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Subject: Blue Alert: Water Line Rupture

Project Hanford Lessons Learned

Title: **Water Line Rupture**

Date: March 25, 1998
Identifier: 1998-RL-HNF-0011

Lessons Learned Statement:

In an era of changing missions, care must be taken to ensure that infrastructure designed for past operational needs is modified and managed to foster success of new missions.

Discussion of Activities:

Summary:

A hot sanitary water line on the second floor of the 326 Building ruptured due to over-pressurization of the Hanford 300 Area sanitary water system, damaging ceiling tiles, painted surfaces, pipe insulation, and pressure gauges. Back-flow preventers were activated and a safety shower/eyewash line in Building 3746A ruptured, flooding several lab spaces.

Details:

On November 17, 1997, an eight-inch sanitary water pipe failed southwest of Building 313 in the 300 Area. An estimated 60,000 gallons of water flowed onto the ground around the south side of Buildings 313 and 303K on Ginko Street. The Hanford Fire Department responded to the fire alarm caused by a drop in pressure when the water pipe at Building 313 ruptured. They noted the release of water into Ginko Street and immediately notified the 384 Powerhouse and the Utilities Shift Supervisor. The Utilities Shift Supervisor coordinated the timely isolation of the affected section of water main. Since water was entering several facilities suspected of having fixed radiological contamination, access to the affected area was controlled until radiological surveys could be performed to determine any spread of contamination.

Prompt and correct response to the isolation and repair of the water main by plant operators and the emergency response team prevented any adverse impacts to worker safety or health.

Analysis:

Pressure surges frequently result from grossly oversized pumping equipment and controls. This condition, coupled with aging piping systems within facilities, creates the potential for further, much more significant events. Much greater facility damage and programmatic impact could have resulted if the rupture had occurred in another portion of the facility or had it not been detected so quickly.

Inspection of the excavation revealed the water main, which was installed circa 1945, had been bedded in original soil material consisting mainly of various sized cobbles and rocks. Present day water main bedding standards recommend water mains be bedded in rock free sand to ensure

proper piping support and to minimize "point" fractures of the water main piping. Following installation of the water main and construction of the 313 Facility, a driveway was established over the top of the water main. It is believed that the combination of improper bedding of the water main and continuous transport of heavy loads over the top of the water main led to a crack developing and eventually to the failure of the water main piping. The pipe failure resulted in a pressure drop which caused the standby pump to start. This produced the pressure surge which caused the other system failures.

Recommended Actions:

A project to upgrade the water pumping system with energy efficient pumps and motors sized to meet the current system requirements was planned and material procured but funding was pulled prior to the construction phase of the project. In light of continuing operational problems, plant personnel have identified resolutions to mitigate the water distribution system pressure surges. Work packages have been developed to remove one impeller stage from one of the two existing four stage pumps to reduce the pump discharge head. Planning is in progress to replace the other pump with a smaller capacity pump designed to meet current system requirements.

Estimated Savings/Cost Avoidance (if applicable): N/A

Priority Descriptor: BLUE/Information

Functional Categories(DOE): Conduct of Operations, Emergency Protection, Fire Protection

Functional Categories (User-defined): Instrumentation & Controls,

Mechanical/Structural Originator: Fluor Daniel Hanford, Inc.

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Keywords: over-pressurization, water line, rupture, pressure surges

References: Occurrence Report Number RL--PHMC-S&W-1997-0007, Failure of Sanitary Water Distribution Pipe; Occurrence Report Number RL--PNNL-PNNLBOPER-1997-0029, Damage to PNNL Facilities Caused by 300 Area Sanitary Water Line Rupture