**Meadow Valley Wash Site Assessment for Flood Risk Improvement**
**Caliente, Nevada**

January 2, 2001

Prepared for
U.S. Fish and Wildlife Service
1510 North Decatur Blvd.
Las Vegas, Nevada 89108

Background

Otis Bay Riverine Consultants were commissioned by the U.S. Fish and Wildlife Service to Visit Meadow Valley Wash where it passes through the town of Caliente, Nevada (Figure 1). Recently, residents have expressed concerns about the flood risk from the wash and have engaged in discussions about measures that could be taken to reduce their risk. We understand that one proposal was to dredge the bed of the wash to increase the cross-sectional area to presumably increase the wash's flood conveyance. We were ask to make a provisional assessment of the dredging alternative, survey the wash to identify elements that increase flooding risk, and make recommendations for a flood risk reducing alternative other than dredging. Also, we were instructed to pay close attention to one of the communities greatest expressed concerns, which is the flood risk imposed to the state youth correctional facility, located at the east end of town.

Results of field survey

Figure 2 is an aerial photo showing Meadow Valley Wash where it passes through the town of Caliente, and the main features in our assessment are labeled by number on the photo.

*Number 1* is the state youth correctional facility, which is one of the towns major employers, and is a major flooding concern of the state government and local community. Our preliminary assessment finds that the wash is relatively wide at this site but is seriously impeded by the culvert-fill crossing on the entry road.

*Number 2* is the location of the culvert-fill crossing that bridges Clover Creek. This culvert should be replaced by a bridge that is designed by a qualified engineer to pass, without impeding, the 100 year (or greater) flood peak.

*Number 3* is a highway bridge that narrowly spans the wash. Presently the capacity of this bridge has not been determined. While the bridge spans a channel segment that is much narrower than the remainder of the wash (which could result in reduced conveyance), the bridge deck is positioned at a significant height above the stream bed. This bridge should be included in a hydraulic modeling effort to determine its effect on flood peaks under the assumption that the upstream culvert is removed.

*Number 4* is the entrenched wash as it passes through town. The wash is approximately 150 feet wide and is over eight feet deep. Trees, shrubs, grasses, and forbs cover the wash's bed and would impose resistance to flood flows. The flood elevation resulting from vegetation induced roughness could be simulated by the hydraulic model. In addition, any change in flood elevation resulting from a stream bed dredging project could be simulated and evaluated using the hydraulic model.

*Number 5* is the truss highway bridge on the west end of town. The truss support, being only a few feet above the stream bed, is a poor design for this location. In most streams, and particularly those with a forested riparian area, flood planners expect abundant woody debris to be transported during extreme high flows. Given the wooded floodplain of Meadow Valley Wash, the limited clearance of the truss bridge support, and expected magnitude of high flows, this bridge has a very high probability of at least partially plugging during extreme events.

*In Summary*, we observed two critical impediments to flood conveyance that, if left unaltered, could continue to increase Caliente's flood risk: (1) The culvert crossing that lies just downstream of the youth correctional facility; and (2) The truss bridge that lies at the lower end (west) of town. Due to the hydraulic control provided by these two structures, dredging may have little to no effect on the maximum flood elevation during very large magnitude floods. To properly determine the influence that the bridge and culvert crossings have on the flood elevation, a qualified hydrologist should determine the flood frequency for the upstream drainage basin and model the water surface elevation for a flood peak with a 100 year recurrence interval.

Another substantial risk that both of these structures impose is the risk of collecting stream debris and plugging during a large magnitude event. The design of both structures is such that the probability of plugging is high. If a model was developed to simulate flood flows in this wash, it should be used to evaluate a scenario with a plugged culvert and partially plugged bridge.

<u>Is dredging a reasonable solution?</u>

Given the current situation with the poorly designed bridge and culvert, the flood peak elevation may show little change after the dredging is completed. Only a well calibrated model developed by a qualified professional can accurately predict the flood elevation change between different scenarios for a given flood peak, but it seems probable that the bridge and culvert obstructions are more significant with regards to increased flood risk than the capacity of the existing channel.

A greater concern related to a potential dredging project is that the soils in this area are highly erodible and, to a certain degree, are stabilized by the riparian vegetation. Removal of all vegetation and dredging of the channel bed and banks could lead to instability and accelerated channel migration that eventually results in houses and/or other structures being threatened. Once erosion and rapid channel migration commences, expensive erosion protection would be required. Also, geomorphologists have long established that artificial stream bed lowering can have undesirable effects upstream and downstream of the dredge site. These types of projects frequently lead to vertical degradation (stream bed erosion), which eventually leads to lateral

channel expansion and migration.

Alternative to Dredging

We feel that a better alternative than dredging is floodplain expansion and construction of levees (Figure 3). Floodplain expansion and levee construction could provide several benefits, including flood risk reduction and outdoor recreation, with a much lower risk of channel destabilization. The construction would include excavating the existing bank to build an intermediate terrace, upon which a nature trail could be constructed, and flattening the bank slope angle. The soil material generated from the excavation could then be used to construct a levee. To reduce the risk of erosion, crews would place toe rock along the edge of the existing channel and along the toe of the flattened slope.

There are several reasons that the benefits of this type of project are superior to dredging. First, trees and shrubs that enhance the esthetics of the community, provide habitat for wildlife, and are a welcome relief in a harsh desert environment, would be preserved. Second, the expanded floodplain gives greater flood capacity to the wash. Third, the levees allow for a higher flood elevation to pass safely, which may be crucial given the potential backwater effect created by the bridges and culvert. Finally, a recreational trail to enhance outdoor activity in the community could be easily constructed as part of the project for little cost.

Summary of findings

- The wash is wide and has significant capacity as it passes the youth center. The greatest risk of flooding, however, comes from the culvert crossing , which is part of the access road. This culvert should be replaced by a bridge that has adequate flood capacity.

- The truss bridge on the west end of town has little clearance and is susceptible to trapping woody debris. This bridge should be redesigned and reconstructed.

- We recommend that a qualified hydrologist evaluate the flood risk by developing a hydraulic model to simulate peak flood conditions. This model could then be used to evaluate different scenarios and benefits as related to cost of the project.

- We recommend that a constructed flood control project consider floodplain expansion and levee construction, which would provide some real flood and recreational benefits, while preserving the esthetic value of Meadow Valley Wash for the Caliente community.

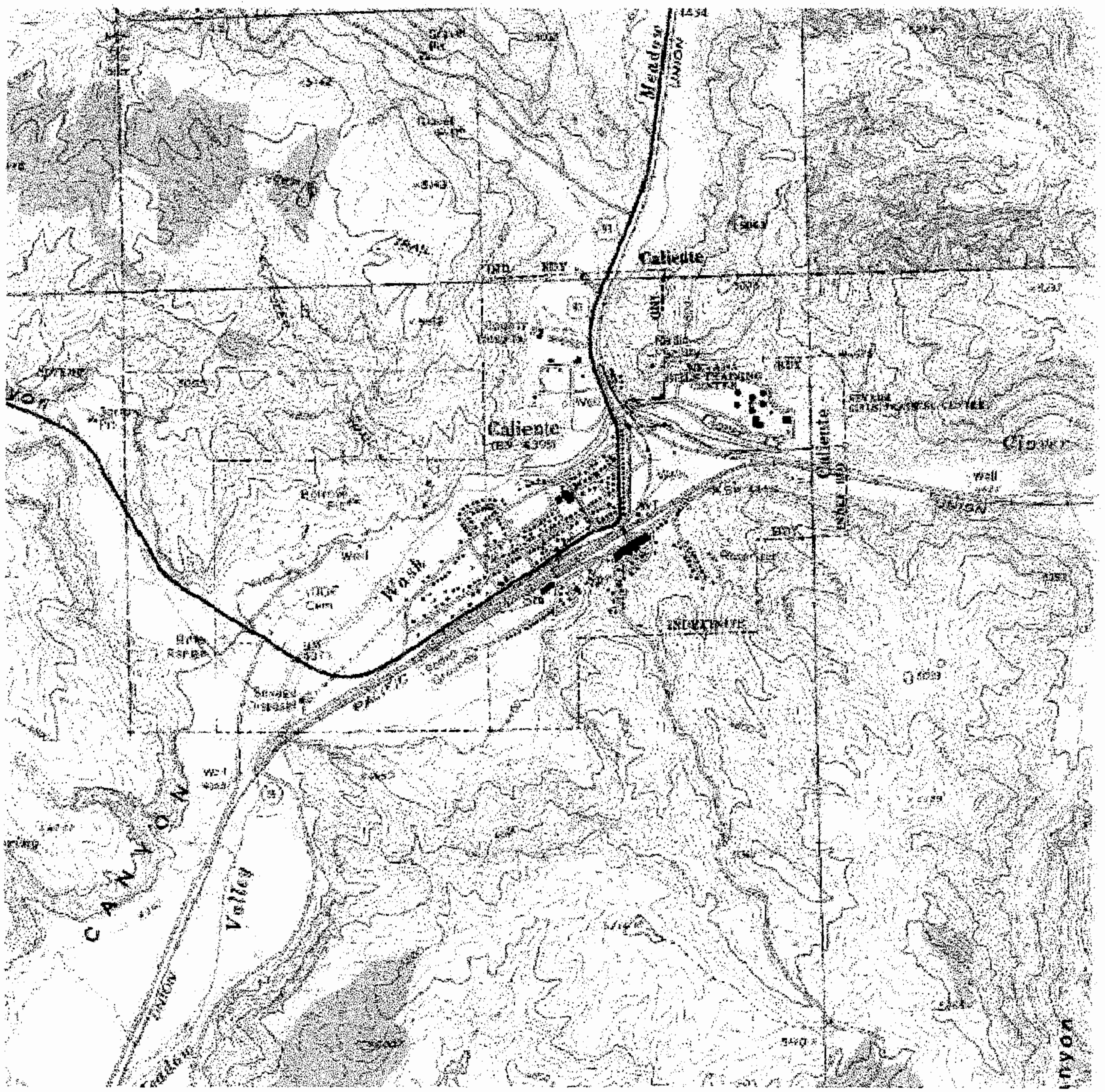


Figure 1. Topographic map of the project area.

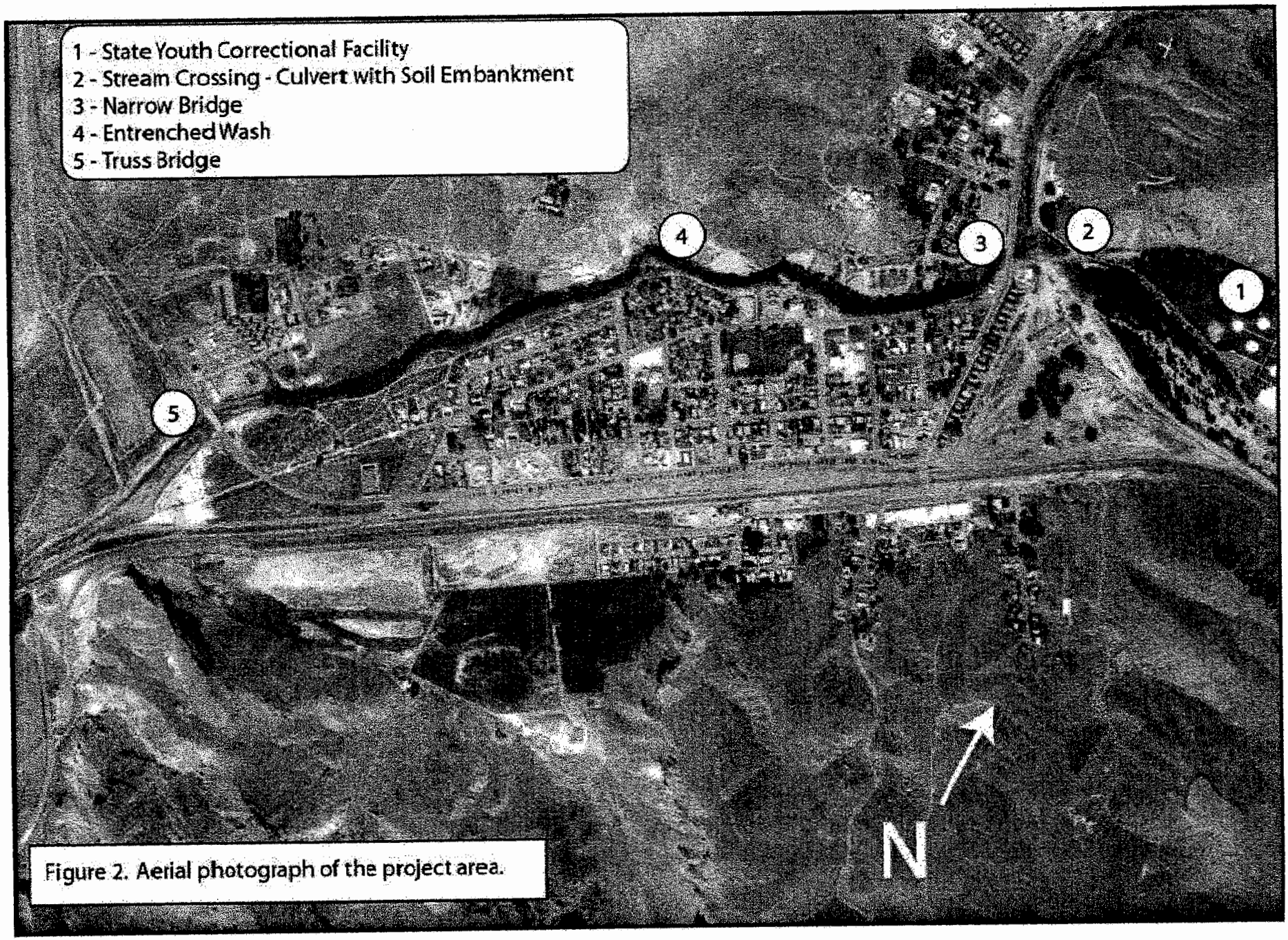


Figure 2. Aerial photograph of the project area.

Meadow Valley Wash

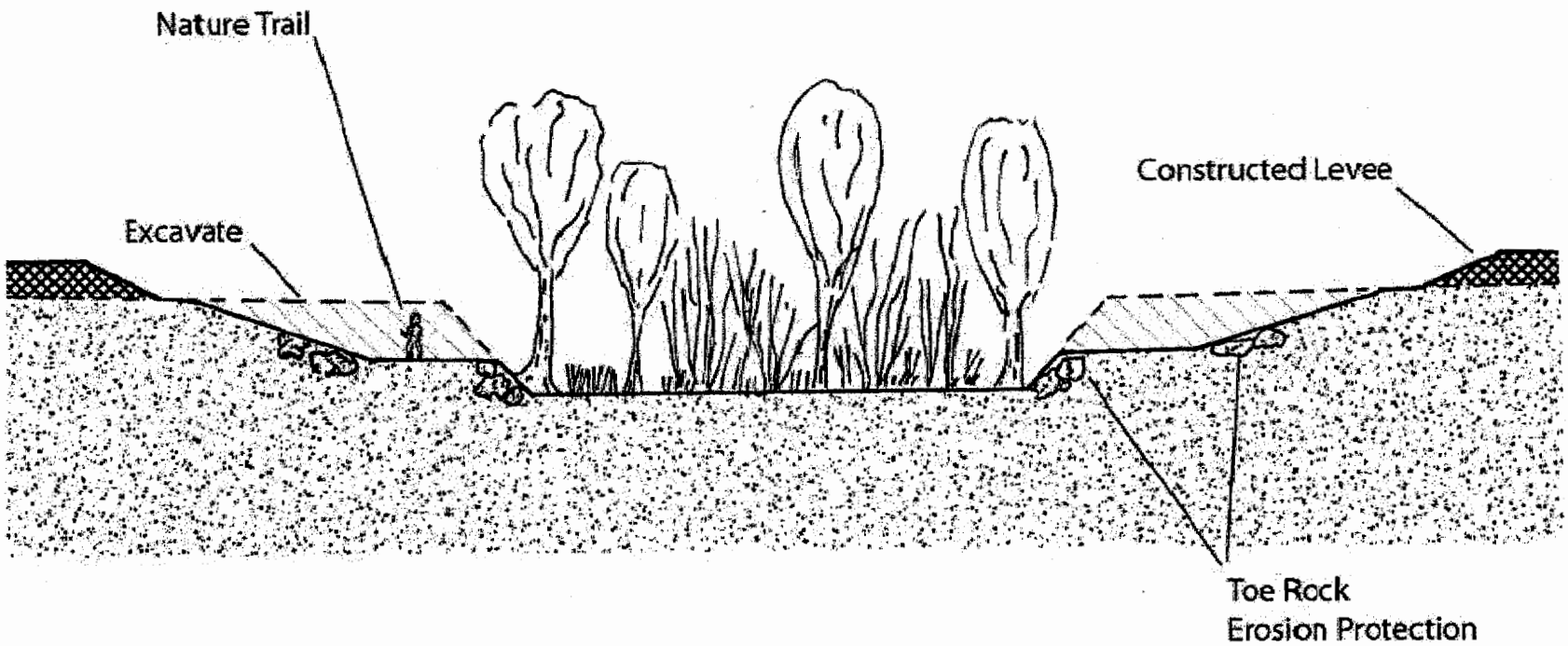


Figure 3. Typical cross section for reduced flooding.