EXECUTIVE SUMMARY

Savage Rapids Dam is located in southwestern Oregon, on the Rogue River, 5 miles upstream from the town of Grants Pass. The dam, owned by the Grants Pass Irrigation District (GPID), is 39 feet high and has been diverting irrigation flows since its construction in 1921. Fish ladders on the dam are old, do not meet current National Marine Fisheries Service (NMFS) fisheries criteria, and delay migrating fish. In addition, the fish screens on the north side of the dam do not comply with current NMFS fisheries criteria. Construction of two pumping plants to deliver irrigation water and removal of the dam are proposed to alleviate these fish passage problems. The pumping plants would be located immediately downstream from the fish ladders to enable GPID to deliver water to its patrons through the existing irrigation canals.
The process leading to this proposal is documented in a planning report/final environmental statement (PR/FES) filed on August 30, 1995. The PR/FES focused only on salmon and steelhead passage concerns at the dam and associated diversion facilities. The Bureau of Reclamation planned to do a detailed sediment study as part of predesign activities if the Congress approved removal of the dam and provided the necessary funding. However, a number of interested government and private entities agreed that the sediment study should begin before the predesign activities in order to expedite approval from the Congress. These entities assisted in acquiring Federal funding for this sediment evaluation study.

The purpose of this study was to determine the potential sediment-related impacts associated with removing the dam. Specific information that was developed included the following:

- An estimate of volume of sediment behind Savage Rapids Dam
- The particle size gradation and spatial distribution of reservoir sediment
- The chemical composition of the reservoir sediment
- The rate at which the reservoir sediment would erode following dam removal
- The expected rate at which eroded reservoir sediment would be transported downstream
- The location and magnitude of sediment deposition downstream from the dam

Study Reach

The reach of the Rogue River studied in detail for sediment impacts following removal of the dam was from the upstream end of Savage Rapids Reservoir (near Evans Creek) to

the confluence with the Applegate River, about 12.5 miles downstream from Savage Rapids Dam. Beyond the Applegate River, the steep gradient and additional tributary inflow will function to easily transport the sediment to the Pacific Ocean, 95 miles downstream from the Applegate River confluence. The water surface drops about 100 feet in the12.5-mile study reach and contains 8 pools 10-20 feet deep and 10 pools less than 10 feet deep. During periods of low flows, water surface elevations through pools are relatively flat, and pools tend to slowly fill with sediment. During periods of high flows, pool velocities increase, and the water surface elevation through the pools has a downward slope. During these times, sediment is rapidly scoured from the channel bed of pools and transported downstream.

Data Collected

A 2-foot contour map of Savage Rapids Reservoir was developed from a bathymetric (underwater) survey of the reservoir. Similar data were also collected along the river bottom downstream from the dam to the confluence with the Applegate River. These data were used to develop river cross sections for computer modeling purposes. Additional data were collected to determine the volume, size, and chemical characteristics of sediment trapped behind Savage Rapids Dam.

Riverflows and Sediment Transport Computer Models

A river hydraulics model, HEC-RAS, developed by the U.S. Army Corps of Engineers, was applied to the study reach to provide a mechanism of predicting specific hydraulic parameters, including water surface elevation, average velocity, and water depth for any given riverflow on the Rogue River. Model results were used to compare water surface elevation, average cross section velocity, and water depth for existing reservoir conditions and for river conditions after the dam is removed.

A sediment transport model, HEC-6t, was applied to the study reach to predict those hydraulic parameters indicated for the river hydraulics model as well as erosion of reservoir sediments, sediment transport and deposition downstream, and changes in the stream channel bed. Model results were used to analyze the volume of sediment eroded from the reservoir, the rate of erosion, the rate of sediment transport downstream, and the temporary deposition along the river channel.

Results

- *Reservoir Sediment Volume Estimate* – 200,000 cubic yards (100 feet high if placed on a football field).

- *Reservoir Sediment Sizes and Distribution* – 2 percent fines (silt and clay-sized particles), 71 percent sand, and 27 percent gravel overall; cobbles from 3 to 5 inches in diameter compose up to 20 percent of the deposit found on the north shore of the reservoir. A finer-grained bar deposit is present on the south side of the reservoir but is less than 10 percent of total sediment volume.

- *Chemical Composition of Reservoir Sediment* – Testing of reservoir sediment indicated no contaminants with concentrations significantly higher than naturally occurring background levels. The chemical composition of reservoir sediment would not pose any hazard to water quality, fish and wildlife, or human uses if released downstream.

- *Rate and Extent of Reservoir Sediment Erosion* – Model results show that virtually all sediment would be eroded from the reservoir following the removal of Savage Rapids Dam. About three-fourths of the sediment would be eroded from the area immediately upstream from Savage Rapids Dam within the first year.

- *Rate of Sediment Transport Downstream* – Reservoir sediment would be transported past the Applegate river confluence within a 1- to 10-year period. The specific length of time would depend on the frequency and magnitude of high-flow events following dam removal. High and frequent floods following dam removal would cause reservoir sediment to reach the ocean within a few years.

- *Sediment Deposition Downstream* – Sediment eroded and flushed from the reservoir would be transported downstream. Sediment deposition in pools and eddies would occur during low-flow periods as it does now. Maximum deposition will range from 1 to 8 feet in river pools. However, no flooding is expected to occur because pool deposition would not cause an increase in water surface elevation. In addition, sediment deposited in pools would subsequently be scoured out and transported downstream during high-flow periods. All sediment would be eroded and eventually reach the ocean.

Sediment-Related Impacts to River Infrastructures

- *GPID Pumping Plants* – These pumping plants could be affected by the initial flushing of reservoir sediments. However, this could be prevented or mitigated by properly timing dam removal to help control sediment release and placing the pumping plant intakes to minimize exposure to sediment buildup.

- *City Water Treatment Plant Intake Structures* – High rates of sand deposition in the treatment plant could cause rapid wear on the river intake pumps and complicate the method of removing sand from the plant's sedimentation basins. This deposition of sand could be lessened by releasing sediments during the winter months when flows are higher and the treatment plant is operated at a slower pumping rate and for fewer hours per day. In addition, excessive deposition of coarse sediments in front of the treatment plant could plug the intake structure. Specific construction remedies could be implemented to lessen the potential for this impact.

Specific costs and details of mitigation of potential impacts to the pumping plants and the water treatment plant were beyond the scope of this study. Such information would be developed as part of a final design process for dam removal.