provided a description of events leading up to and following discovery of the spill as known at the time of the inspection. Mr. Winter advised the inspectors that the US Nuclear Regulatory Commission and the landowner were notified of the spill prior to the inspection. Access to the spill area along the drainage had been restricted with the construction of a temporary electric fence. Module 5-5 (located within Mine Unit 5) was not in production at the time of the spill and therefore the associated Module 5-5 header house was

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inactive. The trunkline from the Module 5-5 header house ties into the trunkline that carries production fluid from an actively producing portion of Mine Unit 5, Module 5-2. The Module 5-5 trunkline was not isolated from the Module 5-2 trunkline which resulted in production fluid being backed-up in the line connected to the Module 5-5 header house. A 6-inch butterfly valve is located in the Module 5-5 header house and serves as the isolation valve between the trunkline and header house production manifold (**Photo 1**).

Mr. Winter and Mr. McCullough advised the inspectors that the valve was determined to be faulty as the indicator was in the closed position but allowing fluid to leak by and fill the production manifold located in the header house. U1's investigation into the root cause of the spill identified recent weather data showing ambient temperatures had been below zero (minus 24°F) on January 5 and 6, 2014. U1 therefore concluded that the break in the above-ground, PVC constructed manifold was from expansion of freezing production fluid which had seeped into the manifold line (**Photos 2 & 3**). Due to the building being inactive, the release was unnoticed for an estimated nine days until routine quarterly sampling activities occurred in the area.

The release was observed to have flowed out of the header house and to the North West down a dry ephemeral drainage which leads to Willow Creek which is also ephemeral. Because of the very cold temperatures at the time of the spill, the fluid appeared to have moved slowly, freezing as it flowed down the drainage causing no significant erosion (**Photos 4, 5, 6, 7, & 8**). Visual observation of the frozen flow, along with surface water sampling data U1 collected downstream from the spill indicated that the spill did not reach any active waters including Willow Creek (**Photos 9 & 10**). The distance along the drainage from the header house to Willow Creek is approximately 6,000 feet. According to the U1's written Spill Report, the release flowed approximately 5,440 feet down the dry ephemeral drainage. U1 estimated that approximately 24,000 square feet (0.56 acre) of soil was impacted.

The majority of the spill volume appeared to be concentrated between the header house and an existing earthen dike (impoundment) located within the drainage approximately 3,300 feet downstream (channel distance) from the header house. As indicated by the total length of the spill's flow path discussed above, some of the fluid had flowed around the dike when the capacity of the diked area had been exceeded. After discovering the spill, U1 bermed up the west end of the dike to prevent any additional fluids from flowing further down the drainage. A submersible pump and associated piping had been installed in the impoundment to pump fluid back to the Modular 5-5 header house for disposal. Per U1's Spill Report, approximately 9,000 gallons of the released fluid was able to be recovered before the remaining fluid in the impoundment froze solid (**Photo 11**). The frozen fluid in the drainage is interpreted to be comprised of spill fluid and frozen surface run-off from recent snow melt occurring prior to the spill.

During the inspection, the on-site LQD and U1 personnel discussed viable options for cleaning up the spill. Due to the fact that the fluid was frozen and still in-place, the option of picking up the frozen material was assessed. LQD and U1 agreed to attempt peeling up some of the ice to see if cleaning up the spill in its frozen state was an option. Investigation of this option was

assessed with an on-site backhoe and was found not to be viable due to the fluid being frozen into the topsoil (**Photos 12 & 13**). Further assessment of this clean-up option concluded that picking up large amounts of the frozen spill fluid would result in extensive damage to the ground surface which could expose the underlying soil in the channel bottom to erosion. Additionally, it was considered that handling and transporting the frozen production fluid could potentially pose an unnecessary human health and environmental safety risk. As a result, LQD recommended excavating two catchment basins in the drainage between the header house and the impoundment. As reported in U1's written Spill Report, such basins were installed following the inspection to catch and recover fluid as it melts.

Prior to the inspection, U1 had collected samples of the spill fluid at key locations and had submitted them to both Intermountain Laboratories in Sheridan, WY and Willow Creek Mine's on site lab for analysis. Information regarding these samples was provided in U1's written Spill Report. Samples were collected from the Module 5-5 header house manifold, a location directly outside the header house, the impoundment located within the drainage (impoundment), the small pond located at the confluence of the drainage and Willow Creek (DV-1 Pond) and from locations in Willow Creek upstream and downstream of the spill (CRCG-05 and WCOMC respectively). Analysis of these samples from the Mine's on site lab showed Uranium concentrations in the spill fluid samples from the header house and the impoundment ranging from 11.9 ppm to 13.6 ppm. DV-1 Pond showed a concentration of 0.49 ppm, and the Willow Creek samples showed no detectable concentration of Uranium. A map showing the sample locations was included with U1's January 24, 2014 Spill Report.

Due to the frozen conditions at the spill site, sample collection and assessment of the results will be on-going. U1 has indicated in their Spill Report that soil samples will be collected as soon as the ground thaws. After all analysis of the soil samples has been reviewed, a determination will be made if remediation actions are necessary. Corrective actions which have been implemented or are planned for immediate implementation include; the installation of blind flanges in all modular buildings that are not utilized for production activities to prevent a re-occurrence of a valve leaking by; and continued efforts to pump and collect fluid from the impoundment and catchment basins as the frozen fluid melts.

While conducting the inspection, the inspectors and U1 personnel had walked in areas where the spill fluid had infiltrated into the dirt floor of the header house and where it had frozen in the drainage. Following the inspection, the inspectors and U1 personnel performed a personal survey using U1's Alpha Radiation Survey Meter as part of the Mine's check-out protocol. There was no radiation detection above background levels on the surfaces (shoes) that came in contact with the spill fluid.

### **Conclusions & Recommendations**

LQD's inspection of the spill concluded that U1 has followed the approved spill contingency plans included in the Mine's permit. LQD requests that U1 perform the following actions to continue minimizing the current effects of the spill and assess the spill site for the potential of

additional actions after the fluid has thawed. LQD requests that U1 provide a sampling plan to investigate the effects of the spill on soil, and surface water.

~~Soil Sampling -- Provide locations at which soil samples will be collected. LQD suggests~~ collecting multiple samples along the flow path including the impoundment location, catchment basin locations, and DV-1 pond. Also provide the locations where background samples will be collected (unaffected locations upstream, downstream or in tributaries of the effected drainage). LQD recommends analyzing the soil samples for the parameters used for the Willow Creek Permit (478) baseline analysis with the additional analysis of Selenium. Please provide the sampling methods to be used, the analytical suite to be analyzed, laboratory(s) to be used for analysis, and projected sampling schedule. Based on the results of the soil sample analyses, LQD and U1 can assess the applicability of collecting vegetation samples to assess the potential uptake of toxic constituents such as selenium from the effected soils.

**Surface Water Sampling** – Collect water samples from the locations indicated in U1’s January 24, 2014 Spill Report; “WCOMC”, “DV-1 Pond”, and “Impoundment”. The water samples should be sampled on a monthly basis focusing on times following melting and/or precipitation events. LQD recommends collecting these samples during the months of March, April, May, June, and July of 2014. LQD recommends analyzing the surface water samples for those parameters utilized for the Willow Creek Permit (478) quarterly compliance monitoring program. Please provide the sampling methods to be used, the analytical suite to be analyzed, laboratory(s) to be used for analysis, and projected sampling schedule.

**Radiological Survey** – After the fluid has thawed, LQD recommends that U1 perform a gamma-ray survey of the soil along the spill path to provide a comparison to the background survey data collected for the permit’s radiological baseline. In accordance with appropriate NRC guidelines, please provide details for conducting a gamma-ray survey utilizing soil sample analysis and radiation scanning detection methods. Soil samples should be collected at key points along the spill path focusing on areas such as the impoundment and catchment basins. Radiation scanning detection methods should be conduction along the entire length of the spill path. Please outline the sampling methods, analytical parameters, and sampling locations to be used.

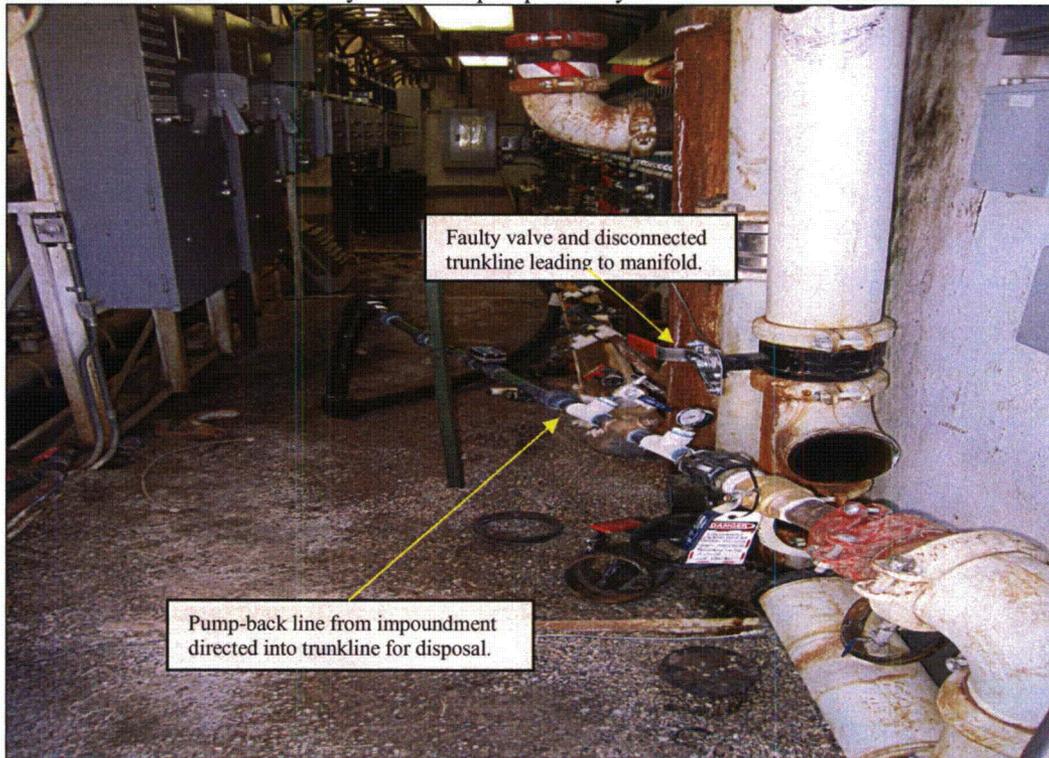
LQD encourages U1 to continue its efforts to pump and collect fluid from the impoundment and two catchment basins through the spring of 2014, focusing on pumping efforts during and following melting and/or precipitation events that may carry affected soils down the drainage to Willow Creek.

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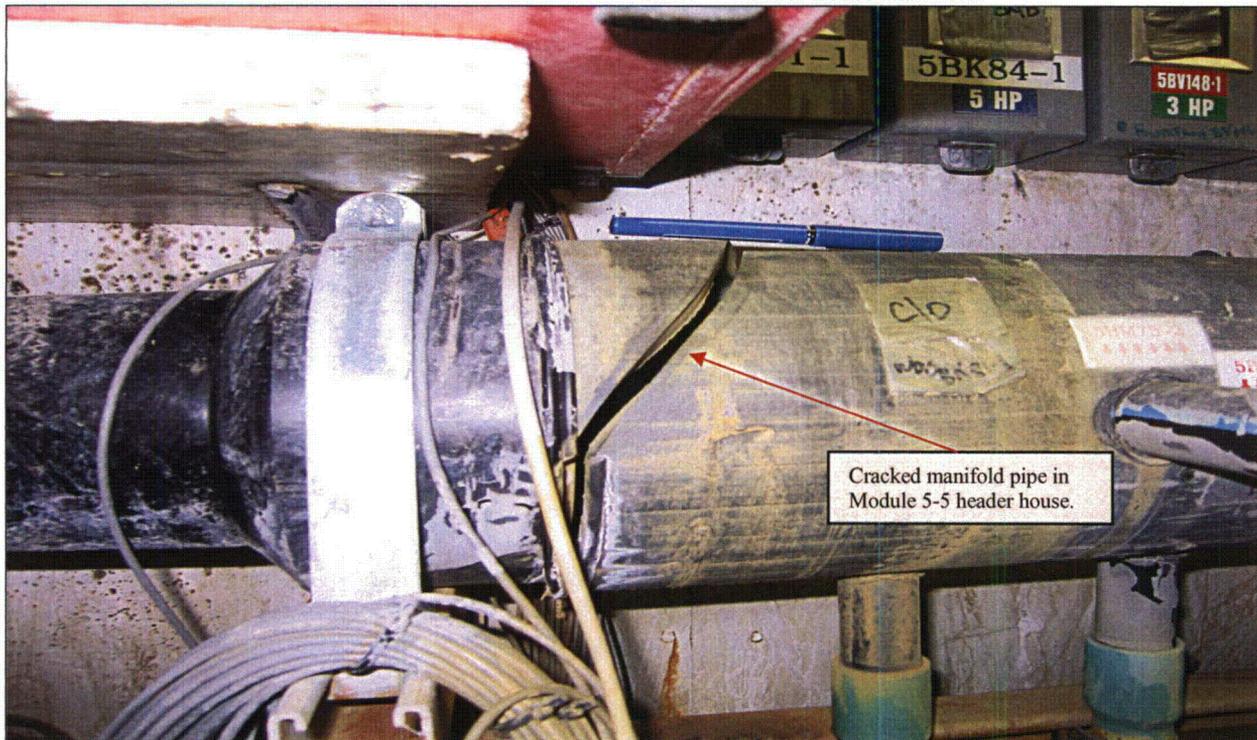
cc. Cheyenne LQD File

### PHOTO LOG

**Photo #1** – View of faulty valve and pump-back system in Module 5-5 header house.



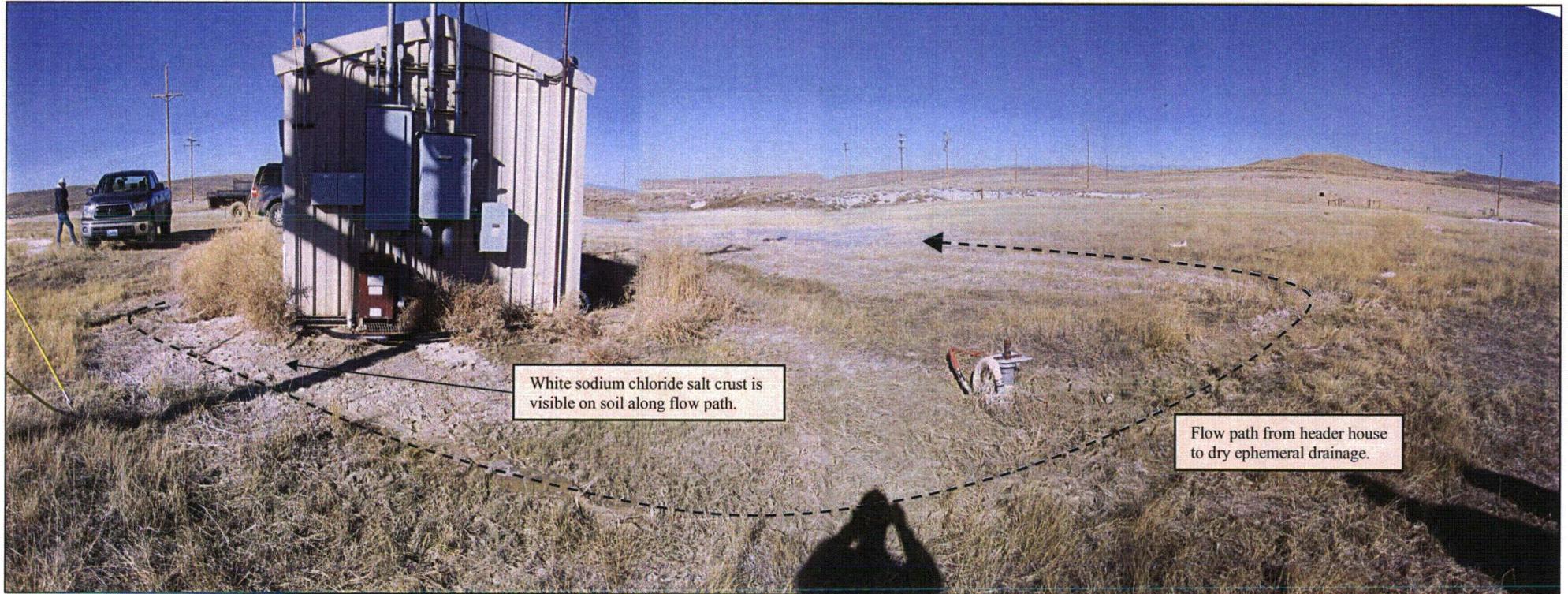
**Photo #2** – View of break in Module 5-5 header house manifold.



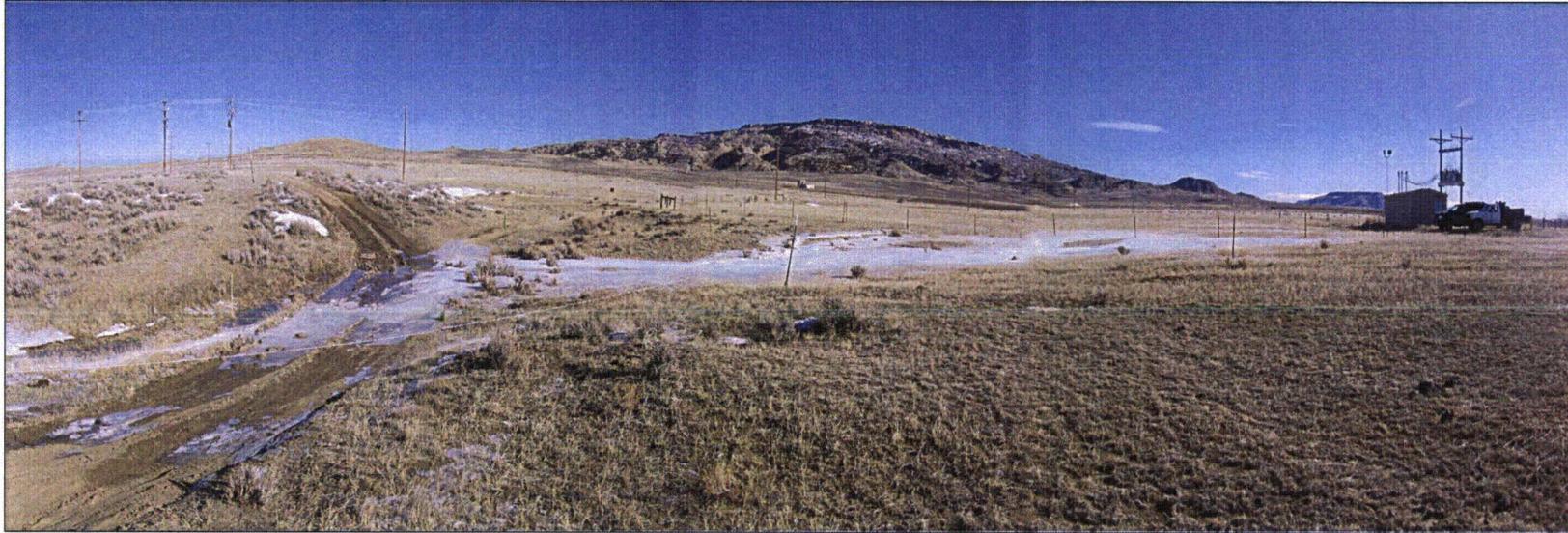
**Photo #3** – Interior view of Module 5-5 header house manifold.



**Photo #4:** View of spill flow path from header house.



**Photo #5:** View of frozen spill flow path in drainage directly down-stream from header house.



**Photo #6:** View of frozen spill flow path in drainage directly down-stream from header house.



**Photo #7:** View looking down-stream of frozen spill flow path between impoundment and header house.



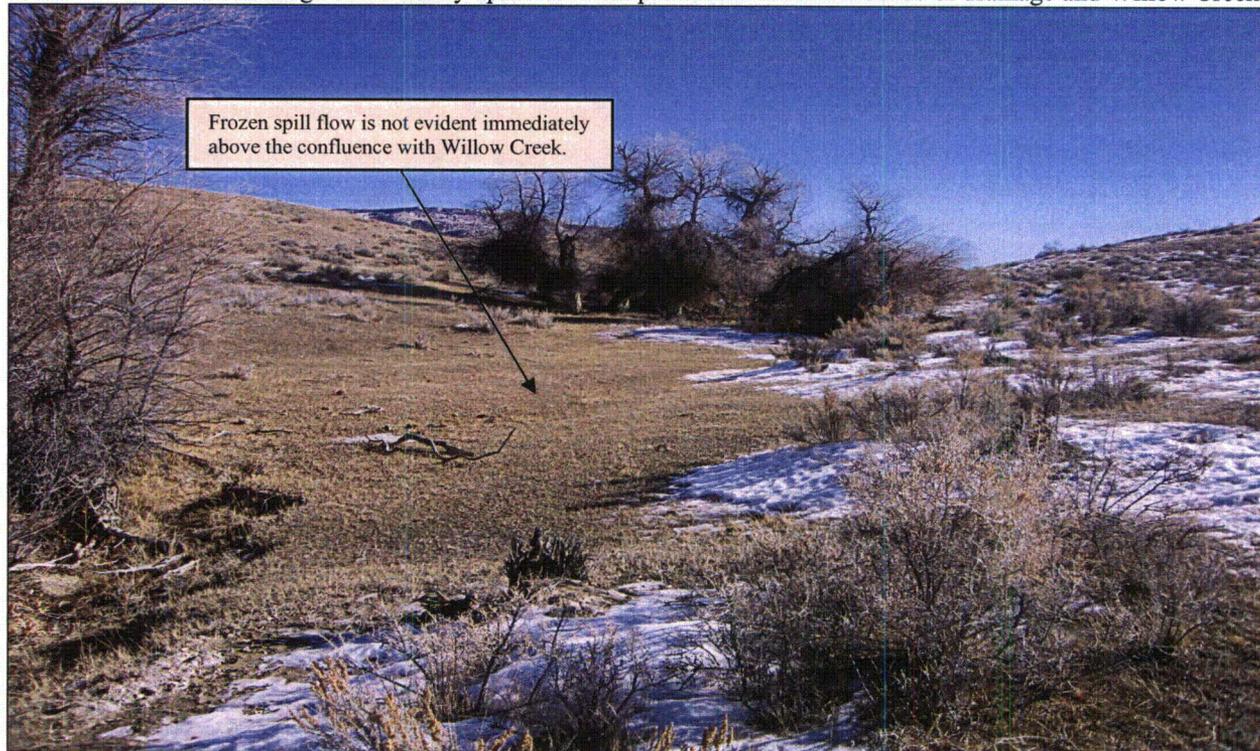
**Photo #8:** View looking upstream of frozen spill flow path between impoundment and header house.



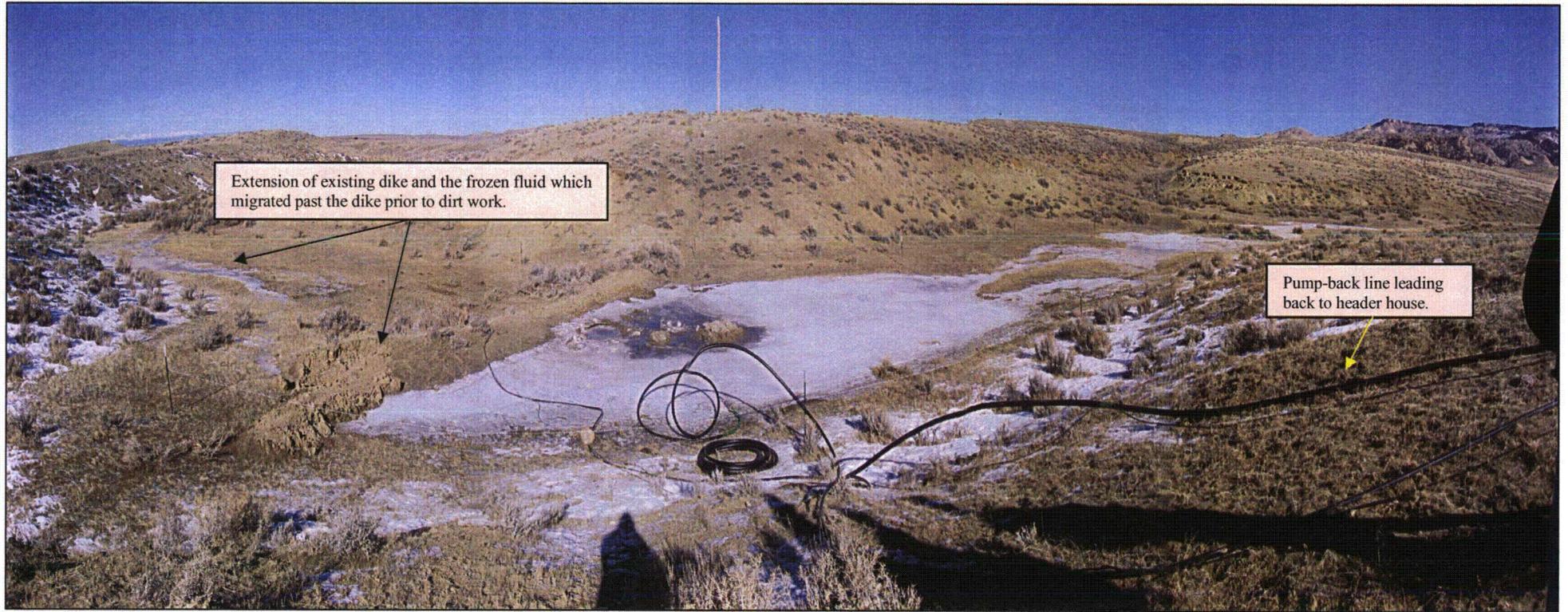
**Photo #9:** View of pond located at confluence of drainage and Willow Creek (DV-1 Pond).



**Photo #10:** View of drainage immediately upstream from pond located at confluence of drainage and Willow Creek.



**Photo #11:** View of impoundment with pooled spill fluids located approximately 3,300 feet down the drainage from Module 5-5 header house.



**Photo #12:** Attempt to peel up frozen spill with loader.



**Photo #13:** Attempt to peel up frozen spill with back-hoe.

