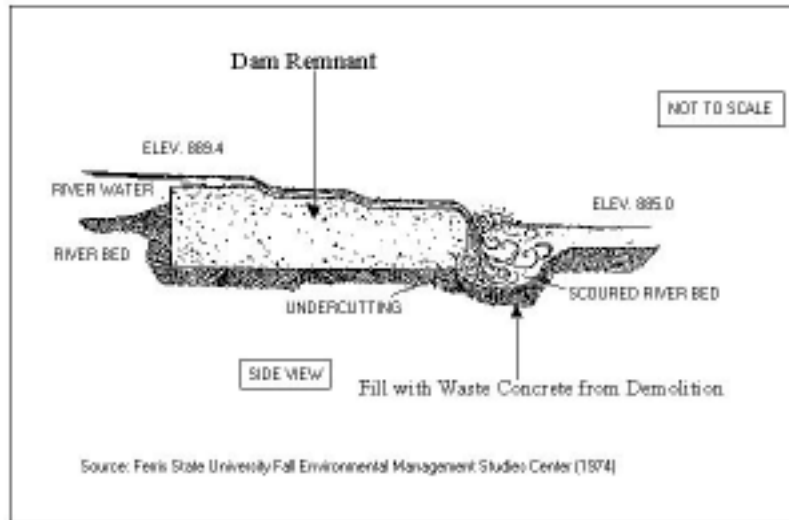


3.0 Proposed Procedures for the Dam Remnant Removal

The existing 4-ft. high dam remnant is to be removed, bringing the river bottom back to a more natural state (42). To prevent the migration of sediment and debris downstream during the removal process, mitigation procedures have been developed by Prien & Newhof consultants and the City of Big Rapids. The procedures are based on the Muskegon River sediment study conducted by the United States Geological Survey (USGS) in 1997 (23).

Figure 2: Sketch of Structure After Unsuccessful Removal of Original Dam (35).



3.1 Dredging

The mitigation calls for the removal of sediments upstream of the dam remnant to prevent the migration of these sediments downstream. It is predicted that the river velocity above the current remnant will increase due to the absence of the 4 ft. high dam foundation. Sediment accumulations are presently from the foundation of the dam to a distance of approximately 3,500 ft. upstream. An estimated 17,000 cubic yards of sediment will need to be removed from the riverbed north of the dam to minimize the volume of sediment that could migrate downstream as a result of increased flow rates (25). Prein & Newhof designed a dredging process to remove this sediment.

The resulting excavation will create a depression on the river bottom that will serve as a sediment trap, collecting re-entrained sediment before it can travel downstream (25). This dredging technique is performed by a specifically designed barge, called a “MudCat™”, mounted with an auger-type vacuum that rotates, drawing in water and sediment (Figure 3).

Figure 3:



Ellicott Intl. MudCat™ Dredge, Photo taken facing east, June 28,2000 (46).

The sediment is then pumped through a 12-inch diameter pipe approximately 1,200 ft. downstream to the collection site. From this point, the dredged material is discharged to a collection basin where sediment is allowed to settle and water is drained back into the river. Bails of straw have been placed on the bank of the river to filter the water runoff prior to its return. The collected sediment will then be removed at the completion of the construction phase. If possible, the City would like to treat the sediment as a resource and sell it for road fill, etc. (Figure 4).

Figure 4:



Sediment collection basin. Photo taken facing northeast, July 6, 2000 (46).

3.2 Remnant Removal

While proceeding with sediment removal, the first step in the dam remnant removal project has begun. This step is to construct a water diverting structure that will allow the demolition process to be completed. The water diversion and subsequent demolition will be completed on one section of the dam at a time (Figure 5). Water will be diverted from the west side of the dam first, allowing for its demolition. The barrier will then be removed and placed on the east side of the remnant to complete the demolition. The proposed course of action is to use large industrial pulverizing machines, similar to a “jack hammer”, to break the concrete from the dam into boulder like pieces 10” to 16” in diameter. Waste concrete will have the metal reinforcing rods removed, and will be used as retaining material for the riverbanks and fill for the scoured river bottom in front of the dam remnant to prevent erosion (25).

Figure 5:



Aerial photo of remnant removal area with diverting structure and MudCat™ in place, June 29, 2000 (46).

3.3 Cofferdam Removal

A cofferdam is located 1,100 ft. downstream from the dam remnant. The original purpose of this dam was to cover the water line serving the eastside of the city. This dam was intended to be temporary, but has remained in the river since 1988 (37). In 1999 the dam was rebuilt so it could be used as a sediment trap during dredging operations for the hydroelectric dam removal project. The cofferdam is scheduled to be removed Summer 2001. Procedures for the cofferdam removal have not yet been prepared (43).

4.0 Physiography

4.1 Scope/Purpose

The physiographic assessment included the following areas; glacial history, soils and climate information, possible erosion sites of the riverbed and banks, and migration of sediment downstream. The purpose of this study was to research and document the current characteristics of the physical environment from approximately 850 feet north to 625 feet south of the dam remnant. This documentation may be used in future physiography studies to evaluate and quantify any changes to the environment within the dam remnant removal area due to erosion and dredging.

4.2 Soils

There are six soil types in the study area. The main soil association for is the Mecosta association. Glacial tills form this association, which consists of nearly level to gently rolling terrain that is excessively drained due to sandy soils. The major soil type found on the west bank of the river is Mecosta Sand. Psammaquents and Glendora Loamy Sand are also found in smaller areas on the west side of the river. Coloma Sand is the major soil type found on the east side, while Alganese Loamy Sand, Covert Sand, and Glendora Loamy Sand are also in the same area (Figure 6).

A descriptive summary of the six major soils types found in the dam remnant removal study area are as follows (Map symbols consists of a number or number-letters. The initial number represents the type of soil. The capital letter following the number indicates the class of slope. The letter A represents a slope of 0-3 %, letter B represents a slope of 0-6%, and numbers without a letter indicate nearly level soils or miscellaneous areas) (21):