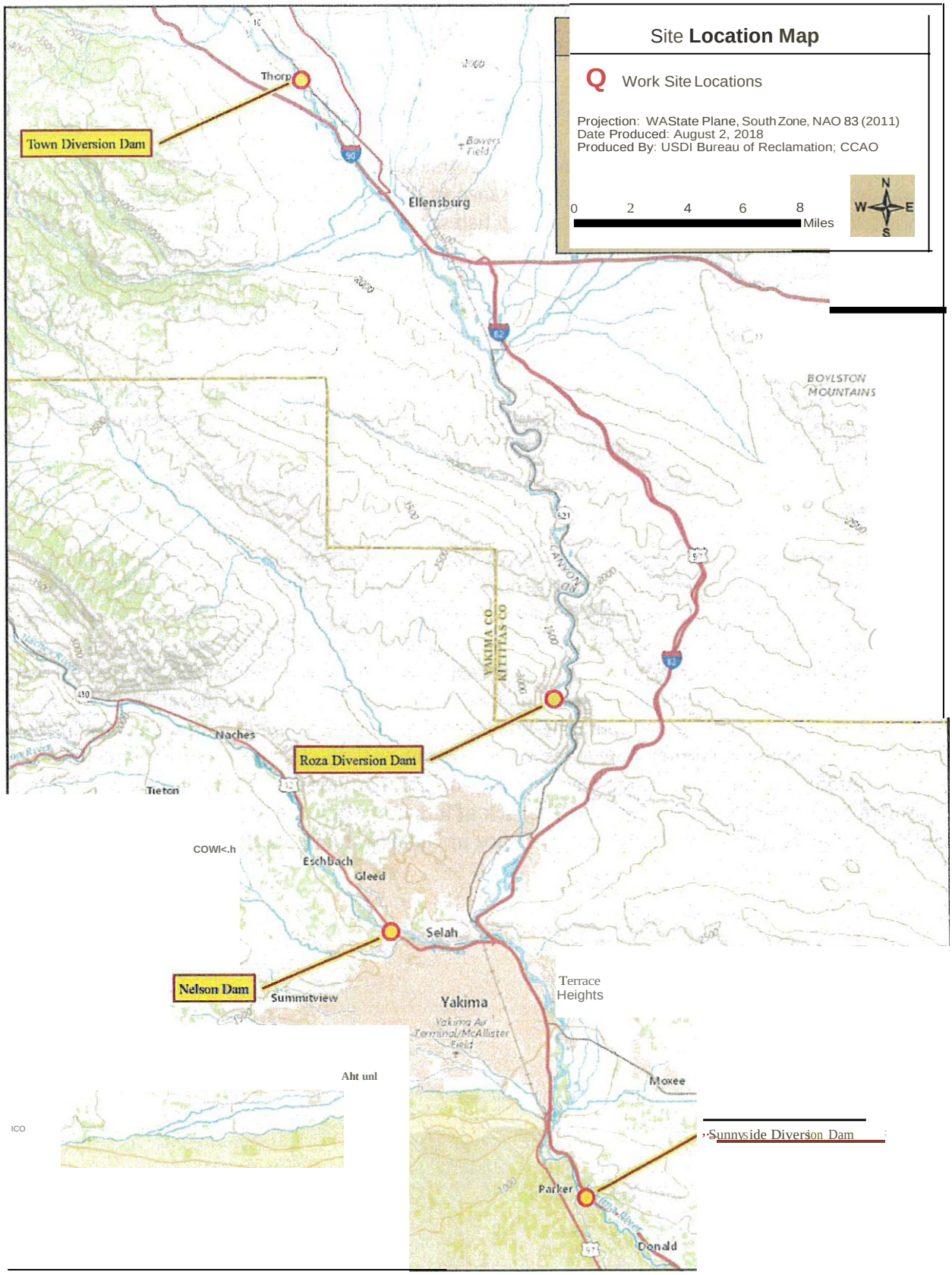


Figure 1. Vicinity map of the four diversion dams.

**Project Description**

Gravel and Debris Removal - Bypass Outfalls and Ladder Entrances and Exits

Channel aggradation often occurs upstream of diversion dams as bedload and fine sediments encounter slackwater conditions and fluvial transport diminishes or ceases. Periodic removal of deposited material is required in order to keep fish screen bypass outfalls and ladders clear and properly functioning. Reclamation personnel and its contractors occasionally send compressed air through the bypass pipes, especially at the smaller facilities, during the irrigation season to clear bypasses that become plugged with debris. Occasionally, in-water dredging is required to keep the outfall bypass and ladder entrances clear.

While patterns of sediment deposition can be unpredictable, routine dredging activity is required at Nelson Dam, Roza Dam, Sunnyside Dam, and at the Town Diversions. Descriptions of activities at these locations are provided below.

Roza Dam

Roza Dam forms an impoundment (Roza Pool), where a significant amount of fine sediment material -settles out and accumulates on the upstream side of the dam near the left bank. This sediment accumulation has resulted in a large mud flat area that is exposed every year when the Roza Pool is drawn down for annual screen maintenance at this facility (Photos 1 and 2). Sediment deposition has grown and shifted downstream to the point that water flow into the left bank low-flow fish ladder attraction flow intake has been cut off when the elevation of Roza Pool is dropped to its minimum operating level during annual fish screen maintenance activities (Photo 3). When the attraction flow gates are not operational due to the excessive sediment accumulations, there is insufficient water to meet operating criteria for the low-flow fish ladder. During maintenance drawdown period, the lack of attraction flow for the low-flow fish ladder may cause migration delays for migratory fishes including salmon, steelhead and trout.

Photo 1. Roza Dam sediment deposition area upstream of the dam on the left bank during the maintenance drawdown period.

Photo 2. Roza Dam sediment deposition area upstream of the dam that is exposed during the maintenance drawdown period.

Photo 3. Roza left bank fish ladder trashrack showing accumulated material on lower portion of trashrack at low forebay pool elevation and extent of sediment accumulation near the attraction flow intake.

Reclamation is proposing to dredge up to 1,500 cubic yards ($yd^3$) of sediment from the Roza Pool, during a January 1 to January 31 work window in order to provide better migration conditions for adult salmonids (Figure 2). This project will occur while Roza Pool is at its lowest elevation of the year (1207 feet). An excavator or backhoe will walk on the accumulated sediment and remove most of the material in the dry. When the majority of material is removed, the "plug" that remains will be pulled to allow water to access the area. All dredged/excavated materials that are removed from the Roza Pool will be loaded into dump trucks using the existing access road and disposed of in an existing spoil disposal site that is located on Reclamation property approximately ¼ mile upslope from the Roza Pool). All access routes are established and will not result in a loss of vegetation.

The proposed action will remove accumulated sediments from the low-flow fish ladder attraction flow intake and trashrack to restore adequate water flow into the ladder to ensure that passage is not impeded during the six week Roza Pool drawdown period in mid-October through November of each year. Work is expected to take 15 days within this work window and will likely occur annually (beginning in 2020). The future annual work will not exceed 1,500 cy3.

Yakima River at Ro;za Dam Faci lity P lan View

Project Layout

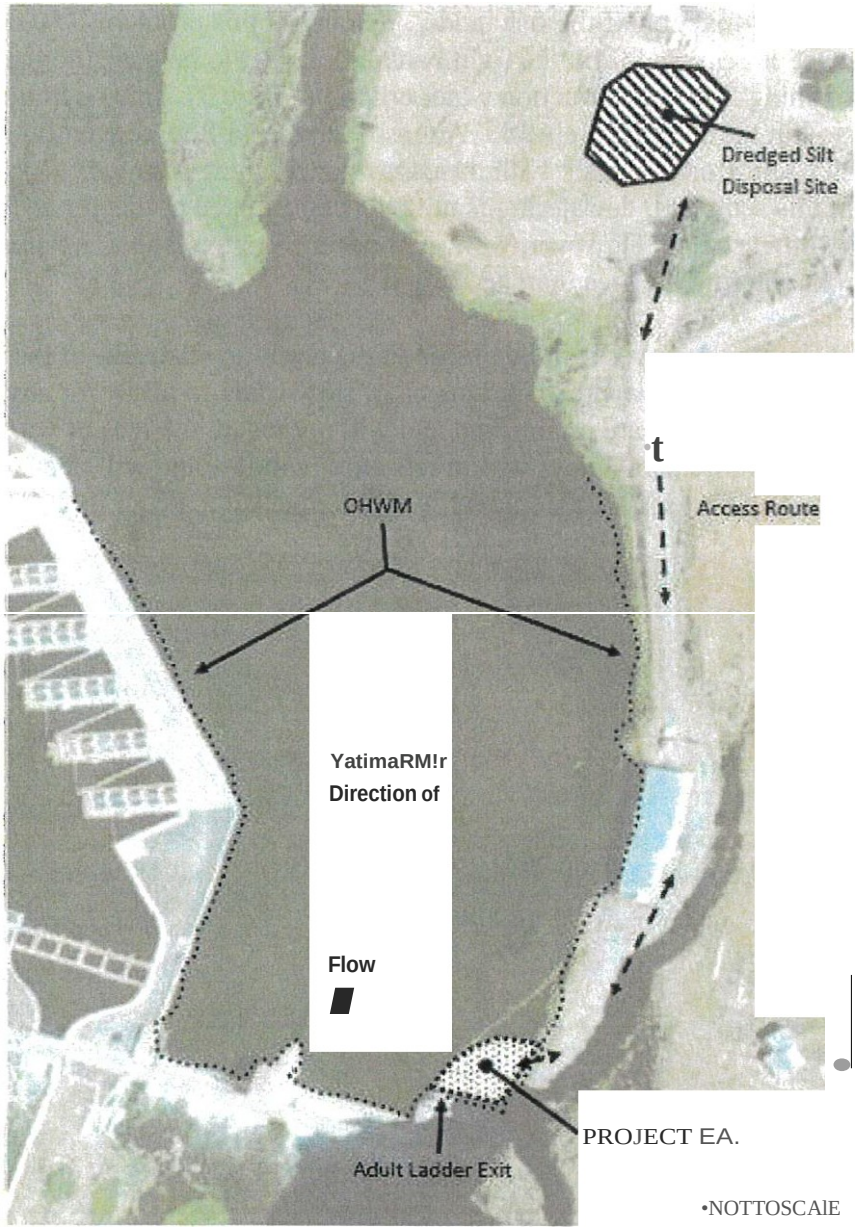


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Figure 2. Plan view of sediment removal area at Roza Dam.

Sunnyside Diversion Dam

Gravel and sediment frequently deposit on the upstream side of the right bank ladder (Photo 4). This deposition has inhibited function of the fish ladder. To con-ect this problem, 250 $cy^3$ of gravel and sediment must be removed from the right bank fish ladder to help ensure that flows are sufficient for maintaining flow and attraction water criteria (Figure 3). This operation occurs during a low-flow period in the summer (July 15 - August 31) when a flow restriction is apparent. All work will occur from the bank with the excavator reaching instream. Due to presence of lamprey in this sediment, dewatering is not being considered at this time. This will result in some turbidity downstream. However, work will occur from the ladder, upstream to prevent more water from entering the area than necessary.

Any woody debris that must be removed will be placed in the river, downstream of the dam. Sediment removed will be placed downstream in an area of slow water to allow for any potential lamprey to survive. All access routes are established and will not result in a loss of vegetation. Work is expected to take no more than 3 days within this work window and will need to be completed every 3 years. The first sediment removal work is expected to occur in 2020.

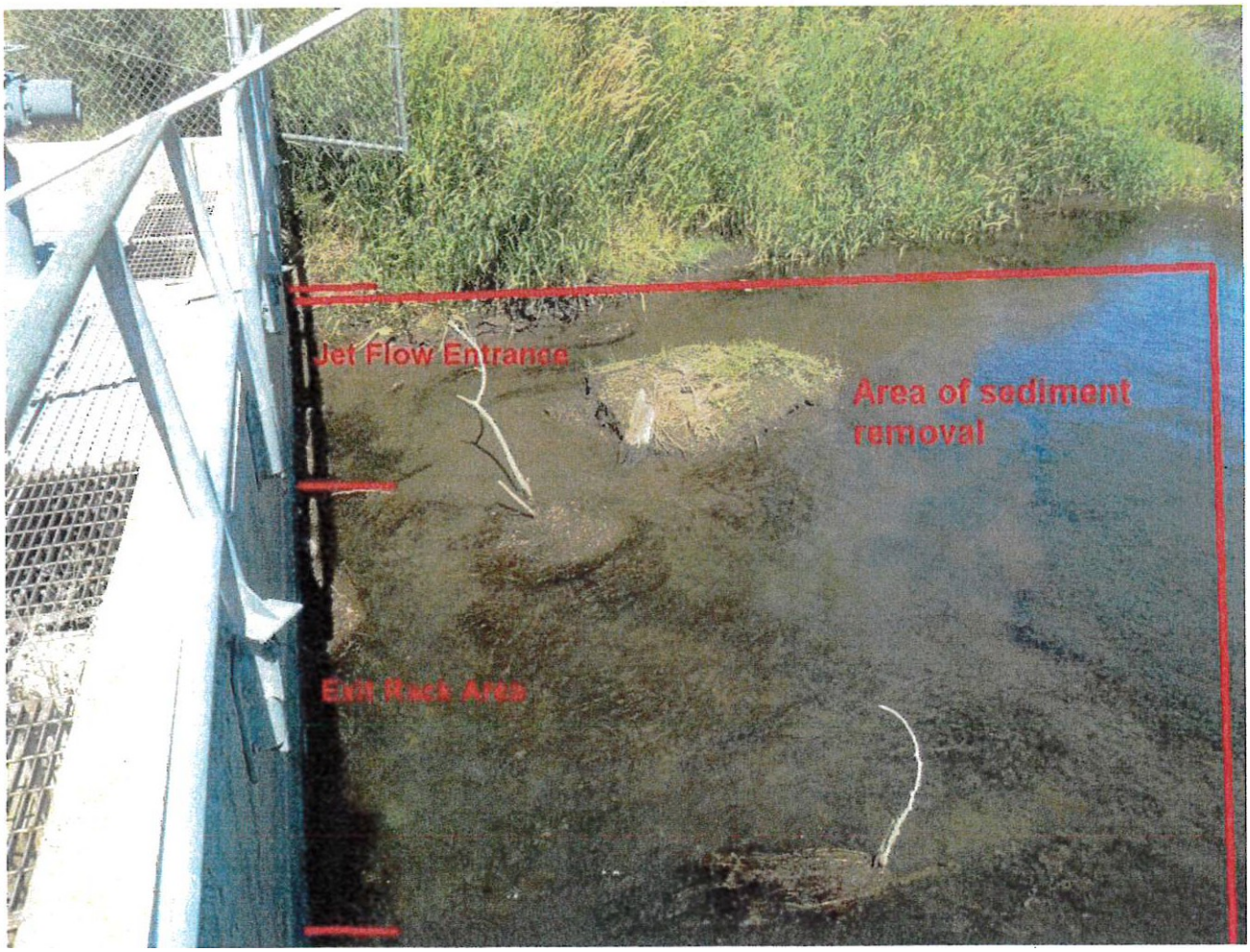
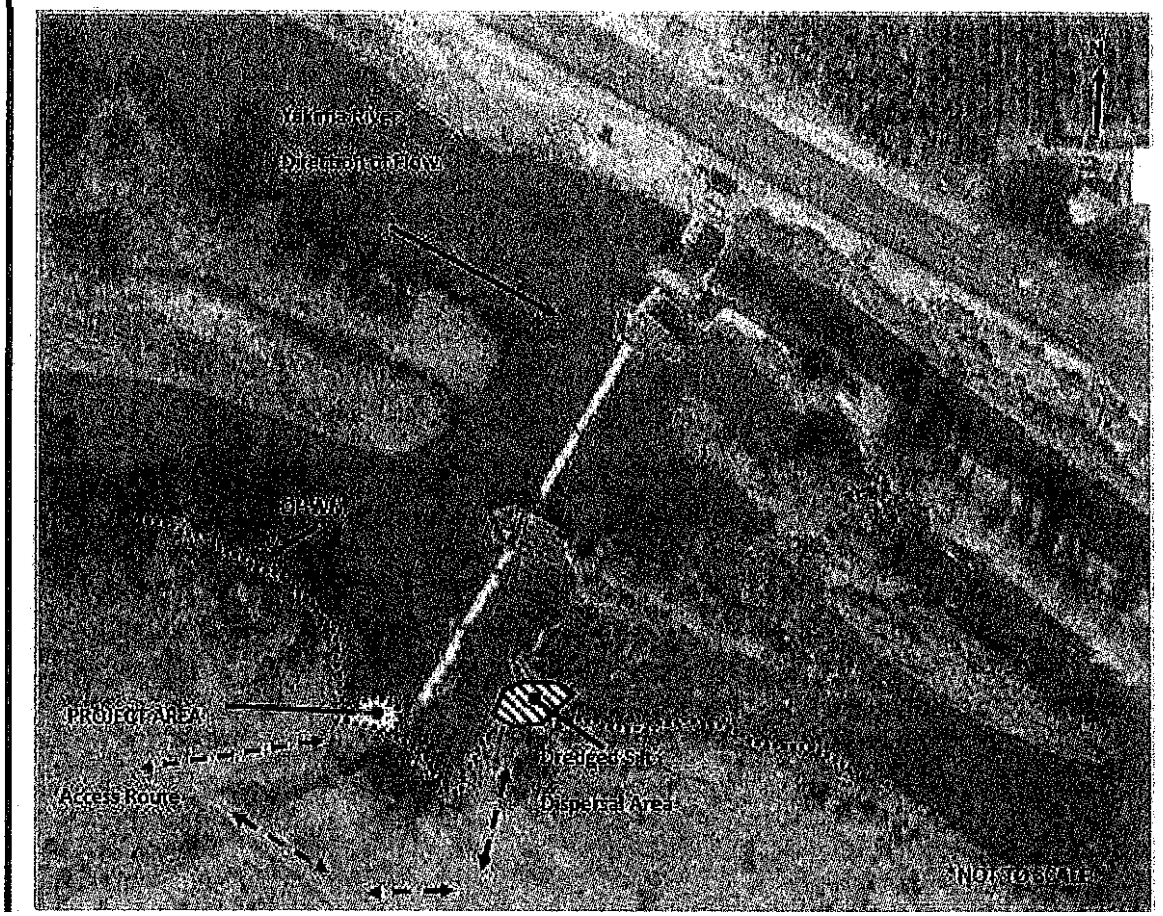



Photo 4. Sediment build up at Sunnyside Fish Ladder.

· Yak'ima·RiveratSirniiyside.barn Facility Plan View

Project Layout




| Channel Maintenance | |
|---|---|
| Element | |
| Length of Channel Maintenance | 30tF. |
| Excavation Volume Below OHWM | 250 CY |
| Excavation Area Below OHWM | 300 SF |

Figure 3. **Plan** view of sediment removal area at Sunnyside Diversion Dam.

Nelson Diversion Dam

The Naches-Cowiche fish ladder and fish bypass systems and Nelson Dam currently operate within fish passage operating criteria during most times of the year, but there are problems that have been identified at this facility that impact ladder and bypass pipe hydraulics and result in reduced fish passage efficiency or restrict fish passage entirely during certain times of the year. The main problem is that channel bedload movement after spring and/or fall high flow events in the Naches River occasionally leads to gravel deposition around the fish ladder entrance and exit as well as the bypass pipe outfall exit that limits the amount of water flow through these structures. These gravel and cobble accumulations either impede fish passage or prevent fish from successfully utilizing these facilities.

To keep the fish passage facilities operational and within established flow criteria, Reclamation maintenance crews need to move or remove about 100 $cy^3$ of gravel deposits that have accumulated near these structures after depositional flow events occur (Figure 4).

Reclamation has, in the past, excavated a channel from the river thalweg to the upstream exit of the fish ladder to allow adult fish to use the ladder. When maintaining the ladder, bedload usually remains in the river to form a berm which directs water flow to the fish ladder. Emergency gravel removal operations to restore adult and juvenile fish passage at this facility have occurred in 2001, 2003 and 2006. Photos 5 and 6 show the streamflow conditions at the fish ladder exit both before and after gravel removal operations in 2006. Sediment deposition and maintenance operations to remove gravel from the ladder exit and fish bypass were similar in all three years that emergency maintenance was required. Without the gravel removal, the fish ladder would have remained impassable to adult fish.

Nm::hem River at Nm;hei;-Cowk:he F,ish ladder and Bypass Pipe Facility
Pfail View

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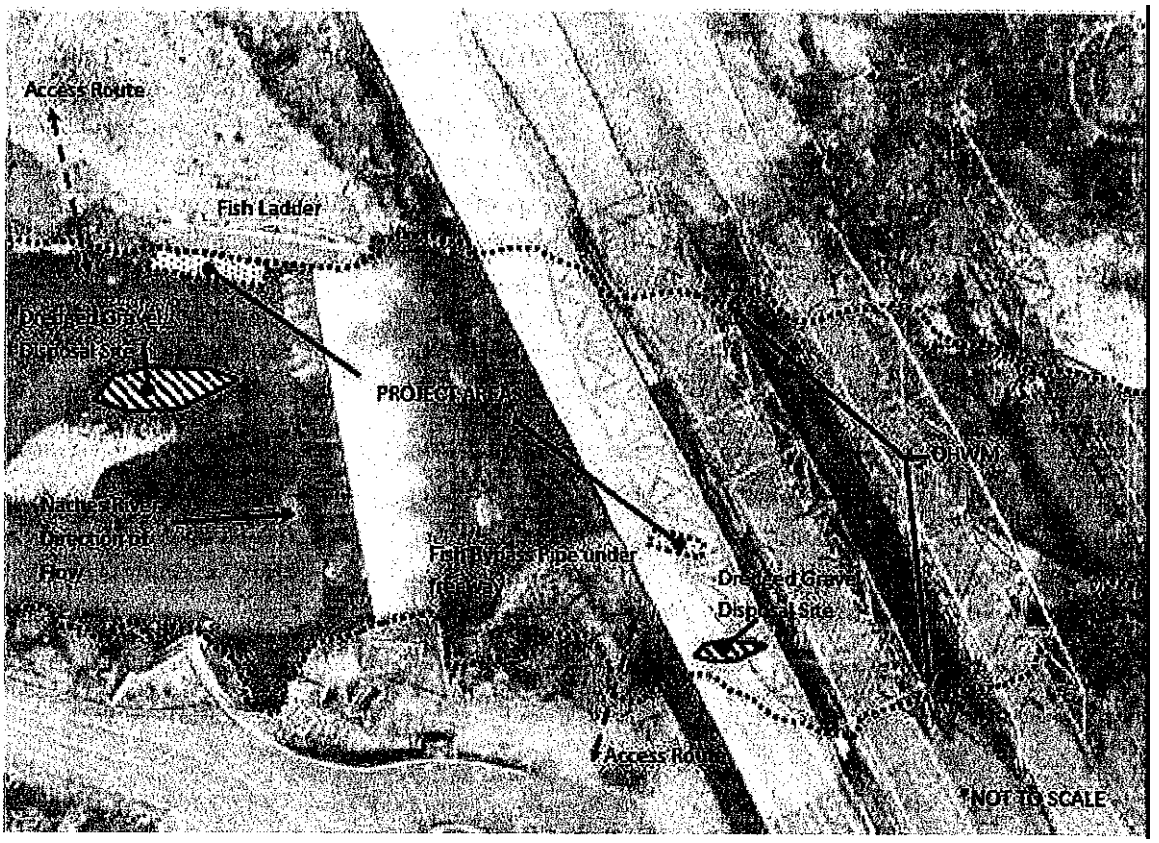


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Figure 4. Aerial view of sediment removal area at Naches-Cowiche Fish Ladder and bypass.

To perform this operation, heavy equipment needs to access the stream channel through existing routes both upstream and downstream of the nearby dam. These access points are established rip-rapped portions of streambank that Reclamation has used in the past to walk tracked excavators to the stream channel. Al[ access routes are established and will not result in a loss of vegetation.

Once in the Naches River, the excavator works from a dry gravel bar to cut a channel through the accumulated gravels, deep and wide enough to provide sufficient water flow to successfu1ly pass adult fish from the fish ladder exit to the main channel of the Naches River during the lowest expected streamflow levels in the river. Material will be excavated from the ladder moving toward the river, in order to keep flow and aquatic species from entering the work area. The gravel will not be removed from the river channel but will be spread downstream of the fish ladder by throwing gravel from bank onto an existing gravel bar in the stream (Figure 4). The Naches River is deficient in gravel so Reclamation has opted to leave material in stream versus storing upland. Similar excavation methods will be used at the bypass outfall pipe location. Work will be completed in the dry and connection to the river will occur last to prevent flow and aquatic species from entering the work area.

This activity will be completed from July 15 to August 31 when streamflows are sufficiently low enough to allow machinery access to the river channel. Work is expected to take 2 days within this work window and will need to be completed every 3 years to maintain passage. The first sediment removal work is expected to occur in 2020.

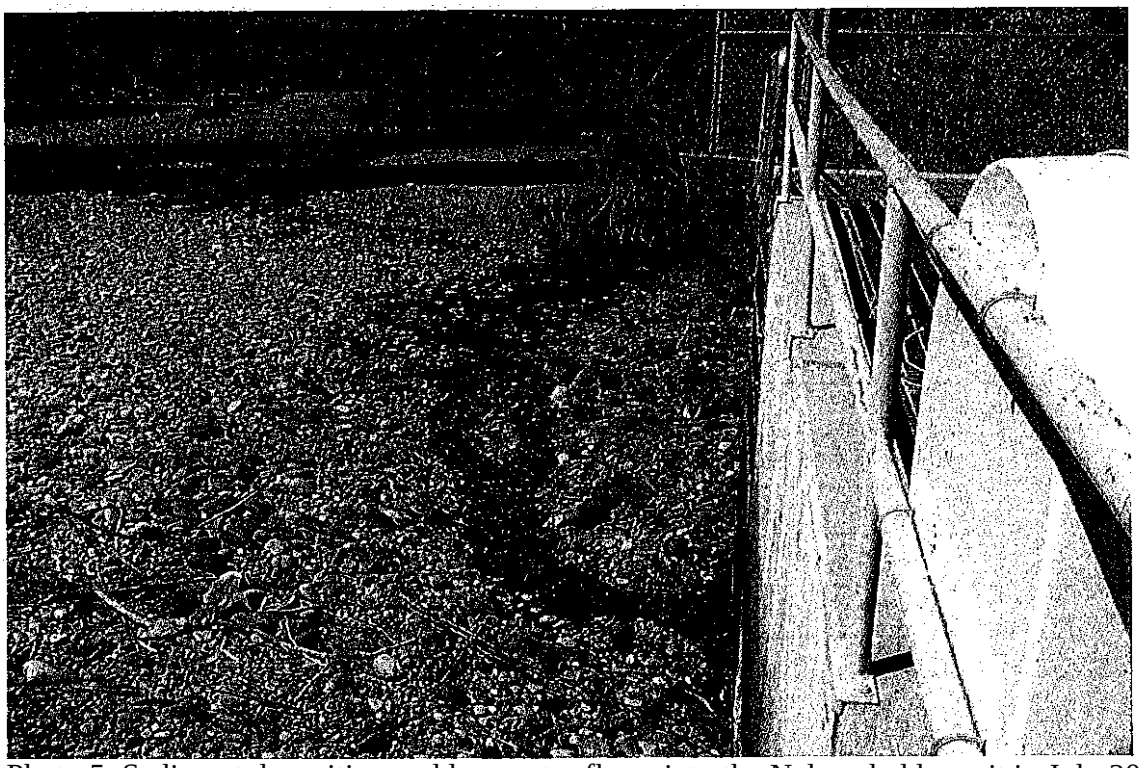

Photo 5. Sediment deposition and low water flows into the Nelson ladder exit in July 2006.

Photo 6. Flow into the Nelson fish ladder exit after gravel removal operations in July 2006. Gravel removal through the depositional area restored water flow and improved fish passage conditions at this facility.

Town Diversion Dam

Cobble and gravels that have built up at the Town Ladder exit and upstream entrance, reduce the depth of water and could impede fish passage out of the ladder and upstream to the main channel (Photo 7). Reclamation will remove 150 cy3 of material in order to restore fish passage during a work window of September 1 - 30 (Figure 5). This is expected to take 3 days to complete and will need to be completed every 3 years. The first sediment removal work is expected to occur in 2020.

The work will be performed with an excavator and/or backhoe with most of the work being performed from the bank or on the gravel bar at the edge of the bank. Any rip-rap armoring the bank that needs to be removed for access will be placed back in the original position. The rock and cobble that is removed from upstream of the ladder will dispersed in the river, downstream of the fish ladder (Figure 5). This dispersal area will be dry during the work window but depositing them at this location will allow for dispersal of the cobbles and gravels in the river during higher flows. All access routes are established and will not result in a loss of vegetation.

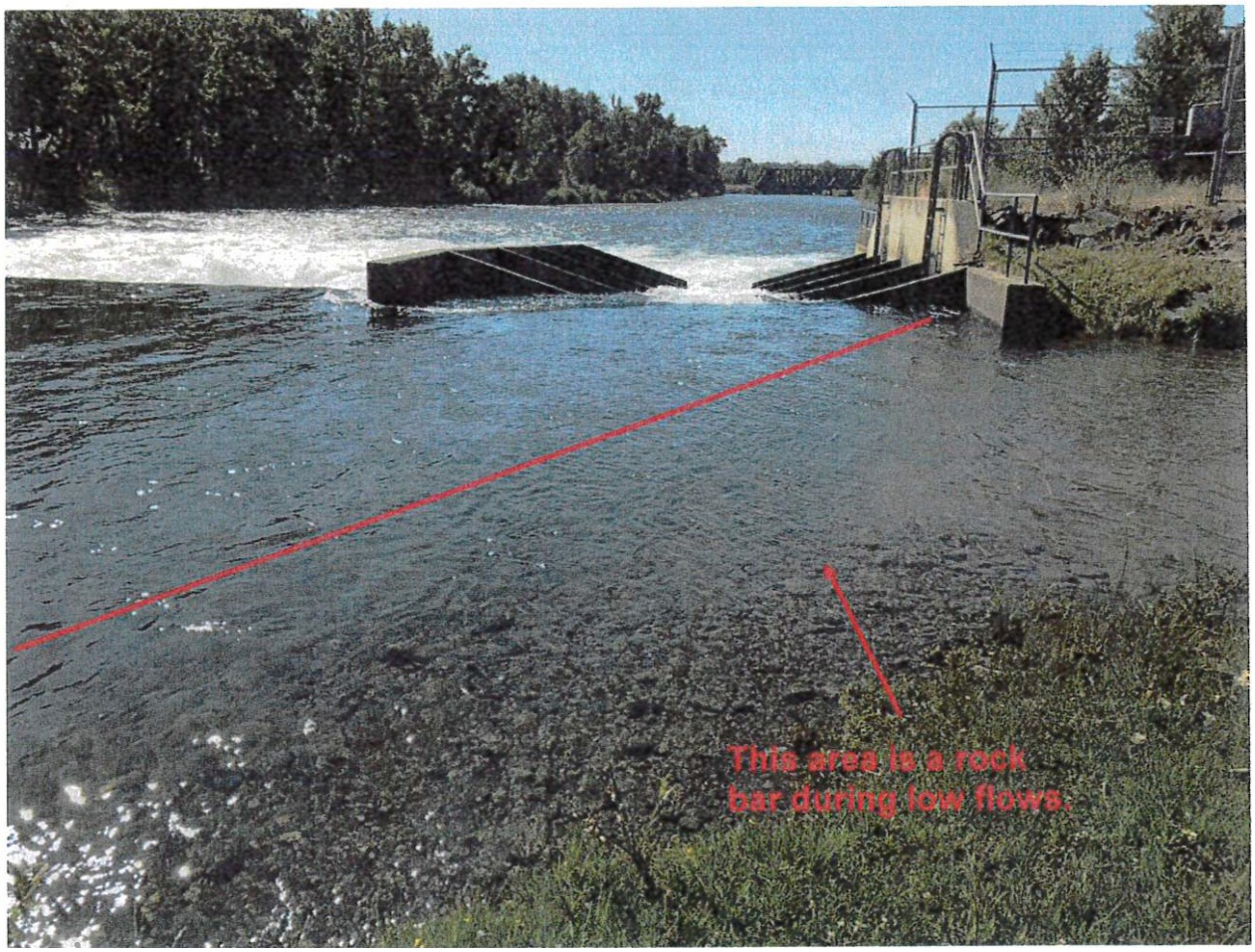

Photo 7. Accumulation of material above Town Ladder that impedes passage at certain flows.

Town Diversion Dam Fish Ladder Facility Plan View

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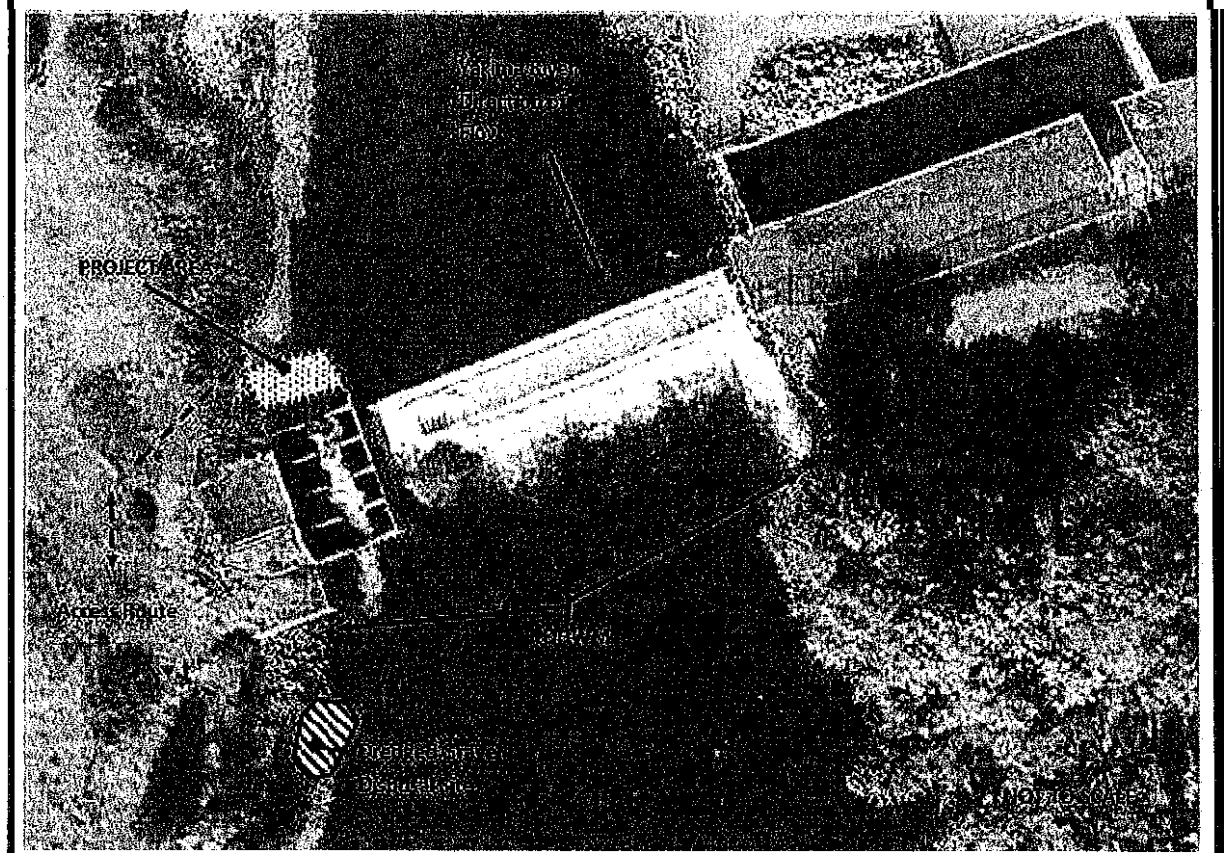


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Figure 5. Aerial view of sediment removal area at Town Dam.