White Cloud Dam Removal Preliminary Analysis

Prepared by Trout Unlimited

TROUT UNLIMITED

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Introduction and Purpose

This report was developed by Trout Unlimited (TU), with input from the City of White Cloud, to serve as a resource for the White Cloud City Council as they evaluate options regarding the White Cloud Dam. The City of White Cloud is faced with the decision of whether to continue investing in ongoing maintenance and repairs for the dam or pursue other options, such as removal of the dam. This report is designed to provide a preliminary understanding of the dam removal option. It is not a complete engineering and feasibility study that would help determine how the dam should be removed but is meant to help inform the decision of whether to pursue dam removal. This report provides an overview of the history, background and status of the White Cloud Dam and White Cloud Pond. Additionally, this report provides an overview of the dam removal process including several case studies, important factors and considerations for removal of the White Cloud Dam, potential results and outcomes of dam removal and options for dam removal funding and support.

Overview and History of Dam and Mill Pond

The White Cloud Dam is a 950-foot long embankment with three gated concrete spillways (Figure 1). On the south side of the dam the embankment is constructed of concrete and is slightly lower than the earthen embankment on the north side of the dam, creating a 140-foot long overflow spillway, designed to allow water to flow over the top of the dam during high flow conditions (Figure 2). There is an auxiliary gated spillway at the north end of the dam, designed to serve as an additional water release point (Figure 3).

Figure 1: White Cloud dam spillway and embankment.

Figure 2: Spillway gate.

Figure 3: Auxiliary spillway intake channel. Photo; EGLE.

The dam was originally built in 1872 to serve the lumber industry. It was destroyed by flooding in 1910 and rebuilt later that year. In 1975, managers breached the earthen embankment to save the dam during a flood (O'Neal 2012). The dam embankment was then raised by three feet, and in 1978, the

auxiliary spillway was installed. The dam failed a second time in 1986 during a flood event and was rebuilt in 1990, adding the overflow spillway (Devaun 2019).

The White Cloud Dam in its current state was built for recreational purposes, impounding the South Branch of the White River to create White Cloud Pond. The pond is approximately 42 acres. The dam provides no electric generation and no practical value in flood control under the current management approach.

Current Status of Dam and Mill Pond

Hazard Potential Rating

All regulated dams are classified by the Michigan Department of Environment Great Lakes and Energy (EGLE) Dam Safety Program according to their hazard potential, or the possible consequences of dam failure or mis-operation. This classification does not reflect the current condition of the dam. The three classification levels are Low, Significant and High. The White Cloud Dam is classified as "High Hazard". This means that failure or mis-operation of the dam would likely cause loss of human life. Failure or mis-operation of High Hazard dams will also cause economic and environmental damage. There are over 2,500 regulated dams in Michigan. Only 3.5% of these dams are considered High Hazard (Figures 4 and 5) (EGLE, 2021).

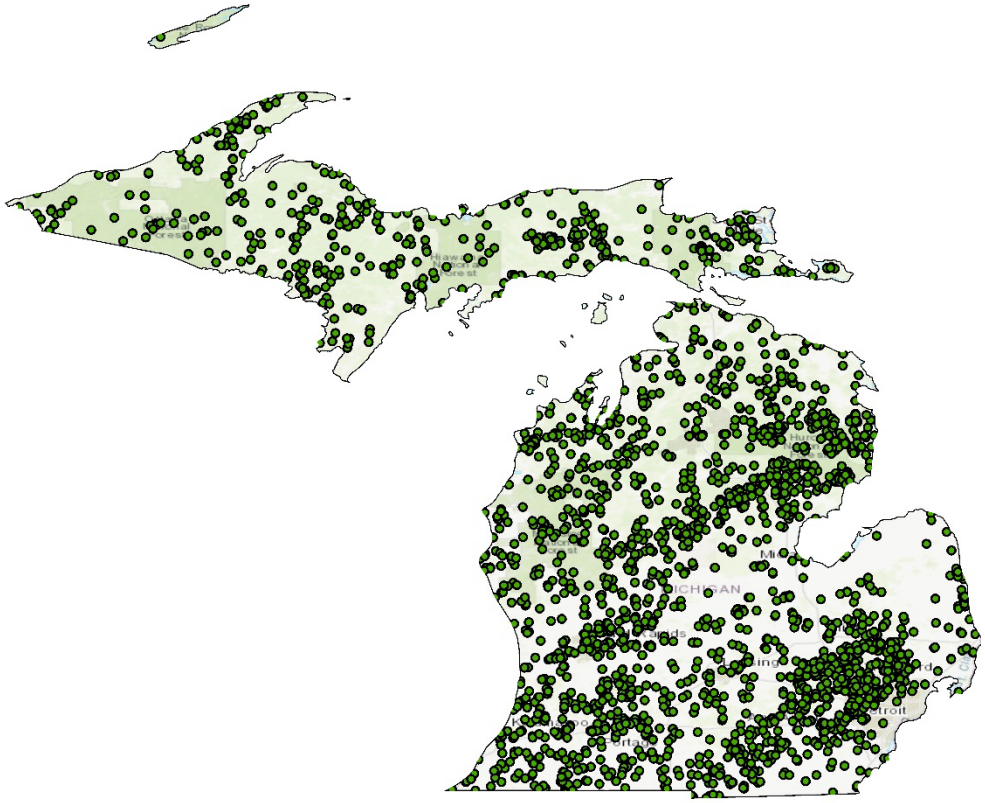

Figure 4: Approximate locations of existing regulated dams (green dots) in Michigan.

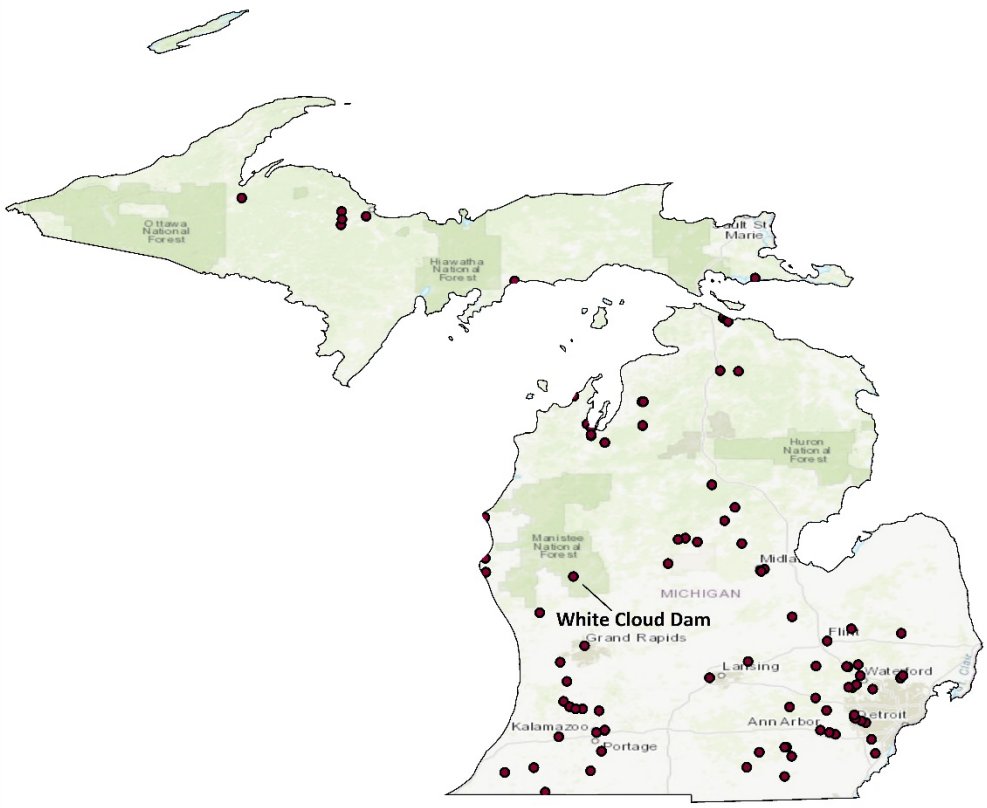

Figure 5: Approximate locations of existing dams considered to be high hazard (red dots) in Michigan.

Recent Safety Inspection

The White Cloud Dam was last inspected in July of 2019. Regular dam safety inspections are carried out by the EGLE Dam Safety Unit. The White Cloud Dam is currently required to be inspected every three years (the inspection frequency of high hazard dams could change in the future, current legislation in Michigan may propose annual inspections for high hazard dams). The inspection stated that the dam is in fair condition, with no apparent structural deficiencies that may lead to the dam's immediate failure. The inspection report included several recommended and required actions (Devaun, 2019).

1. *Review and update the hydrologic and hydraulic analysis of the dam*

The White Cloud Dam was designed to contain a 0.5 percent chance (200-year) flood discharge (2,600 cubic feet per second). Any flood greater than this magnitude would overtop, or spill over the dam. This means that, according to historical rainfall and streamflow data, a flood that would overtop the dam is predicted to have a 0.5% chance of occurring in any given year. So, it is probable that one flood of this magnitude would happen in a 200-year period.

However, the dam was overtopped once in 2017, once in 2018 and twice in 2019. All of these overtopping events occurred during flooding events that were smaller than the designed flood (200-year). It is the opinion of EGLE that these overtopping events occurred due to mis-operation of the dam (i.e. auxiliary spillway gates not raised sufficiently or quickly enough (EGLE Dam Safety, personal communication, November 8, 2021)).

It was recommended that the hydraulic capacity (i.e., how much flow the dam is able to pass) and freeboard (i.e., the vertical distance from the top of the dam to the maximum pond level) be re-evaluated to ensure they are adequate for the designed flows. The report also suggested that the probability of a flood that would overtop the dam be re-calculated.

The hydraulic capacity, freeboard and calculations estimating the probability of dam overtopping were all reviewed by White Cloud's consultant OMM Engineering and found to be accurate. However, the ability of the dam to meet the designed hydraulic capacity requires proper operation of the dam.

In addition to potential overtopping due to mis-operation, increases in the frequency and magnitude of precipitation events and flooding in recent years has called into question the accuracy of flood probability predictions (Figure 6). Overtopping often precedes dam failure causing approximately 34% of failures in the U.S. (Association of Dam Safety Officials, 2013).

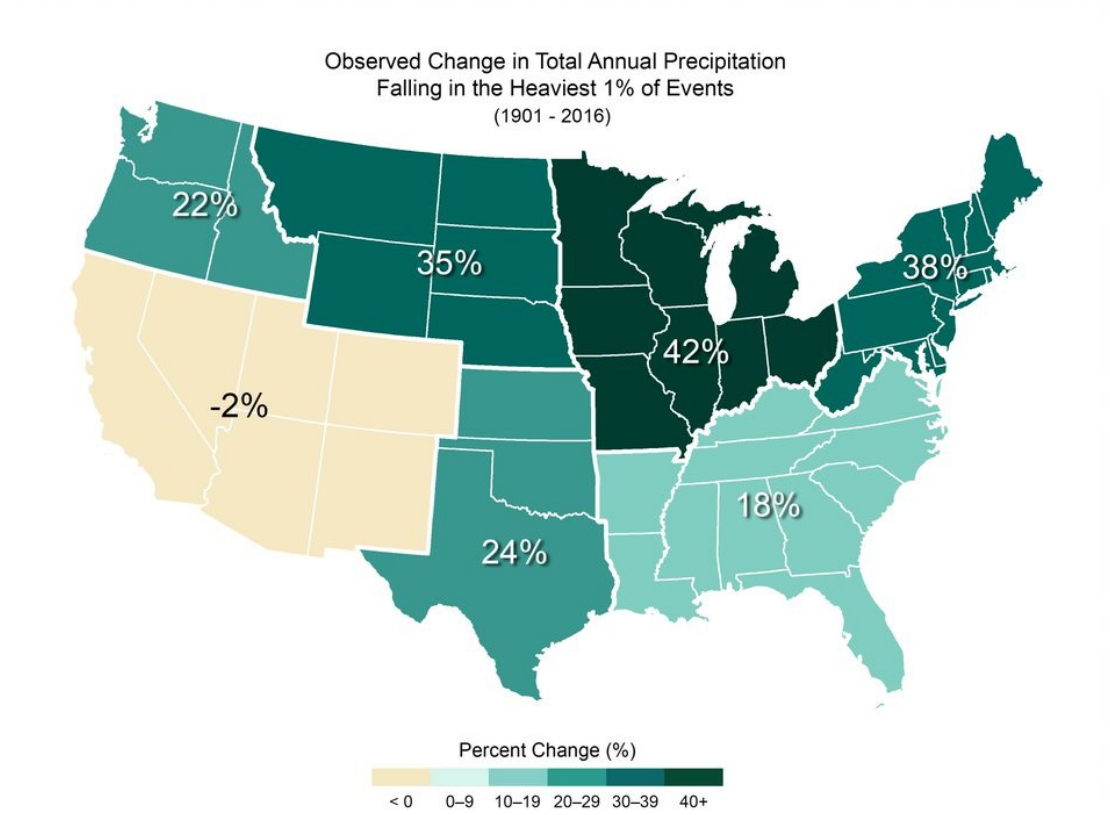

Figure 6: The Great Lakes Region shows a 42% increase in extreme precipitation over the past 100+ years (US Global Change Research Program, nd).

2. *Repair concrete on primary and auxiliary spillway within next three years.*

Some deterioration of the concrete on the spillways was observed in the 2019 inspection. It was required that the spillways are repaired and resurfaced.

3. *Extend the walls of the auxiliary spillway between the road and pedestrian bridge, to provide sufficient freeboard during the design flood.*

The walls of the auxiliary spillway were determined to be too low to provide sufficient freeboard during a 200-year flood event. It was required that the walls be extended vertically.

4. *Remove trees and brush from embankments and auxiliary spillways.*

White Cloud Department of Public Works completed this in Spring of 2020. They continue to conduct routine mowing and brush removal on the embankment.

5. *Install signage and floating barriers upstream of spillways to warn swimmers and boaters away from hazards.*

This is a recommendation, and not required by EGLE.

6. *Update Emergency Action Plan (EAP) (this is a requirement for high hazard dams).*

The plan was updated in 2017 and sent to EGLE in 2020.

Additional Note: It was also noted that the concrete wall on the upstream side of the earthen embankment has a 41-foot wide gap, at the boat launching area. This requires that the City install a temporary levee during extreme floods to ensure the dam can handle the design flood and prevent water from flowing through this gap and eroding the embankment. The current EAP calls for placing sandbags in this area during extreme floods to address this issue.

Maintenance and Repairs

The cost of maintaining and repairing dams increase as they age. Like a used car, the older a dam gets, the more frequent and more significant repairs become. In order to maintain compliance with dam safety regulations and to prevent failure of the dam, the City of White Cloud will have to budget yearly for dam maintenance and repairs. The city's annual budget for fiscal year 21-22 was $827,115. Informal guidance received by the city indicates that the city may need to budget an additional $50,000 to $100,000 per year to maintain the dam and keep it in compliance (Yvonne Ridge, personal communication, June 23, 2021).

In response to the safety inspection, the City of White Cloud Engineer developed an Opinion of Costs to address the required repairs. The cost of completing all required actions (items 2 and 3 above) was estimated to be $140,000. Other planned maintenance for the dam, not required by EGLE, is estimated to cost approximately $22,000.

In fiscal year 21-22 the city budgeted $7,500 for dam repairs. These funds were used to complete $2,500 in required repairs and $5,000 for non-required repairs and maintenance. To remain compliant with dam safety regulations, the City will need to complete the remaining $137,500 in repairs by the end of 2022 (three years after EGLE inspection report filed). The dam is scheduled to be inspected again in 2022.

Two recent events have required the city to expend additional funds for dam repairs.

In 2018, the auxiliary spillgate was overtopped causing water to flow over the emergency spillway resulting in a collapse of the dam embankment. Emergency repairs were completed costing $99,000. Funds for repairs were obtained from the Section 19 state disaster assistance fund. This funding source is not an ongoing opportunity but was provided by the State of Michigan under a Governor's Disaster

Declaration in response to severe flooding in the County of Newaygo. When authorized under a Governors Disaster Declaration, Section 19 funding may reimburse eligible local units of government (Cities, Villages, Townships, and Counties) for eligible recovery efforts post disaster. This includes but is not limited to repair for damages to public facilities or roadways caused by the disaster.

Stoplogs are used to adjust the water level in White Cloud Pond. When the dam gates are open, the stop logs impound the water, allowing water to spill over the top to maintain the specified water level in the pond. In July of 2021, two stoplogs failed at the primary spillway, causing White Cloud Pond to drop by approximately 10 feet (Figure 7). This issue was not identified in the previous inspection report. Not all parts of the dam are readily observable, and even with regular inspections, unforeseen issues can arise requiring additional resources and increased liability. All the stoplogs were subsequently replaced at a cost of $650.

Figure 7: Stoplog failure in July 2021.

Status of White Cloud Pond

The 42-acre White Cloud Pond is primarily used for swimming, fishing and boating. The pond has approximately 1.8 miles of shoreline and is deepest near the boat launch and swimming area, with a maximum depth of 18 feet (Figure 8). The pond becomes shallower to the northeast, away from the dam, eventually reaching an average depth of <4 feet. In general, the lower third of the pond's length, closest to the dam is the deepest with depths >10' common. The middle third of the pond length has begun to fill with sediment, and ranges in depth from approximately 4' - 10'. The upstream most portion of the impoundment has received significant sedimentation, and is now <5' deep (Figure 9). This section includes from M20 downstream to where the reservoir "bends", or turns and flows to the west towards the dam.

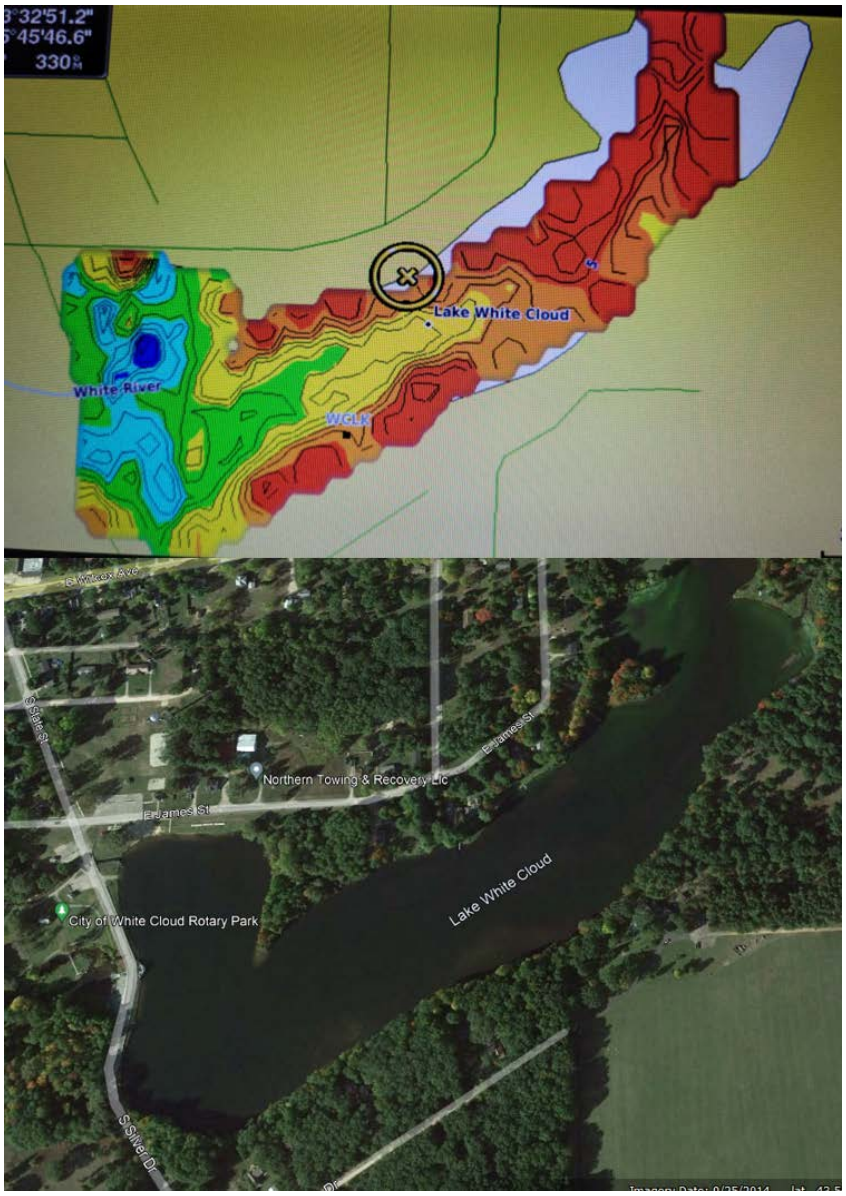

Figure 8: Bathymetric map of the White Cloud Pond Reservoir with aerial imagery of the same area.

Red: <5ft

Orange: 5-7ft

Yellow: 7-10ft

Green: 10-12ft

Light Blue: 12-15ft

Dark Blue: 15ft

Dams not only impede the flow of water, they also impede the flow of sediment. Streams and rivers pick up sediment, carry it downstream and eventually deposit it. When a river is impounded, the velocity, or speed, of the water decreases causing sediment suspended in the water to settle to the bottom of the impoundment. Over time, continued deposition of sediment has begun to fill the White Cloud dam reservoir, reducing the depth and overall water storage. In time, it is likely that the pond will become completely filled with sediment.

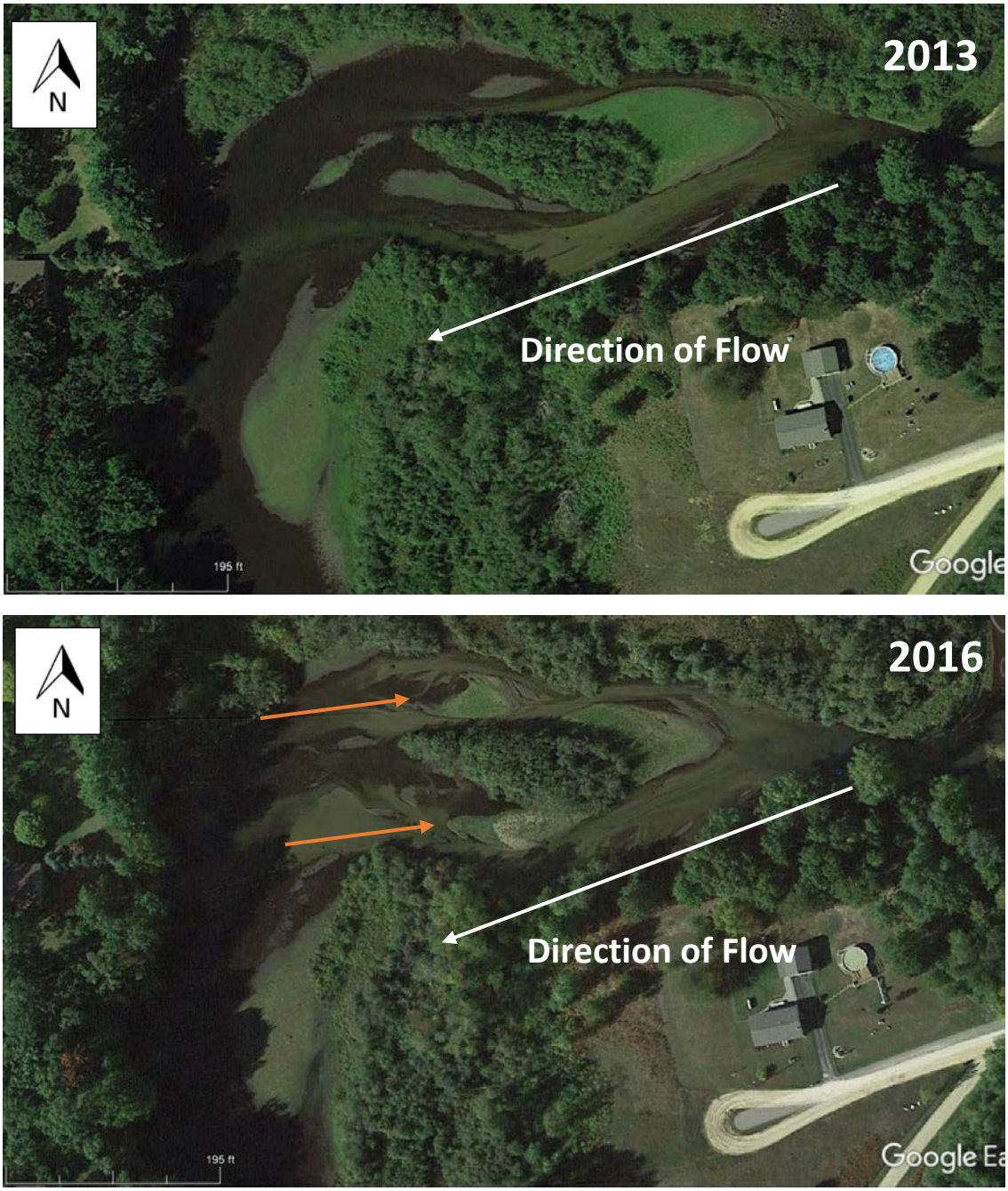

Figure 9: Aerial images of the uppermost portion of the White Cloud Impoundment indicates increased sedimentation between 2013 and 2016. Red arrows indicate areas showing increased sedimentation. This site is located just downstream of the M20 bridge.

The sediment design life (period of time before a reservoir or mill pond fills with sediment) is typically 50 to 100 years (Advisory Committee on Water Information, 2017), but is highly variable based on the sediment supply of rivers, and the size and volume of reservoirs. In the late phases of this process, the reservoir will be shallow with abundant fine sediment. This promotes the growth of aquatic plants and algae, which accelerates the filling of the reservoir and can reduce water quality.

Based upon visual assessments and historic records, White Cloud Pond appears to now be about mid-way through reservoir filling, yet without additional data on the sediment transport rate from upstream, we are unable to project how long the rest of the sedimentation process may take. Sediment can, in some cases, be addressed by removal through dredging to prolong the lifespan of the reservoir. However, dredging of submerged sediments is typically cost-prohibitive and thus limited as a practical means for managing sediment.

As an example, the town of Morley in Mecosta County (MI) maintains a dam on the Little Muskegon River that creates Morely Pond. Increasing sedimentation has contributed to blooms of nuisance vegetation, forcing the town to spend $7,000 to $15,000 dollars a year for invasive species management. The town received a quote of $500,000 - $1 million to dredge the pond (Wheelock, 2009).

In 2019, the Michigan Department of Natural Resources (MDNR) conducted a fisheries survey in the pond. Of the 1,333 fish captured, 94% were Bluntnose Minnow, Brook Stickleback, White Sucker and Common Carp. There were a small number of gamefish and panfish caught including 19 sunfish (which were recently stocked by the city of White Cloud), two Black Crappie, one Brown Trout and five Northern Pike. Seventeen Pumpkinseed Sunfish, averaging 4-inches, were caught as well. Based on the results of this survey, it is MDNR's opinion that the pond does not offer good fishing opportunities (Tonello, 2019).

Overview of Dam Removal Process

Rivers and Dams

Watersheds and rivers are the drainage network for surface and groundwaters in an area. Both surface topography and underground geology influence how water flows over, under, and through the earth into rivers. As the river flows downstream, the water also interacts with and carries sediments, nutrients, organic material and aquatic organisms. Dams, while constructed to provide benefits to people, alter the natural flow and pattern of water, sediments, nutrients and biota. Dams impound rivers, creating lake-like environments within rivers, and in turn the natural patterns and ecology of river systems are impacted. There is a wealth of scientific literature accumulated over the last 50 years that document the different ways dams alter and impact river systems. In relation to White Cloud Dam, a few particular alterations or impacts are of significance.

Water temperature is a fundamental characteristic of a river system, which defines the fish community. Coldwater fish such as brown trout, brook trout, steelhead (rainbow trout), salmon, and various smaller fish such as sculpin, need coldwater to survive. The White River watershed upstream from White Cloud Dam is exceptionally cold with temperatures in the optimal range for coldwater fish to survive and thrive. As this coldwater flows into the White Cloud Dam impoundment it slows and warms, and when it leaves the impoundment has reached a temperature range in summer months that is stressful for coldwater fish. This temperature impact was documented in 2000 by researchers from Michigan State

University (Lessard and Hayes, 2003; see Figure 10 below). The temperature impact was again documented by TU in 2020, when an eight degree Fahrenheit increase in water temperature below the dam as compared with upstream of the dam was measured (Figure 11). As a result, the White River downstream from White Cloud Dam provides marginal habitat for coldwater fish such as trout. To mitigate this loss in coldwater habitat, the DNR annually stocks brown trout at various locations in the White River downstream of the dam to provide angling opportunities. From the research and data collected, if the dam were removed, it is predicted that brown trout and brook trout would naturally reproduce and survive at higher abundances downstream of the dam than stocking allows.

Table 3. The estimated impact of each dam on mean summer temperature (above-below).

Stream	Temp. Change (C)	Impact
Manton	-5.46	High
Boardman	-3.98	High
Middle	-3.90	High
Cedar	-3.84	High
White	-3.29	High
Sugar	-3.14	High
Dowagiac	-2.15	Low
Fish	-1.99	Low
Prairie	-0.36	Low
Maple	0.98	Low
Mean	-2.71	

Figure 10: White River temperature change due to White Cloud Dam from Lessard and Hayes, 2000. White River Dam temperature change equivalent to 6 degrees Fahrenheit. Of the 10 dams displayed in this table at least 5 have been subsequently removed.

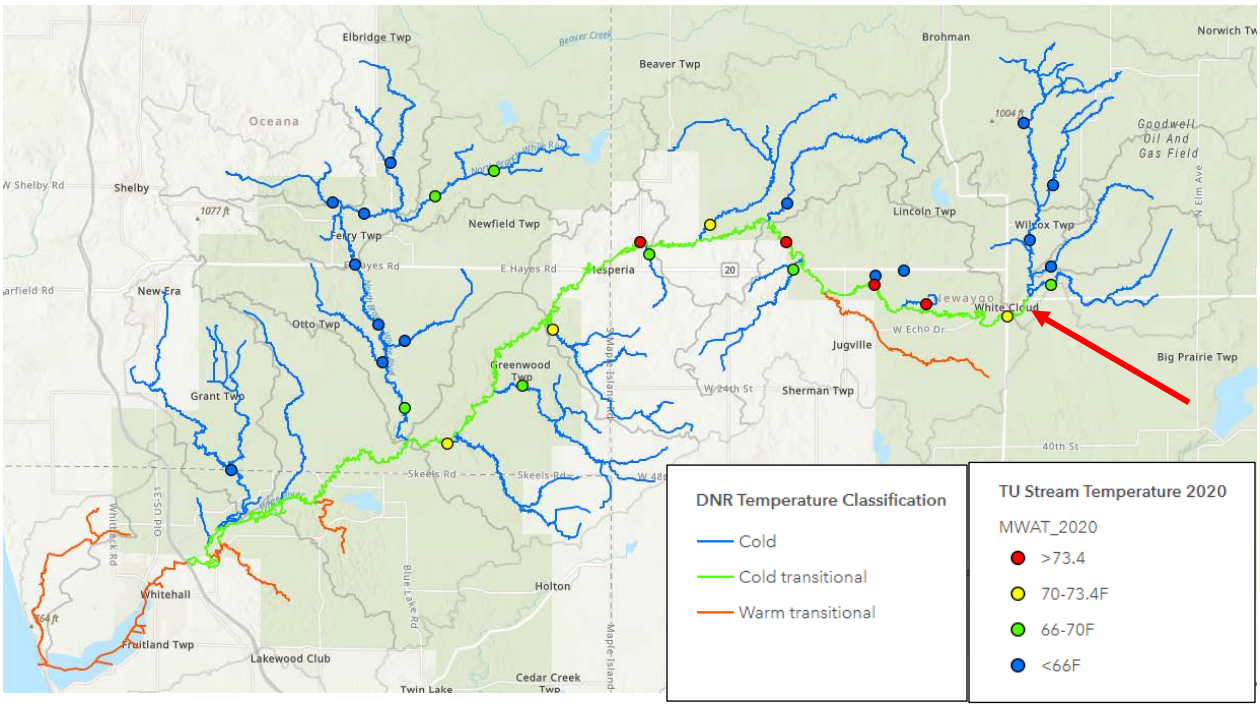

Figure 11: Temperature monitoring results show high quality coldwater habitat (blue dots) above White Cloud Pond, transitioning to marginal coldwater habitat (yellow and red) below the dam. Red arrow indicates the location of the dam.

Additionally, White Cloud Dam prevents fish passage in the White River upstream and downstream of the dam. For example, brown trout planted downstream of the dam encountering critical water temperatures in the summer, are unable to swim upstream, above the dam, to use the cold thermal refuges.

Dam Removal Process

The dam removal process can seem complex and daunting. However, while each dam and river system has its own unique specific conditions, there are several general steps that apply to all dam removals. Here, we identify and discuss those steps in relation to the White Cloud Dam.

1.) *Dam owner/stakeholder consideration of dam removal*. Most of the dams in Michigan have been in existence now for over a century. The dams and the impoundments they create have become normal fixtures in people's lives, and contemplating dam removal involves considering change to things we have become used to. This is often the most difficult and most important step in the process. People's interactions with dams and resulting ponds are diverse. Ponds can hold a wide range of values and memories, making considerations for their disposition complex. It is important to start the process by accurately identifying all considerations involved with keeping and maintaining the dam, and all considerations for removing the dam. This includes clearly predicting the burdens, opportunities, costs, and people's interests associated with both options. The natural next step is to weigh these factors in regard to how important each consideration is, to whom or to how many, and to evaluate tradeoffs between them. For example, in all dam removal decisions, the economic costs (size and frequency of costs, and how the funding for them will be derived) almost always factors heavily into final decisions. Furthermore, for municipally owned dams, the costs to keep and maintain dams must be considered in light of funding options, such as increased taxes and cuts to other services. In some cases, the preferred decision simply is not economically viable.

2.) *Engineering & Removal Planning*. If a decision to further pursue dam removal is made by the owner, the next step is to collect relevant site data, and to develop plans for removal and site restoration following removal. Some dams are small and dam removal plans are relatively simple. Larger dams are more complex and can have many important variables that need to be assessed and provided for in dam removal planning. The White Cloud Dam is of moderate size when compared to other dams in the state that have been considered for dam removal. For more complex dam removals, dam owners often engage with an entity (e.g. a consulting firm or non-governmental conservation organization (NGO)) to assist in project management in coordination with the owner. The owners and their partners would then pursue grant funding (through various governmental grant programs or charitable foundations) to acquire funds to have an engineering assessment and dam removal design plan created. Once funding is acquired, a qualified entity would be contracted to complete engineering and design work. This would be managed by the dam owner, a consulting firm or NGO acting in coordination with them. In the process of developing the engineering and design plans, the dam owner is consulted regarding options available to them ("alternatives"). The outcome is a dam removal plan or project design that presents the strategy and project components that are preferred by the dam owner, provides details necessary for the actual project to be conducted, provides the necessary information to successfully acquire permits for the project and a project cost estimate.

Within engineering and dam removal designs, several key elements make up the bulk of the work. Sediment management is a key component. This includes understanding what type of sediments are in

the impoundment and may be mobilized following dam removal. Are those sediments contaminated, and if so, where and to what degree? Will the sediment be too excessive for the river downstream to carry and distribute? Does infrastructure exist that would possibly be impacted by the sediment movement? Depending on answers to those questions, specific strategies are developed to address sediment-related issues.

The second key topic is the actual planning of the dam structure demolition, including how the dam is constructed and how the actual physical removal process will need to be conducted. The third key component is to understand and plan site restoration design following dam removal. Removing dams will expose or uncover bottomlands of the impoundment, and owners need to develop a plan for how they want to use newly exposed land in the future. Some dam owners may elect to leave the exposed land to natural revegetation, while others may want to create a new park with various amenities. How the exposed land is desired to be used should be decided and defined in the dam removal plan, and conducted as part of the project and identified in the project cost estimates.

3.) *Implementation*. When the engineering and design plan is approved by the dam owner it is then possible to pursue grant funding to pay for the dam removal project. There are a variety of federal, state and private grant programs available that provide funding for dam removals. These are discussed separately within this report. Because of the level of documented impact White Cloud Dam has on conditions within the White River, achieving funding for this project would have a high level of probable success. When funding is achieved, the dam owner or an agent acting on their behalf, would then serve as fiduciary for the funding and contract with construction and/or restoration consulting firms to implement the plan. Permitting would be navigated using the engineering and design plans, and the actual project would then commence.

A typical timeline for these steps, following a dam owner decision to pursue dam removal, might include: 1 – 1.5 years for acquisition of funding and execution of an engineering and design plan, 1 – 1.5 years to acquire funding for dam removal project, 1-2 years for completion of the dam removal project. Thus, it might be reasonable for the entire process to take 3-5 years to fully complete, following the decision to pursue removal.

Because White Cloud Dam is rated as High Hazard, and because there are repairs required by EGLE to be completed in the near future, a decision to remove the dam may have implications regarding the timeline for the required repairs. This is at the discretion of EGLE Dam Safety staff, but if they know that a dam owner has chosen to pursue removal, it is common for them to work with the dam owner on the safety requirements. For example, if they know the owner is committed and working toward dam removal, they may grant a temporary stay for certain requirements, and/or they may temporarily waive them but require the pond level to be lowered to some extent during the dam removal process, to reduce risk of safety issues. In general, they have responsibilities to reduce safety risks posed by dams, but they recognize that dam removal processes take time, and that removal will eliminate future safety risks. Our past experiences with this same situation has found EGLE to be understanding, supportive and accommodating of balancing short- and long-term safety risks with dam removal projects.

What Dam Removal Looks Like

In explaining what a dam removal would look like, it is useful to revisit what the dam did to alter a segment of stream originally, because generally a goal of dam removal is to reverse those changes. In the most general sense, the impoundment and pond created will be drained of water, and that area will return to looking, generally, like the stream further upstream and downstream of the dam and impoundment. Rivers flow downhill, and how steep that downhill angle is (i.e. slope or gradient) varies along rivers. It is not universal, but often dams were located and constructed at the downstream boundaries of relatively steep sections of rivers. This allows a dam of a certain height to impound a large volume of water, which was often beneficial to the purpose of the dams. So, it is often the case that the river section restored through dam removal might also be relatively steep. The steeper the slope of a section of river, the more riffles and pools it has, compared to less steep sections that are slower flowing and comprised of more uniform "run" habitats.

Throughout the life of a dam, sediment delivered down river systems settles and accumulates in the impoundment, first filling up the upstream portions of the impoundment, and progressively filling in downstream portions. So, upon dam removal, the new river channel will cut downward through the accumulated sediment. The accumulated sediment is often very rich with organic material and contain decades worth of plant seeds. Following dam removal, these newly exposed sediments revegetate surprisingly quickly. The result is nearly immediate coverage of grasses and low-growing vegetation. If left alone, years later some trees and shrubs such as willows begin to grow.

In this case, the former impoundment area will turn into a flowing stream section, with wide prairie-like settings surrounding it where the impoundment had flooded. However, individual landowners of the exposed impoundment bottomlands can often decide how they will manage that property. Some owners may choose to actively mow the property and manage it as added lawn; others may choose to let a natural grassland like area develop and maintain it by cutting tree growth; and others may help a forested vegetation takeover by planting trees of their choosing or allowing natural trees to grow. Figures 12 and 13 show two Michigan rivers before and after dam removal. Before/after images show the transition from an impoundment to a river. More aerial images of dam removal sites can be found in Appendix A.

Figure 12: Aerial image of Boardman River before/after removal of the Brown Bridge Dam.

Figure 13: Aerial image of Manton Creek before/after removal of Mill Pond Dam.

Special Considerations for White Cloud Dam

Property Owner Impacts

There are 34 waterfront land parcels surrounding White Cloud Pond. Parcel sizes range from 0.38 to 86 acres, with a median of 1.2 acres. Parcel boundary descriptions for these properties vary in how they describe the boundary as it relates to White Cloud Pond and the South Branch White River. Some parcels state the boundary to be the “water’s edge of Lake White Cloud” while other boundaries are described as just “the water’s edge”. Other parcels boundaries are described as the “shore of Lake White Cloud”, while some do not reference the lake at all. Some parcels at the uppermost section of the lake reference the “White River” or “thread of White River” as boundaries. Typically, parcels that make no mention of water as a boundary are fixed, and the boundary may not change even though the water's edge location changes. For parcels abutting the water's edge on impoundments, its typical to see a variety of different terms, and those used would matter for how the parcels might change with loss of the impoundment or “pond”. In some cases, dam owners bought the bottomlands to be flooded by the dam, and still retain parcels describing those boundaries. Yet, it's also common for submerged bottomlands to not clearly be owned by any entity, with a variety of waterfront parcels that all currently end at the current water’s edge (who wants to pay taxes on underwater land right?). In the case of the White Cloud Dam, there is no apparent owner of the bottomlands.

If the dam were to be removed and the water level lowered, 30 or more acres of land will be exposed, possibly leading to questions of ownership due to inconsistent parcel boundary descriptions and references. The variable property descriptions can cause confusion and discord, as landowners sort out new property boundaries. In some dam removal cases, newly exposed lands (without clear ownership asserted) are turned into public parks and river access. But an alternative that may be suitable in this situation is to assign the newly exposed lands to the adjacent property owners. This would allow them to maintain waterfront property status, and will increase the size of the parcels, both benefiting property value. One simple strategy to accomplish this would be to extend property lines until they reach the river’s edge, or center thread of the river channel. See example of this approach below in Figure 14. Many strategies are possible for dealing with the newly exposed land ownership. As this has legal components, and ramifications to adjacent property values and taxation, this is a key element to proactively address.

For this report, an experienced real-estate agent based in West Michigan was contracted to conduct a property value analysis to estimate the potential impact of dam removal on the value of properties around White Cloud Pond. By comparing property sale values with frontage on White Cloud Pond with property sale values for comparable homes on the White River, the analysis determined that White River frontage is more valuable than frontage on White Cloud Pond. According to the analysis, if two identical properties were listed, one on White Cloud Pond and one on the White River, the river property would fetch approximately 20% more than the pond property. The methods and results of this analysis are explained in more detail in Appendix B.

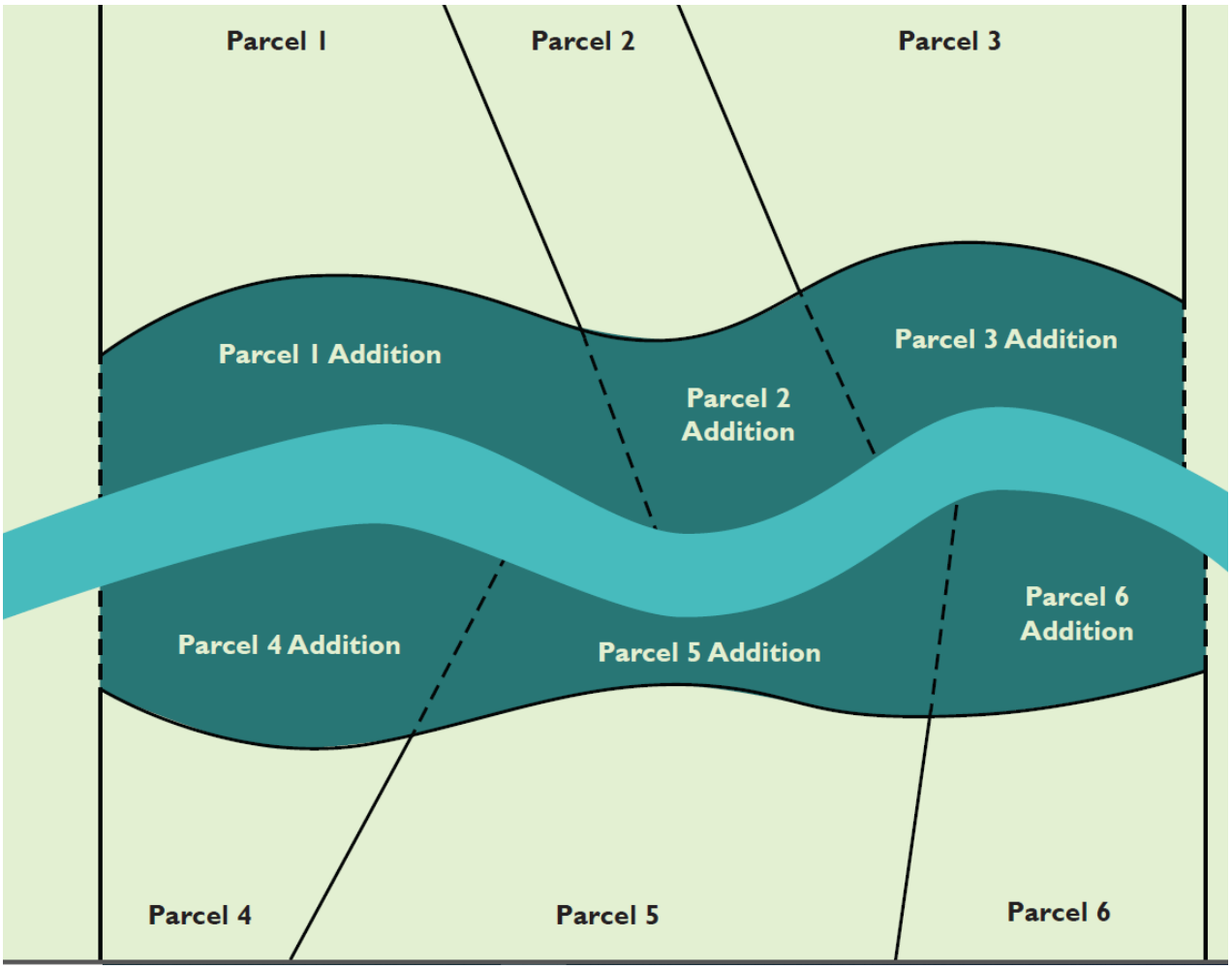

Figure 14: Conceptual representation of potential parcel expansions with newly exposed land. Dark green represents an existing pond. The blue represents the river that would form after dam removal. The parcel additions are newly exposed bottomlands that are added to adjacent properties.

Current Use Impacts

The White Cloud Pond is currently used for swimming, fishing and boating. There is a beach with about 30 yards of shoreline, a gravel boat launch on Silver Avenue, and shoreline access near the beach and off Silver Avenue. Free swim lessons for 5-16 year old children are held for two weeks in the summer.

The Russell Gilbert Kids Free Fishing Day is an annual event where families gather for a day of fishing and fun with cash prizes for anglers who catch tagged fish. Started in 1983, the event was championed by former White Cloud Mayor Russell Gilbert and has been continued by his family. The event drew over 500 participants in 2021. The Michigan DNR Fish Stocking database shows that White Cloud Impoundment was stocked with Rainbow trout in 2000, 2017 and 2018, and with 800 sunfish in 2019, all from private plantings authorized by the DNR.

According to contacts at the City of White Cloud, three significant concerns of the dam removal option, in addition to impacts on waterfront property, are impacts to free swimming lessons, the public beach and the free fishing day event. Removal of the dam would require the City of White Cloud and event organizers to reimagine these events and programs or explore alternative locations. Some ideas are presented below. This is not an exhaustive list, and the local citizens who organize these events would be best suited to explore potential alternatives. Both up-front and ongoing maintenance costs of alternatives will need to be further evaluated by the city and partners.

Swimming

-Explore the opportunity for a smaller pond to be retained near site of current beach (through possible excavation or landscaping of the exposed bottomlands). It is questionable whether a small pond would provide adequate or desirable swimming opportunities, however.

-Explore the opportunity for installation of a public pool in the park. Avoidance of ongoing dam maintenance costs may allow budgetary discussions of possible public amenities.

-Alternative sites for free swimming lessons could be identified, such as other nearby lakes or pools.

Free Fishing Day Event

-Explore the opportunity for a smaller pond to be retained near site of current beach. The pond could be stocked and used as the site for the event.

-Hold the event on the river. If the dam were to be removed, the city would own approximately 1/4 mile of river frontage. This could potentially provide a larger area for event participants to spread out and fish. Pending DNR approval, trout could be stocked in the river for the event. Because the river provides more suitable habitat for trout, any fish not harvested during the event would provide future fishing opportunity rather than die off in the pond due to high water temperatures. Essentially, wild trout populations in the public waters would be present and healthy (there would already be abundant wild trout present), additional trout could still be added to the area for the event, and the local public could continue to enjoy the fishing there beyond the annual event.

-Alternative sites for the fishing day event could be identified.

<u>Road Impacts</u>

Two roads presently surrounding the dam would need to be addressed by subsequent dam removal plans. First, the road over the top of the dam would obviously be affected. Two strategies are possible for that bridge and road. It is possible that the road could be considered non-essential and could terminate in a dead end on either side, perhaps replaced by parking for river access. If the road were deemed beneficial to maintain, a replacement bridge crossing could be designed and incorporated into the dam removal project. Dams serving as bridges is a common scenario and including bridge replacement as part of dam removal projects is also common.

The second road consideration in removing the dam is M20. The M20 bridge is located across the White River in an area that is still part of the impoundment (while narrower here, the water elevation is still affected by the dam). This poses a consideration and concern for design of a dam removal, in that the river may incise, or cut, downward enough to cause issues with the road embankment stability and or

the bridge abutments. From our preliminary review of the road and river channel, we believe the road embankment stability will not pose serious concern, given the distance and contour of the land between the river and the road embankment. However, future dam removal and associated river restoration design, could ensure this through the use of relatively simple streambank stabilization techniques. As part of this preliminary scoping, we acquired the blueprints for the M20 bridge to assess the depth of the abutments it was built on. Those designs indicated that the abutments or footings of the bridge were built deeply and could safely withstand some degree of lowering of the stream channel (M20 bridge plan set can be found in Appendix C). However, if dam removal is pursued, in engineering and design of the project, we would anticipate that grade control structures would be installed in the river channel downstream of the M20 bridge, to "lock" the elevation of the stream under the crossing at a slightly lower elevation, but to prevent the full extent of incision that might occur there. Slightly lowering the streambed at M20 appears to be feasible, and would allow some, albeit not full, meaningful restoration of habitat conditions in the river upstream of the bridge (the river is unnaturally slow and impounded upstream of the bridge), while ensuring the stability of the M20 bridge structure. These considerations would be dealt with in an engineering and design plan. They are readily compensated for and would not hinder dam removal.

Nearby Landowner Considerations.

White Cloud Dam is owned by the City of White Cloud. The property the dam is located within includes Everett Township. Some of the property the dam is located on, or would need to be accessed, is owned by Harbison Walker. In order to secure permits for dam removal projects, permission of landowners where land will be accessed is required. As part of a dam removal project, there may be a need to undertake certain activities in locations within the former impoundment (e.g., to grade new banks, install grade controls, etc.), and these activities would require permission from landowners.

Property owners along White Cloud Pond would be affected by changes to the dam. While they enjoy the lake like setting created along their properties by the dam, it's the owner of the dam that bears the liability and fiscal burden for maintaining it and deciding whether to remove it. While the City bears the burden of maintaining or removing, it is still appropriate to acknowledge and reflect on how those decisions will affect the nearby landowners. Some landowners may prefer the impoundment, while others may be excited about the possibility of dam removal. Those different perspectives will also vary in how strong they are held. It is also common for lakefront owners to feel strongly against dam removal, but to reflect on it and embrace the changes it brought after a few years. Many of the landowners are already living on a part of the impoundment that has filled with soft sediments and is shallow and mucky in front of their property, while others further downstream may still enjoy deeper water and swimming.

Artistic Renderings of Potential Outcomes of Removal of White Cloud Dam

At the conclusion of dam removal and restoration the site will look quite different. Where there was a small pond, a river would flow. The size of the river will be comparable to nearby upstream and downstream reaches. The river will follow the old river channel, meandering through the area once inundated by the pond. The adjacent, newly exposed, land surface will be managed according to the wishes of landowners. The renderings below were developed to aid the community of White Cloud in visualizing what the site could look like post-dam removal. It is important to note that this is a conceptual rendering, and the actual site outcomes for the newly exposed lands would be determined

by the City of White Cloud and other riverside landowners. Full page versions of the renderings can be found in Appendix D.

Figure 15: View from current White Cloud Dam site, looking southeast.

Figure 16: Blue X indicates the position of the viewer in the previous rendering. The white arrow indicates the direction in which the viewer is looking.

Figure 17: View from position just southeast of current dam site, looking northeast.

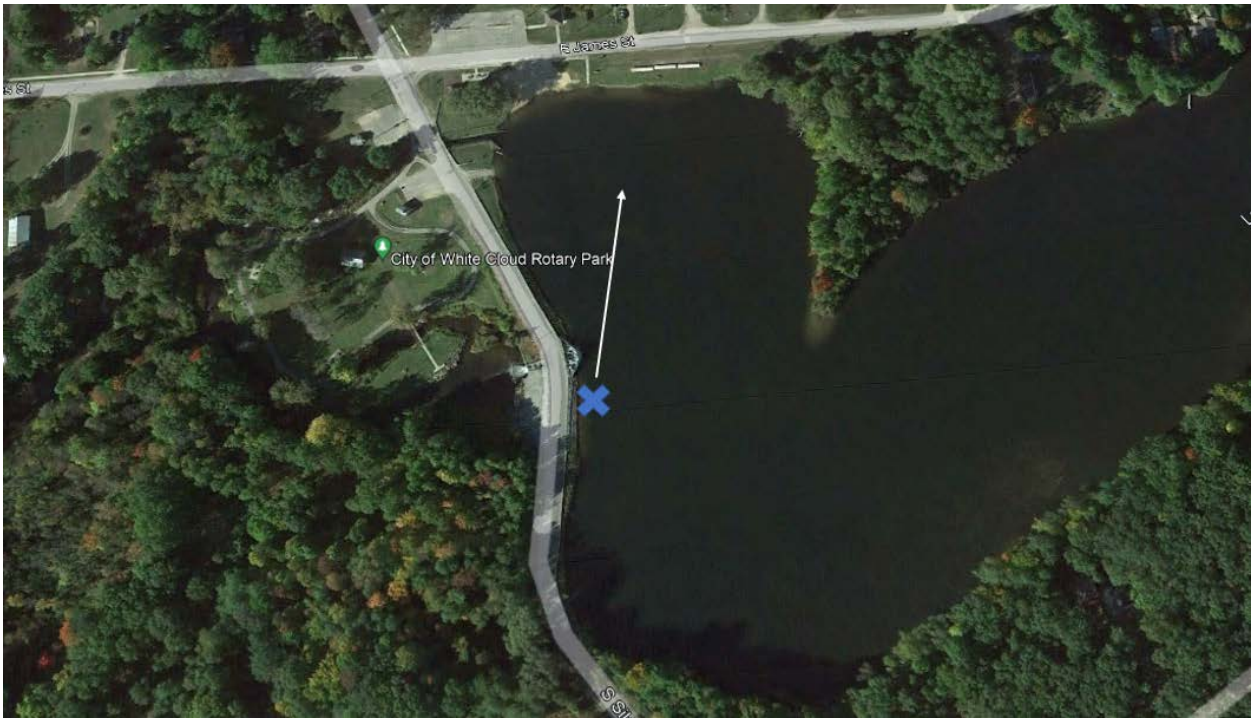

Figure 18: Blue X indicates the position of the viewer in the previous rendering. The white arrow indicates the direction in which the viewer is looking.

Funding and Support Resources for Dam Removal

There are a variety of funding mechanisms to support dam removal. Twenty-percent of dams in the US Army Corps of Engineers National Inventory of Dams are owned by local governments. Another 63% are privately owned (Gonzalez and Walls, 2020). Typically, these dam owners do not pay for dam removal, though they may contribute to dam removal costs in some cases.

Grant programs for dam removal typically fall into one of two categories, programs removing dams for environmental benefits and those removing dams for hazard mitigation. Due to the significant and well documented temperature impacts associated with the White Cloud dam, funding proposals to support removal would be highly competitive for programs funding projects for their ecological benefits. Hazard mitigation grants are sometimes difficult for rural communities to obtain, as cost-benefit analysis falls short when compared to more urbanized areas, where flooding has the likelihood for greater loss of life and infrastructure impacts. That said, environmental benefits are increasingly being factored into hazard mitigation cost/benefit analysis, making rural projects more competitive for these funds.

Federal

There are several federal grant programs that fund dam removal in Michigan, to promote the positive benefits to aquatic life and water quality. In the Great Lakes, grant programs administered by the US Fish and Wildlife Service (USFWS), the National Oceanic and Atmospheric Administration (NOAA) and the Great Lakes Restoration Initiative (GLRI) have been used to support dam removals. The recent passing of the Infrastructure Investment and Jobs Act will significantly increase the availability of funds for dam removal in the coming years. This act will result in an unprecedented investment of $1.2 trillion over the next five years in infrastructure projects, including dam removal. This type of opportunity does not come around often. Over $2.4 billion will be made available nationally to federal agencies and state governments for programs that can be used to fund dam removal. These funds will be administered by agencies such as the Federal Emergency Management Agency (FEMA), USFWS, US Forest Service, NOAA, the Environmental Protection Agency and state hazard mitigation agencies. These funds present a once in a generation opportunity to fund dam removal projects that mitigate hazards and provide environmental benefits. With our deep partnerships with the natural resource agencies, TU is well-positioned to help ensure these funds are put to the best use. Timelines and methods of distribution for many of these funding sources are currently being developed. In Michigan, projects to be considered for state hazard mitigation funds must be submitted for consideration by July 2022. It is unknown how much funding will be available at the time of writing this report, but these funds can be used to complete engineering and feasibility studies in addition to dam removal itself.

State

State funding sources include the Michigan DNR Fisheries Habitat Grant Program. This grant program has had a significant priority on dam removals. Angler licenses are a major source of funding for this grant, supporting priorities that improve fishing. Another funding source to the DNR grant comes from the State Dam Grant, which was partially designed to help local municipalities deal with aging dams. White Cloud dam removal would be highly competitive for funding under this program. In addition to the DNR grant program mentioned, there is currently legislation being considered in Michigan that may provide enhanced funding for dam removals, including new grants just for the engineering and

feasibility studies. While this enhanced funding would add significant additional grant funding for projects like this, this legislation has not yet been passed and funded at this time.

Private

Private funding is also available for dam removal. The National Fish and Wildlife Foundation Sustain our Great Lakes Program has invested millions of federal and corporate partner funding to support natural resource restoration projects such as dam removal. Other regional foundations, such as the Great Lakes Fisheries Trust, make investments in dam removal. Local foundations, such as the Fremont Area Community Foundation, may also invest to support natural resources and economic benefits of dam removal.

It is important to note that outside entities can provide support for fundraising and project management, often at no cost to the city. Conservation organizations, such as TU, have experience developing funding proposals, organizing partners, developing bids, managing contractors, obtaining state/federal permits, etc. for dam removal, and can provide any, or all, of these services to the city. The city could also choose to hire a consultant to manage a dam removal project. Some consultant costs may need to be covered by the city, though they can also be included in grant budgets and at least partially covered by outside funders.

While the costs of continued repairs to dams usually must fall to the dam owner, costs to remove dams and the associated projects (e.g., bridge replacements) are typically able to be covered through grant funding from outside sources. With White Cloud Dam, the unique nature of this project, the ecological benefits of removing it, its hazard rating, and the additional surge of federal funding becoming available position it with an extremely high probability of securing needed grant funds. This would effectively shift the financial burden from the City to outside sources.

Acknowledgements

We would like to thank the following people for providing information critical to the development of this report.

Yvonne Ridge and April Storms of the City of White Cloud

Dan DeVaun, Thomas Horak and Luke Trumble of the EGLE Dam Safety Unit

Abby Watkins of Newaygo County Emergency Services

Mark Tonello of the Michigan DNR

Mike Halloran of Michigan Department of Transportation

Kristin Thomas, Nichol DeMol and Jeremy Geist of Trout Unlimited

This report was developed by Jake Lemon and Bryan Burroughs of TU. If you have questions or comments regarding this report, contact info is provided below.

Jake Lemon: jacob.lemon@tu.org Bryan Burroughs: bryanburroughs@michgantu.org

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Additional Resources

TU/WV Rivers Dam Removal Decision Making Guide

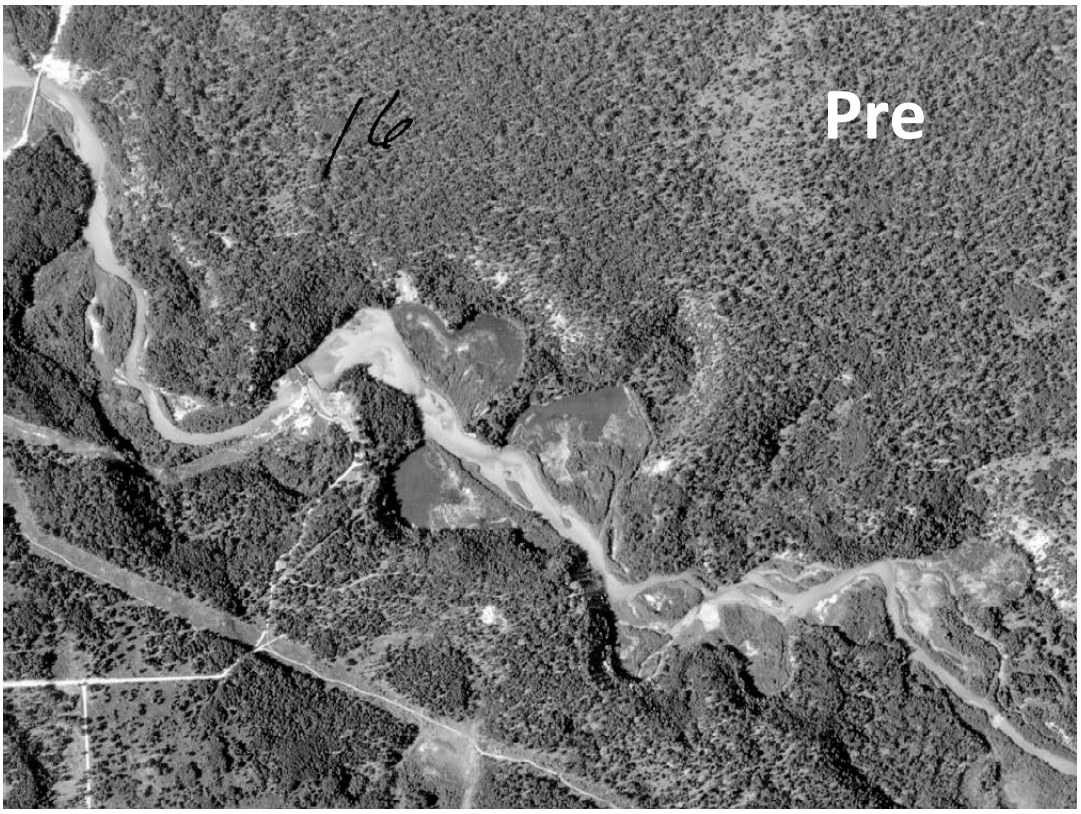
Michigan Dam Safety Task Force Recommendations

Michigan Municipal League Foundation Report. *The Growing Crisis of Aging Dams: Policy Considerations and Recommendations for Michigan Policy Makers*

Appendix A

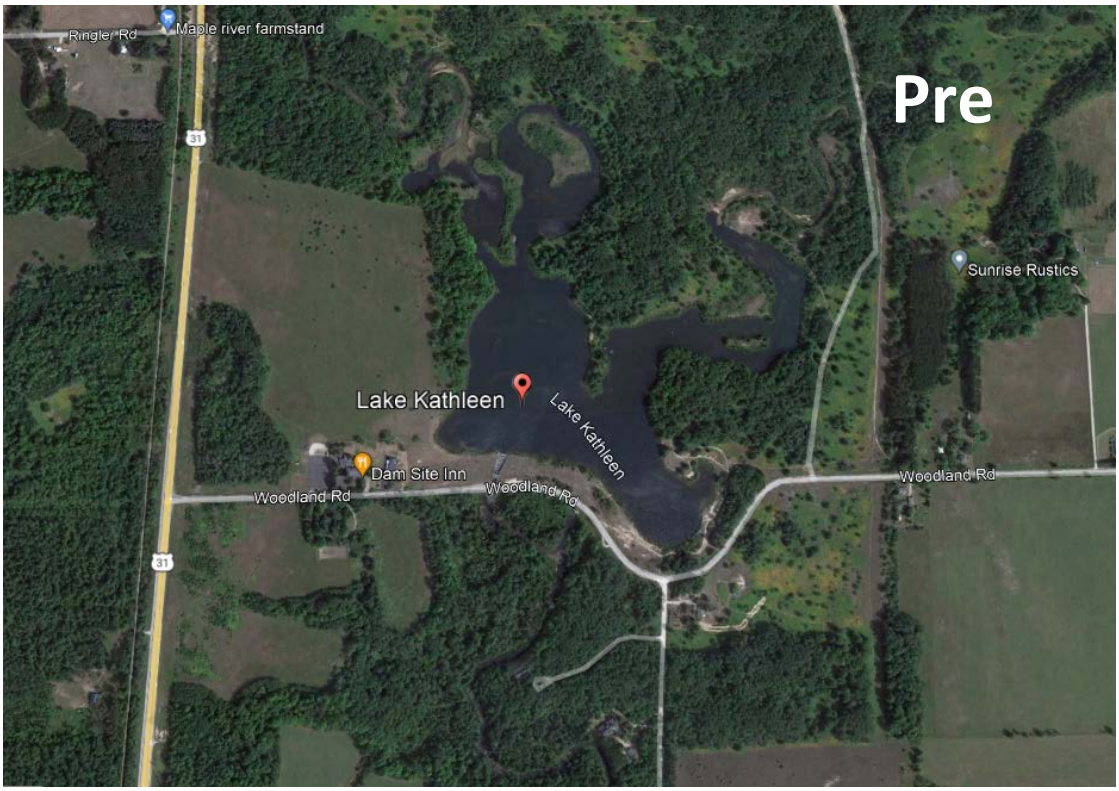
Additional Aerial Images of Dam Removal Sites

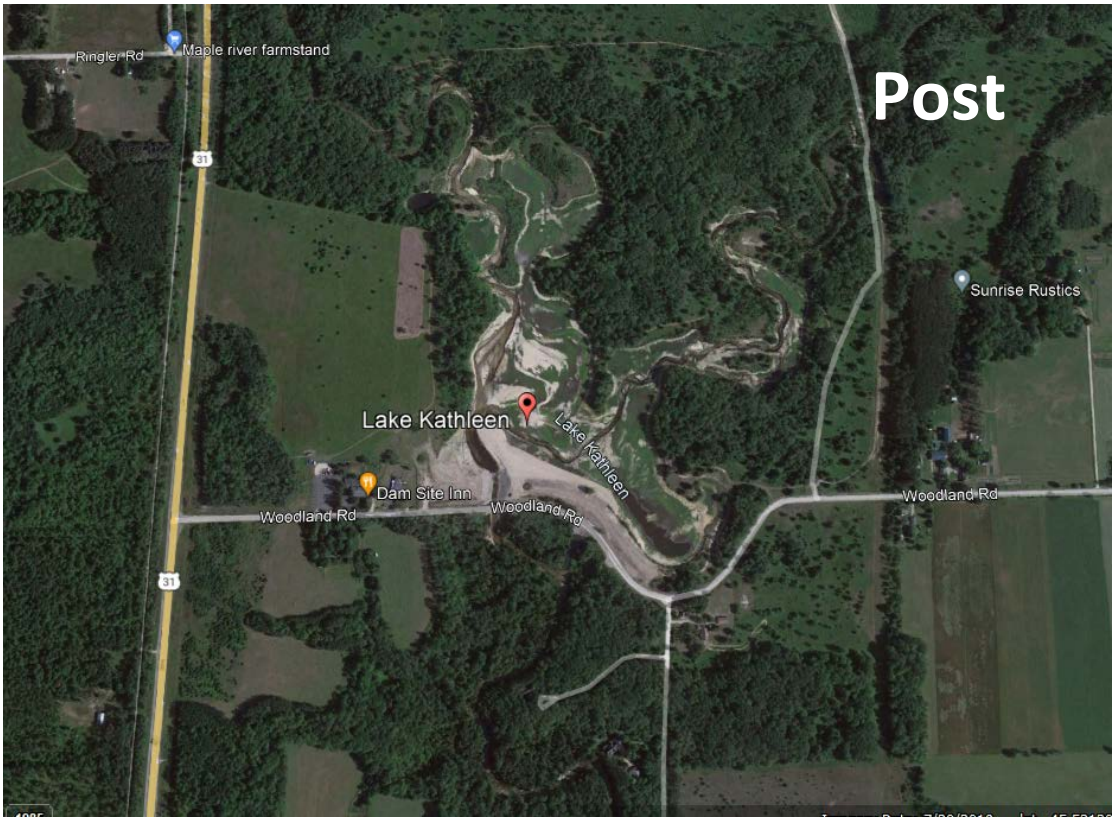
Mill Creek Dam Removal in Dexter, MI



Stronach Dam on the Pine River

Song of the Morning Ranch Dam on the Pigeon River





Lake Kathleen Dam on Maple River. Post removal image taken shortly after removal and site is not fully restored.

Appendix B

Property Value Analysis Report

BRETT VREDEVOOGD

February 11, 2022

Brett Vredevoogd

Realtor with Berkshire Hathaway

5136 Cascade Rd Grand Rapids MI 49546

brettonclay@gmail.com

(616) 676-7308

My name is Brett Vredevoogd and I am a residential Realtor born and raised in the Grand Rapids area. I have been a Realtor for 9 years now, and have done a lot of work with recreational single-family homes and vacant land all over the western portion of the lower peninsula.

When approached with this project, we had a lengthy discussion about how to determine the difference in property value between White Cloud Lake Frontage and White River frontage. The best way I could think of doing this was to imagine that a seller had come to me with two identical properties but in 2 different locations. One with water frontage on White Cloud Lake and one with water frontage on the White River.

I took a look at all of the recorded sales on White Cloud Lake over the last 20 years and took an average of the year built, numbers of beds and baths, square footage, condition, and acreage to come up with the "average" White Cloud Lake property. The property I ended up with was a 1961, 1400 square foot (sqft) ranch with 3 bedrooms, 1 full bath on 1 acre of land in livable but not updated condition.

I took this property and applied it to recent comparable sales (within the last 12 months) on both White Cloud Lake and The White River.

Here is a summary of the data:

1. On White Cloud Lake

I looked at all recorded sales on the MLS over the last 12 months with water frontage on White Cloud Lake. The average sale price over the last 12 months was $178K which is around $91/sqft.

Next, I looked at the City of White Cloud non-waterfront. If I look at all single-family homes built before 1990 with 3-4 bedrooms, more than 1000 square feet above grade and less than 2000 square feet total. The average sale price over the last year in the city is $112K and $81/sqft.

This shows nicely that there is a premium that people pay for water-frontage on White Cloud Lake.

2. On The White River

I took a look at all sales over the last 12 months on the White River. These happen to all be right around the city of Hesperia. Next, I selected the homes that were most similar to my 1961, 1400 sqft subject home. Of these similar properties the average sale price over the last 12 months comes out to $227K with $151/sqft ranging from $120-$195/sqft.

In Conclusion:

If you were to come to me with two identical houses, one on White Cloud Lake, and one on the White River and I was to run two different market studies, I would tell you this:

The home on White Cloud Lake can expect to get somewhere between $178-$200K or. $127/sqft- $142/sqft with a sale in today's market.

If this home was on the White River, you can expect to get somewhere between $225K-$250K or $160/sqft - $178/sqft in todays market

In conclusion, using recent public data from the Multiple Listing Service (MLS), the river frontage seems to be more valuable than White Cloud Lake frontage equaling out to around a 20% premium for White River frontage over White Cloud Lake frontage.

If you would like to see any of the data that was used, or if you have any questions at all feel free to reach out to me at brettonclay@gmail.com.

Brett Vredevoogd

Realtor With Berkshire Hathaway HomeServices

Appendix C

M20 Bridge Plan Set

MICHIGAN
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED BRIDGE REPLACEMENT

MICHIGAN PROJECT STP 0562(013)

CONTROL SECTION 62015

JOB NUMBER 60572A

M-20

CITY OF WHITE CLOUD
WILCOX TOWNSHIP
NEWAYGO COUNTY

PLAN INDEX	
SH. NO	DESCRIPTION
1	TITLE SHEET
2	GENERAL PLAN OF SITE
3-4	SOIL BORING DETAILS
5-7	GENERAL PLAN OF STRUCTURE
8	REMOVAL DETAILS
9-10	PILE DETAILS
11-17	ABUTMENT DETAILS
18-21	RETAINING WALL DETAILS
22-23	33' BOX BEAM DETAILS
24-26	SUPERSTRUCTURE DETAILS
27	EXPANSION JOINT DETAILS
28	SLAB AND SCREED DETAILS
29	STEEL REINFORCEMENT DETAILS

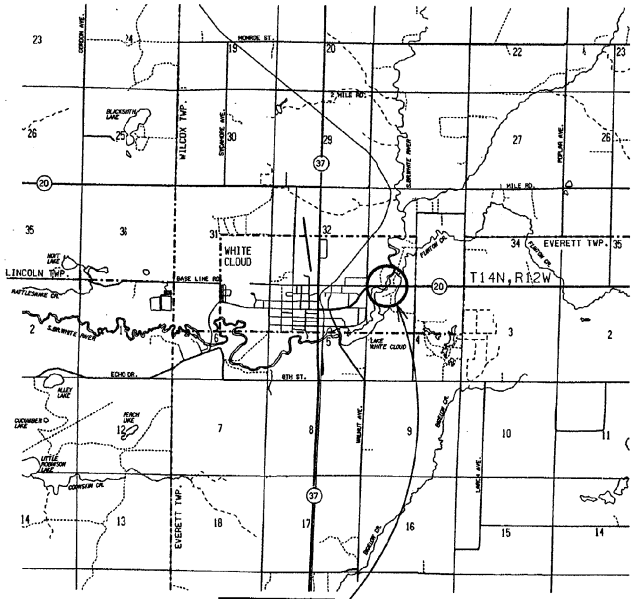
STANDARD PLANS

WHERE THE FOLLOWING ITEMS ARE CALLED FOR ON THE PLANS THEY ARE TO BE CONSTRUCTED ACCORDING TO THE STANDARD PLAN GIVEN BELOW OPPOSITE EACH ITEM UNLESS OTHERWISE INDICATED.

BRIDGE RAILING, 2 TUBE	B-21-E
MOLDING, BEVEL, LIGHT STANDARD ANCHOR BOLT ASSEMBLY AND NAME PLATE DETAILS	B-103-D

TITLE SHEET LEGEND

- PROPOSED BRIDGE PROJECT
- EXISTING ROADS
  - CITY STREET
  - COUNTY
  - STATE ROUTES
  - FEDERAL DIVIDED ROUTES
  - FEDERAL DIVIDED INTERSTATE ROUTES
  - HOT MIX ASPHALT
  - GRAVEL
- SECTION LINE
- CITY, VILLAGE OR TOWNSHIP LIMITS
- RAILROADS



GENERAL NOTES

THE DESIGN OF THE STRUCTURE IS BASED ON CURRENT AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES H525 LOADING. LIVE LOAD PLUS IMPACT DEFLECTION DOES NOT EXCEED 1/800 OF SPAN LENGTH. THE LOAD FACTOR METHOD OF DESIGN WAS USED FOR THIS DESIGN.

EXCEPT WHERE OTHERWISE INDICATED ON THESE PLANS, OR IN THE PROPOSAL AND SUPPLEMENTAL SPECIFICATIONS CONTAINED HEREIN, ALL MATERIALS AND WORKMANSHIP SHALL BE ACCORDING TO THE MICHIGAN DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION 2003 EDITION.

THE STATIONING AS SHOWN ON THESE PLANS FOR THE INTERSECTION OF THE CENTERLINE OF BRIDGE AND ROADWAY CENTERLINE IS BELIEVED TO BE CORRECT. IT SHALL, HOWEVER, BE CHECKED AT THE TIME OF STARTING CONSTRUCTION, AND IF THE STATIONING SHOWN ON THE PLANS IS INCORRECT, IT SHALL BE REPORTED TO THE DESIGN OFFICE IN LANSING, AND THE STRUCTURE SHALL BE STAKED OUT USING THE ACTUAL INTERSECTION OF THE CENTERLINE OF BRIDGE AND ROADWAY CENTERLINE AS THE CONTROL POINT.

THE DESIGN OF THE STRUCTURAL MEMBERS IS BASED ON MATERIAL OF THE FOLLOWING GRADES AND STRESSES:

CONCRETE: GRADE S2 & T	f'c = 3,000 psi
CONCRETE: GRADE D	f'c = 4,000 psi
STEEL REINFORCEMENT	fy = 60,000 psi
STEEL REINFORCEMENT: STIRRUPS FOR PRESTRESSED BEAMS	fy = 60,000 psi
STRUCTURAL STEEL: AASHTO M270 GRADE 36	Fy = 36,000 psi
PRESTRESSED CONCRETE	f'c = 6500 psi
PRESTRESSING STRANDS	f's = 270,000 psi

ALL EXPOSED CONCRETE CORNERS SHOWN SQUARE ON THE PLANS SHALL BE BEVELED WITH ½" TRIANGULAR MOLDINGS EXCEPT AS OTHERWISE NOTED.

2024 ESTIMATED TRAFFIC DISTRIBUTION

4500	AVERAGE DAILY TRAFFIC
101	DESIGN HOURLY VOLUME
10%	COMMERCIAL
2250	DIRECTIONAL TRAFFIC
50 MPH	DESIGN SPEED

CONTRACT FOR: BRIDGE REPLACEMENT AND PLACING RIPRAP

APPROVALS

RECOMMENDED FOR APPROVAL Jeff Mahdavi — PROJECT MANAGER — DATE 7-18-05

RECOMMENDED FOR APPROVAL Eric M Bowen — DELIVERY ENGINEER — DATE 7-18-05

MICHIGAN
DEPARTMENT OF TRANSPORTATION
GLORIA J. JEFF - DIRECTOR

APPROVED BY Mark A VanPortfliet for ENGINEER OF DEVELOPMENT — DATE 7-26-05

MDOT — MAHDAVI/MIKESELL — DESIGN UNIT

CONTROL SECTION	JOB NUMBER	FEDERAL NUMBERS PROJECT	FEDERAL NUMBERS ITEM	SHEET NO.
B01-62015	60572A	STP 0562 013	HH4351	1

CONTROL SECTION — JOB NUMBER: B01 OF 62015 - 60572A
DATE: 09/12/03 CHECKED BY: A.MAHDAVI DRAWN BY: T. DUDA FILE NAME: b016201 5as.dgn
DATE: CORRECTED BY: R.K.OLIN DATE: 2-8-05

COORDINATES

PROP. REF. PT. A STA. 575+46.66
N: 751577.4250
E: 12754591.1040
PROP. REF. PT. B STA. 576+36.66
N: 751577.5592
E: 12754688.5139

BENCH MARKS

B.M.*103 ELEV. 849.24
CHISELED "X" IN THE SE. CORNER OF THE SE. BRIDGE ABUTMENT WALL OF A CAMEL BACK HISTORICAL BRIDGE OVER THE WHITE RIVER ON M-20 (BASELINE RD.) EAST OF WHITE CLOUD.

B.M.*104 ELEV. 866.32
RR SPIKE IN A UTILITY POLE 0.1 MILES EAST OF THE INTERSECTION OF M-20 (BASELINE RD.) AND CATALPA RD. 65' SOUTH OF THE CENTERLINE OF M-20

B.M.*108 ELEV. 847.10
CHISELED "X" TOP OF SOUTHERLY PIN TOP OF STEEL BEAM. 3' WEST OF WESTERLY END OF BRIDGE AT NORTHERLY AUXILERY SPILLWAY. 35.5' SW OF A UTILITY POLE.

EXISTING STRUCTURE

THE EXISTING STRUCTURE IS A 50 FOOT SINGLE SPAN REINFORCED CONCRETE BRIDGE. IT WAS BUILT IN 1928, WITH A CLEAR ROADWAY OF 28 FEET.

WITNESSES

CP*5 - 120D SPIKE.
NORTHWEST QUAD OF CATALPA RD. AND M-20.
28.393' LEFT OF STA. 591+02.036.
N: 751607.9580 E: 12756146.3500 ELEV. 859.432'
N35E - 26.969' - TELEPHONE PED.
NORTH - 28' - CENTERLINE M-20
WEST - 54' - CENTERLINE OF CATALPA.

CP*6 - 120D SPIKE.
NORTH SHOULDER OF M-20 ACROSS FROM RIVERVIEW DR.
20.098' LEFT OF STA. 581+14.086.
N: 751508.3050 E: 12755158.4125 ELEV. 852.480'
S42W - 86.7' - POWER POLE WITH LIGHT.
N88W - 52.1' - MAILBOX TO HOUSE NUMBER 1865
S10E - 54.7' - TELEPHONE PED.

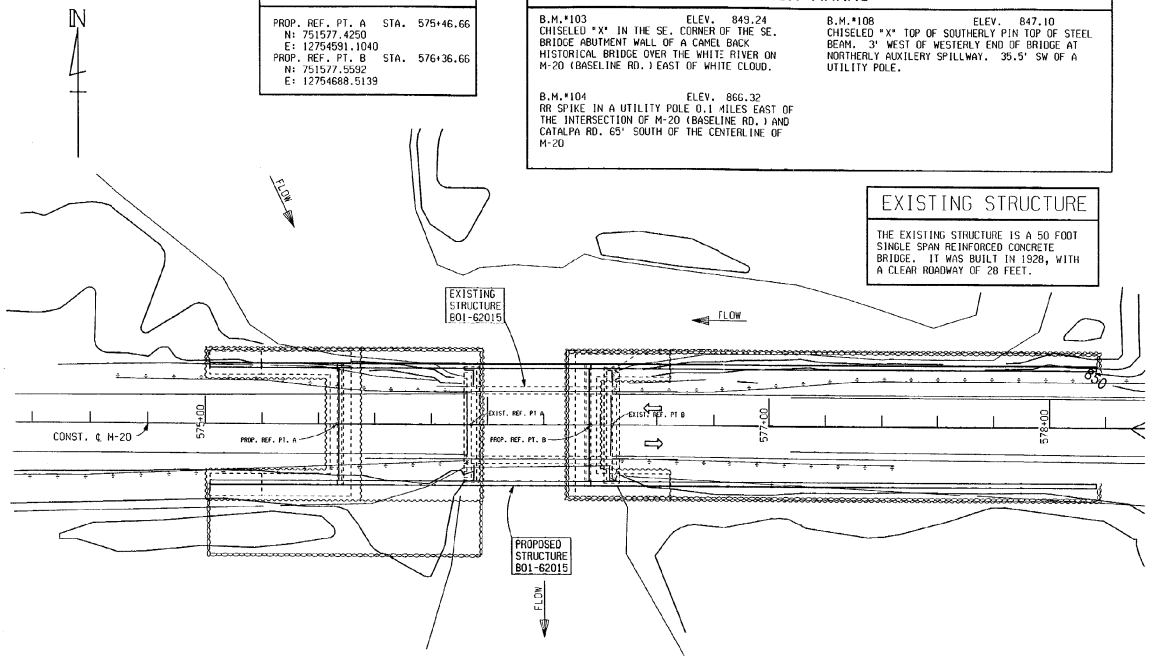
CP*10 - 120D SPIKE.
V OF INTERSECTION OF WILCOX RD. AND M-20.
61.229' LEFT OF STA. 551+89.101.
N: 750434.9100 E: 12752742.3700 ELEV. 69.779'
S75W - 150.3' - POWER POLE WITH LIGHT.
N27E - 69.4' - SW CORNER OF HEADWALL
SE'LY - 61' - CENTERLINE M-20.

UTILITIES

SBC
BURRIED CABLE & FIBER OPTIC LINE
ATTENTION: KEVIN CRISSMAN
BIG RAPIDS ENGINEERING OFFICE
121 MAPLE
BIG RAPIDS, MICHIGAN 49307
(231) 796-9901

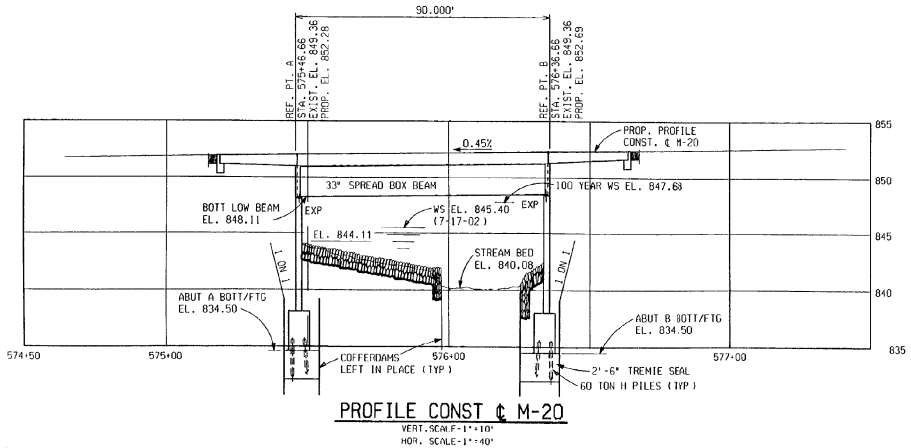
CONSUMERS ENERGY
AERIAL LINE
ATTENTION: JAY P. ANDREINI
820 W. MAIN ST.
FREMONT, MI 49412
(231) 928-4146

REVISIONS			
NO.	DESCRIPTION	DATE	BY



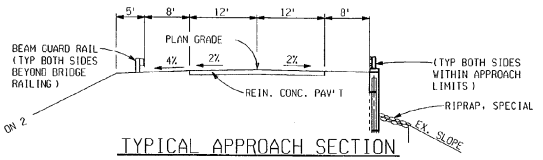
SITUATION PLAN

SCALE: 1"=40'-0"



PROFILE CONST ℄ M-20

VERT. SCALE-1"=10'
HOR. SCALE-1"=40'



TYPICAL APPROACH SECTION

2024 ESTIMATED TRAFFIC DISTRIBUTION

4500	AVERAGE DAILY TRAFFIC
101	DESIGN HOURLY VOLUME
10%	COMMERCIAL

NOTES:

THE WORK COVERED BY THESE PLANS INCLUDES REMOVAL OF THE EXISTING STRUCTURE, CONSTRUCTION OF THE PROPOSED BRIDGE AND PLACING RIPRAP TO THE LIMITS SHOWN. ALL OTHER WORK IS INCLUDED IN THE ROAD PLANS THAT ARE A PART OF THIS CONTRACT.

THE CONTRACTOR SHALL LOCATE ALL ACTIVE UNDERGROUND UTILITIES PRIOR TO STARTING WORK AND SHALL CONDUCT HIS OPERATIONS IN SUCH A MANNER AS TO ENSURE THAT THOSE UTILITIES NOT REQUIRING RELOCATION WILL NOT BE DISTURBED.

REMOVE PEAT AND OTHER UNSUITABLE MATERIAL BELOW PROPOSED APPROACH FILL LOCATION AND BACKFILL WITH EMBANKMENT, STRUCTURE, COMPACTED-IN-PLACE. (SEE ROAD PLANS FOR TREATMENT LIMITS, METHOD AND QUANTITY.)

M-20 TRAFFIC IS TO BE DETOURED OVER OTHER EXISTING ROADS.

TOPOGRAPHY SHOWN HERE REPRESENTS CONDITIONS EXISTING AT THE TIME THE FIELD SURVEY WAS MADE. HOWEVER, THESE CONDITIONS MAY HAVE BEEN MATERIALLY ALTERED BY THE OPERATIONS OF OTHERS PRIOR TO THIS CONTRACT.

WATER LEVEL IS SUBJECT TO CHANGE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING A DETERMINATION OF WATER LEVELS THAT MAY EXIST DURING CONSTRUCTION.

MEASURES SHALL BE TAKEN TO PREVENT DEBRIS FROM FALLING FROM THE STRUCTURE. IF DEBRIS FALLS INTO THE WATERWAY, IT SHALL BE REMOVED WITHIN 24 HOURS. SINCE DISTURBANCE OF THE WATERWAY BOTTOM MAY BE AS HARMFUL AS THE DEBRIS ITSELF, THE PREVENTIVE MEASURES MUST BE EFFECTIVE.

IMMEDIATELY AFTER THE CONSTRUCTION OF AN ABUTMENT IS COMPLETED, SLOPE PROTECTION AND SEEDING OR SODDING SHALL BE PLACED ON THE ADJACENT EMBANKMENT SLOPES.

STRUCTURE BACKFILL COMPACTED-IN-PLACE, 1994 CUBIC YARDS.

PLAN ELEVATIONS REFER TO NAVD88 DATUM.

MDOT Michigan Department of Transportation

GENERAL PLAN OF SITE
M-20 OVER WHITE RIVER

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	2 OF 29

DRAWN BY: R.K.OLIN DATE: 04-04 CHECKED BY: RWC DATE: CORRECTED BY: R.K.OLIN DATE: 5-23-05
FILE NAME: b01 62015sv1.dgn

TEST HOLE NO. 1

LOCATION STATION: 575+73.0
7.0 ft LEFT OF M-20 CENTERLINE
M-20 OVER THE WHITE RIVER
GROUND SURFACE ELEVATION: 849.43 ft

849.43		BITUMINOUS
848.9		MODERATELY COMPACT BROWN FINE GRAVEL WITH FINE SAND
847.4	4 5 5	MODERATELY COMPACT BROWN FINE AND MEDIUM SAND
844.4		
843.4	5 8 10	MODERATELY COMPACT DARK BROWN FINE AND MEDIUM SAND. TRACE OF FINE GRAVEL. TRACE OF WICK AND ROTTED WOOD (POSSIBLE CORDEROY AT 7 FEET)
839.4		EST. CONTRACTION SCOUR ELEV. 835.6±
836.9	7 8 12	BOTT/FTG ABUT A ELEV. 834.50
834.9		
834.4	7 11 13	MODERATELY COMPACT BROWN FINE SAND
829.4		
824.4	8 12 16	
821.4		
819.4	10 13 21	COMPACT BROWN FINE SAND
814.4	5 11 19	MIN. PILE PENETRATION ELEV. 813.00
812.4		
809.4	6 8 16	MODERATELY COMPACT BROWN FINE SAND
804.4	9 10 19	
799.4	12 12 ▼	
798.9		
794.4	10 16 39	VERY COMPACT GRAY SANDY SILT
789.4	10 17 38	
785.4	13 18 40	
784.4		VERY COMPACT GRAY FINE SAND
779.4	10 14 45	EST. PILE TIP ELEV. 778.00±
777.9		E.O.B. 71.5 ft

BORING DATE 6/15/04

FREE WATER FIRST NOTED BELOW GROUND SURFACE: 5.0 FT.

WATER BELOW GROUND AFTER COMPLETION: AUGERS OUT: 5.0 FT.

* 50 BLOWS FOR 4 INCHES.

TEST HOLE NO. 2

LOCATION STATION: 576+45.0
6.0 ft RIGHT OF M-20 CENTERLINE
M-20 OVER THE WHITE RIVER
GROUND SURFACE ELEVATION: 849.44 ft

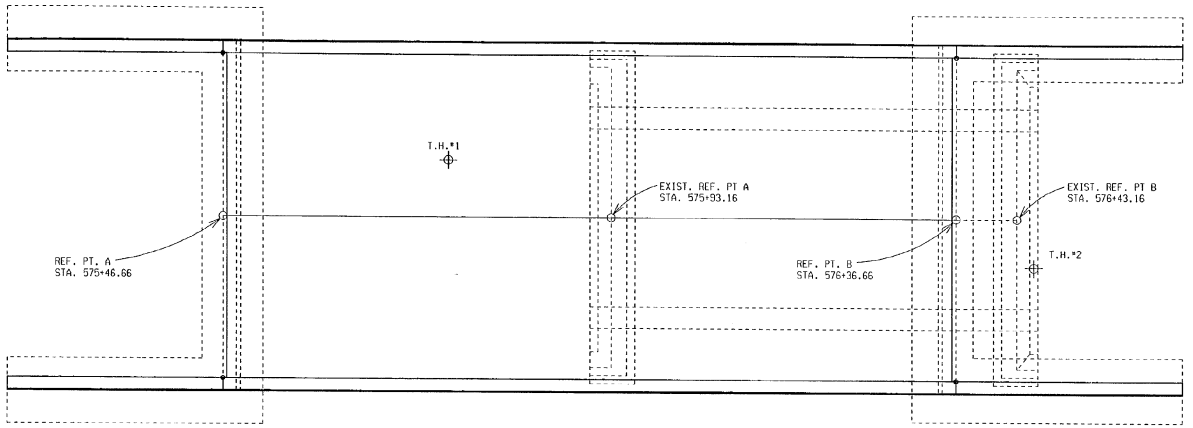
849.44		BITUMINOUS
848.9		CONCRETE
847.9	3 3 3	LOOSE BROWN FINE AND MEDIUM SAND
844.4		
842.9	1 1 1	VERY LOOSE BROWN FINE AND MEDIUM SAND. TRACE OF FINE GRAVEL. TRACE OF ROTTED WOOD
839.4		EST. CONTRACTION SCOUR ELEV. 835.6±
836.9	6 7 10	BOTT/FTG ABUT B ELEV. 834.50
834.4		
829.4	4 5 7	MODERATELY COMPACT BROWN FINE SAND
824.4	6 6 8	
819.4	7 7 10	
814.4	6 9 15	MIN. PILE PENETRATION ELEV. 813.00
812.4		
809.4	6 9 14	
804.4	7 8 9	
799.4	4 5 8	MODERATELY COMPACT GRAY SANDY SILT WITH FINE SAND LAYERS
794.4	5 13 ▼	
789.4	5 10 11	
786.4		
784.4	6 13 25	COMPACT GRAY FINE SAND
778.4	8 18 41	
774.4	11 17 46	VERY COMPACT GRAY FINE SAND EST. PILE TIP ELEV. 773.00±
772.9		E.O.B. 76.5 ft

BORING DATE 6/22/04

FREE WATER FIRST NOTED BELOW GROUND SURFACE: 5.0 FT.

WATER BELOW GROUND AFTER COMPLETION: AUGERS OUT: 5.0 FT.

* 50 BLOWS FOR 2 INCHES. PUSHED A ROCK.



LOCATION DIAGRAM

NOTES:

(0 0 0) 1st 6"
2nd 6"
3rd 6"

NUMBERS IN CIRCLES DENOTE NUMBER OF BLOWS REQUIRED TO DRIVE A 2" O.D. (1⅜" I.D.) SPLIT SPOON SAMPLER 3 SUCCESSIVE 6" INCREMENTS USING A 140# HAMMER FALLING 30".

CONSISTENCY WAS DETERMINED BY INSPECTION OF SAMPLES AND SUBSTANTIATED BY SOILS RESISTANCE TO DRILLING TOOLS.

THE SOIL BORING LOGS REPRESENT POINT INFORMATION. PRESENTATION OF THIS INFORMATION IN NO WAY IMPLIES THAT SUBSURFACE CONDITIONS ARE THE SAME AT LOCATIONS OTHER THAN THE EXACT LOCATION OF THE BORING.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

MDOT Michigan Department of Transportation

SOIL BORING DATA

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	3 OF 29

DRAWN BY: TIMOTHY R. CROOK DATE: 7/14/04 CHECKED BY: AM DATE: 12-9-04 CORRECTED BY:R.K.OLIN DATE: 5-23-05

FILE NAME: b0162315ab.dgn

TEST HOLE NO. 3

LOCATION STATION: 568+50.0
14.0 ft RIGHT OF M-20 CENTERLINE
M-20 OVER THE WHITE RIVER
GROUND SURFACE ELEVATION: 855.10 ft

855.10		
854.1	2 3 2	LOOSE BROWN FINE GRAVEL WITH FINE SAND
850.1	1 0 0	LOOSE BROWN FINE TO COARSE SAND WITH FINE GRAVEL
846.1	1 1 1	VERY LOOSE DARK BROWN FINE AND MEDIUM SAND, TRACE OF MUCK, PEAT LAYER AT 15.5 FEET
845.1	6 8 13	MODERATELY COMPACT BROWN FINE SAND
840.1	10 19 25	COMPACT BROWN FINE SAND
837.1	8 20 30	
832.1	9 17 32	
830.1	7 17 23	COMPACT GRAY FINE SAND
825.1	10 18 24	
824.1	16 21 26	
820.1		
815.1		
810.1		
805.1		
803.6		E.O.B. 51.5 ft

BORING DATE 6/28/04

FREE WATER FIRST NOTED BELOW GROUND SURFACE: 10.5 FT.

WATER BELOW GROUND AFTER COMPLETION: AUGERS OUT: 10.5 FT.

TEST HOLE NO. 4

LOCATION STATION: 571+00.0
14.0 ft RIGHT OF M-20 CENTERLINE
M-20 OVER THE WHITE RIVER
GROUND SURFACE ELEVATION: 849.46 ft

849.46		
848.5		LOOSE DARK BROWN FINE AND MEDIUM SILTY SAND, TRACE OF FINE GRAVEL
844.5	1 0 0	LOOSE DARK BROWN FINE AND MEDIUM SILTY SAND
839.5	1 1 0	VERY LOOSE BROWN FINE TO COARSE SAND
836.5	1 2 3	LOOSE BROWN FINE SAND
834.5	7 12 21	
831.5	9 15 23	COMPACT BROWN FINE SAND
829.5	5 15 21	
824.5	9 17 23	
819.5	5 6 11	
814.5	7 11 13	MODERATELY COMPACT GRAY FINE SAND
810.5	7 9 20	
809.5		
804.5		
799.5		
798.0		E.O.B. 51.5 ft

BORING DATE 6/24/04

FREE WATER FIRST NOTED BELOW GROUND SURFACE: 5.0 FT.

WATER BELOW GROUND AFTER COMPLETION: AUGERS OUT: 5.0 FT.

TEST HOLE NO. 5

LOCATION STATION: 573+50.0
14.0 ft RIGHT OF M-20 CENTERLINE
M-20 OVER THE WHITE RIVER
GROUND SURFACE ELEVATION: 848.92 ft

848.92		
848.4		LOOSE DARK BROWN FINE GRAVEL WITH FINE SILTY SAND
843.9	1 5 3	LOOSE BROWN FINE AND MEDIUM SAND
841.9	2 5 8	
838.9	7 10 14	MODERATELY COMPACT BROWN FINE SAND
833.9	10 11 23	
830.9	10 13 17	COMPACT GRAY FINE AND MEDIUM SAND, TRACE OF FINE GRAVEL
828.9	3 5 7	
825.9	4 5 9	MODERATELY COMPACT GRAY FINE SAND
823.9	8 14 19	
818.9	6 16 20	
813.9	8 14 17	COMPACT GRAY FINE SAND WITH SILT LENSES
810.9		
808.9		
803.9		
798.9		
797.4		E.O.B. 51.5 ft

BORING DATE 6/23/04

FREE WATER FIRST NOTED BELOW GROUND SURFACE: 5.0 FT.

WATER BELOW GROUND AFTER COMPLETION: AUGERS OUT: 4.5 FT.

TEST HOLE NO. 6

LOCATION STATION: 575+10.0
11.0 ft LEFT OF M-20 CENTERLINE
M-20 OVER THE WHITE RIVER
GROUND SURFACE ELEVATION: 849.11 ft

849.11		
848.9		BITUMINOUS
848.1		MODERATELY COMPACT BROWN FINE GRAVEL WITH FINE SAND
844.1	1 4 3	LOOSE BROWN FINE AND MEDIUM SAND
843.1	1 1 8	LOOSE DARK BROWN FINE AND MEDIUM SAND, TRACE OF FINE GRAVEL, MUCK LAYERS AND ROTTED WOOD (POSSIBLE CORDUROY AT 7 FEET)
839.1	2 10 13	
834.1	9 12 17	
833.6	8 12 16	
829.1	7 11 17	MODERATELY COMPACT BROWN FINE SAND
824.1	4 9 19	
819.1	6 8 18	
814.1	10 15 22	
809.1	11 16 24	COMPACT GRAY SANDY SILT
804.1		
803.1		
799.1		
797.6		E.O.B. 51.5 ft

BORING DATE 6/16/04

FREE WATER FIRST NOTED BELOW GROUND SURFACE: 5.0 FT.

WATER BELOW GROUND AFTER COMPLETION: AUGERS OUT: 5.0 FT.

TEST HOLE NO. 7

LOCATION STATION: 577+10.0
11.0 ft LEFT OF M-20 CENTERLINE
M-20 OVER THE WHITE RIVER
GROUND SURFACE ELEVATION: 849.33 ft

849.33		
849.1		BITUMINOUS
848.6		LOOSE BROWN FINE AND MEDIUM SILTY SAND, TRACE OF FINE GRAVEL
847.3	5 5 4	LOOSE BROWN FINE AND MEDIUM SAND
844.3	3 3 4	
843.3	2 2 1	LOOSE DARK BROWN FINE AND MEDIUM SAND, TRACE OF FINE GRAVEL, TRACE OF MUCK AND ROTTED WOOD.
839.3	2 2 1	
836.3	2 2 6	LOOSE BROWN FINE SAND
834.3	3 4 5	
831.8	3 5 5	
829.3	6 6 12	
824.3	2 5 10	MODERATELY COMPACT BROWN FINE SAND
819.3	6 9 13	
814.3	7 13 19	
809.3	8 15 32	COMPACT BROWN FINE SAND
804.3	13 34 50/4"	
802.8		
799.3		VERY COMPACT GRAY SANDY SILT
797.8		E.O.B. 51.5 ft

BORING DATE 6/17/04

FREE WATER FIRST NOTED BELOW GROUND SURFACE: 5.0 FT.

WATER BELOW GROUND AFTER COMPLETION: AUGERS OUT: 5.0 FT.

TEST HOLE NO. 8

LOCATION STATION: 578+10.0
11.0 ft LEFT OF M-20 CENTERLINE
M-20 OVER THE WHITE RIVER
GROUND SURFACE ELEVATION: 849.58 ft

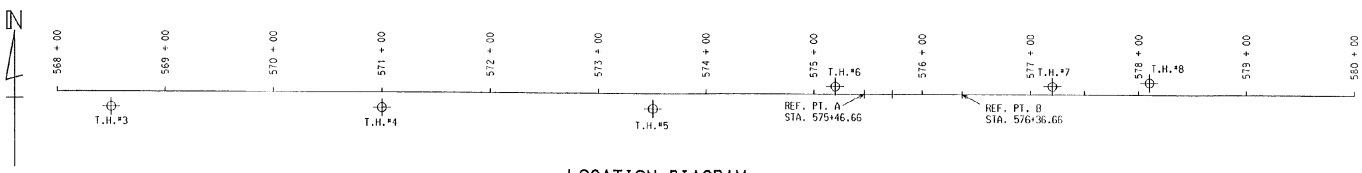
849.58		
848.6		LOOSE BROWN FINE AND MEDIUM SILTY SAND WITH FINE GRAVEL
845.1	4 0 1	LOOSE BROWN FINE AND MEDIUM SAND
844.6		
839.6	1 0	VERY LOOSE DARK BROWN FINE AND MEDIUM SAND, TRACE OF MUCK
836.6	3 11 13	
834.6	10 10 14	MODERATELY COMPACT GRAY FINE SAND
829.6	8 13	
824.6	2 10 11	
821.6	10 12 21	
819.6	12 16 26	COMPACT BROWN FINE SAND
814.6	10 11	
809.6	12 22 45	
805.6		VERY COMPACT GRAY SANDY SILT
804.6	12 16 38/5"	
799.6		
798.1		E.O.B. 51.5 ft

BORING DATE 6/21/04

FREE WATER FIRST NOTED BELOW GROUND SURFACE: 5.0 FT.

WATER BELOW GROUND AFTER COMPLETION: AUGERS OUT: 5.0 FT.

REVISIONS			
NO.	DESCRIPTION	DATE	BY



LOCATION DIAGRAM

NOTES:

(0 0 0) 1st 6" 2nd 6" 3rd 6"

NUMBERS IN CIRCLES DENOTE NUMBER OF BLOWS REQUIRED TO DRIVE A 2" O.D. (1⅜" I.D.) SPLIT SPOON SAMPLER 3 SUCCESSIVE 6" INCREMENTS USING A 140# HAMMER FALLING 30".

CONSISTENCY WAS DETERMINED BY INSPECTION OF SAMPLES AND SUBSTANTIATED BY SOILS RESISTANCE TO DRILLING TOOLS.

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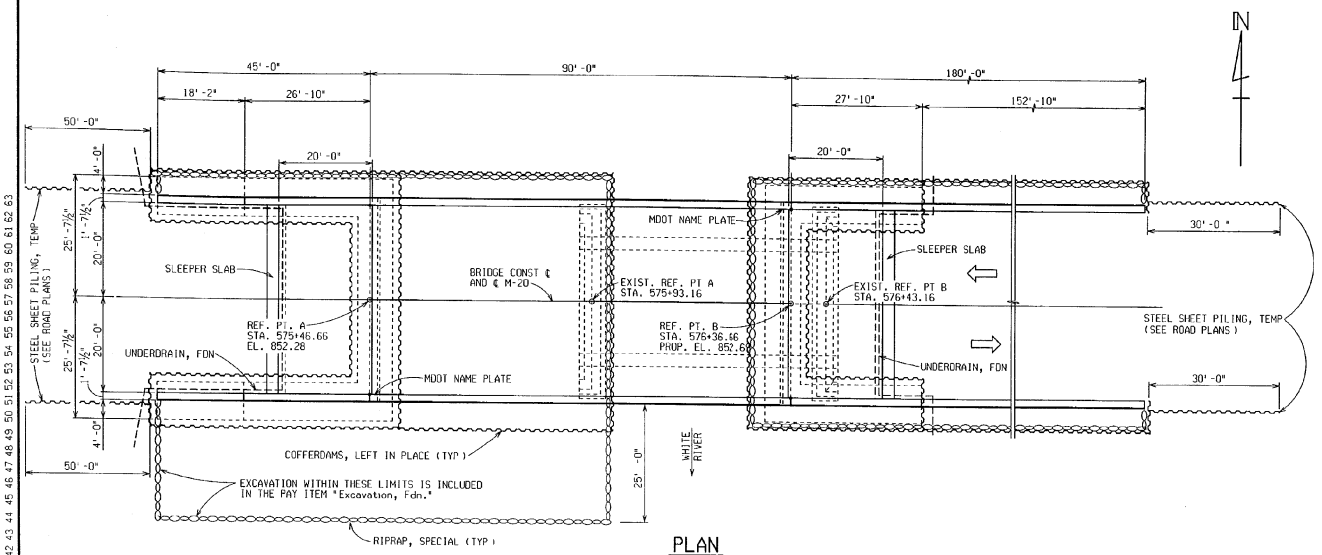
MDOT Michigan Department of Transportation

SOIL BORING DATA

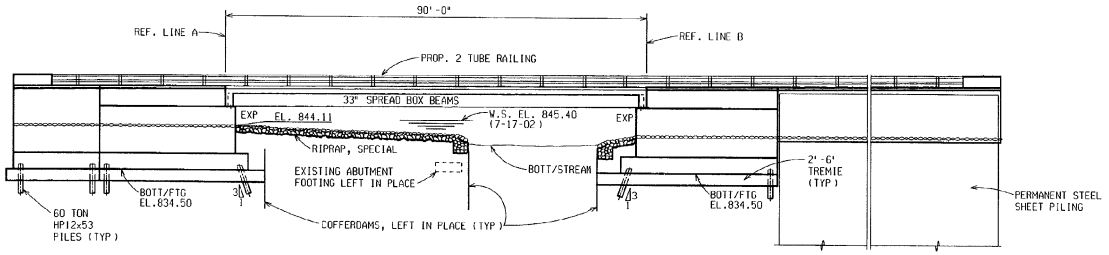
DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	4 OF 29

DRAWN BY: LOUIS D. TAYLOR DATE: 10/4/04 CHECKED BY: AM DATE: 12-9-04 CORRECTED BY: R.K.OLIN DATE: 5-23-05

FILE NAME: b0162015ab.dgn



PLAN



ELEVATION

MISCELLANEOUS QUANTITIES

1	LS	Structures, Rem (B01-62015)
2642	Cyd	Excavation, Fdn
1994	Cyd	Backfill, Structure, CIP
133	Cyd	Embankment, CIP
4838	Sft	False Decking
120	Ft	Turbidity Curtain (Deep)
1	LS	Cofferdams, Left In Place (B01-62015)
800	Syd	Riprap-Special
546	Syd	Simulated Stone Masonry
1273	Cyd	Conc Quality Assurance, Structure
5800	Dlr	Conc Quality Initiative
180	Ft	Underdrain, Fdn, 4 Inch
40	Ft	Underdrain Outlet, 4 Inch
4	Ea	Underdrain, Outlet Ending, 4 Inch
143	Syd	Conc Surface Coating
* 2	Ea	Erosion Control, Filter Bag

* THE MISCELLANOUS QUANTITY FOR "Erosion Control, Filter Bag" WILL NOT BE PAID FOR UNDER SECTION 0002 - BRIDGE, BUT HAVE BEEN INCLUDED WITH SIMILAR QUANTITIES UNDER SECTION 0001 - ROAD IN THE SECEDULE OF ITEMS.

SUMMARY OF HYDRAULIC ANALYSIS

	EXISTING			PROPOSED			
FLOOD DATA	DIS-CHARGE (CFS)	WATER SURFACE ELEV. AT U/S FACE OF STRUCTURE	VELOCITY AT D/S FACE (FPS)	WATER SURFACE ELEV. AT U/S FACE OF STRUCTURE	VELOCITY AT D/S FACE (FPS)	WATERWAY AREA (SFT) AT D/S FACE	CHANGE IN WS EL 22.4 U/S OF PROPOSED STRUCTURE
50 YEAR	2000	846.05	7.17	847.25	3.68	543.21	-0.81
100 YEAR	2400	849.40	8.60	847.59	4.18	574.48	-1.72

MAXIMUM BRIDGE AREA BELOW LOW CHORD IS 575 SQUARE FEET

THE WATER SURFACE AND/OR ENERGY GRADE ELEVATIONS SHOWN ON THE ABOVE HYDRAULIC TABLE ARE TO BE USED FOR COMPARISON PURPOSES ONLY AND ARE NOT TO BE USED FOR ESTABLISHING A REGULATORY FLOODPLAIN. THE ELEVATIONS MAY BE USED PROVIDED THEY ARE VERIFIED WITH THE LAND AND WATER MANAGEMENT DIVISION, MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY.

NOTES:

THE DESIGN OF THIS STRUCTURE IS BASED ON CURRENT AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES HS25 LOADING. LIVE LOAD PLUS IMPACT DEFLECTION DOES NOT EXCEED 1/800 OF SPAN LENGTH. THE LOAD FACTOR METHOD OF DESIGN WAS USED FOR THIS STRUCTURE.

GEOTEXTILE LINER SHALL BE PLACED ON ALL SLOPES PRIOR TO PLACING RIPRAP. PAYMENT FOR GEOTEXTILE LINER SHALL BE INCLUDED IN THE PAYMENT FOR RIPRAP.

THE RIPRAP QUANTITY IS BASED ON THE LATERAL DIMENSIONS OF THE AREA TO BE PROTECTED, REGARDLESS OF THE NUMBER OF LAYERS REQUIRED. THE ESTIMATED WEIGHT OF RIPRAP IS 480 TONS.

THE TREMIE SEAL DESIGN WAS BASED ON A WATER SURFACE AT EL. 845.40.

THE DRAINAGE AREA CONTRIBUTORY TO THIS CROSSING IS 93.7 SQUARE MILES.

FALSE DECKING SHALL INCLUDE THE AREA BOUNDED BY REFERENCE LINES A AND B AND OUTSIDE FLANGE FASCIAS OF THE FASCIA BEAMS. THE ESTIMATED AREA IS 1600 SQUARE FEET DURING REMOVAL AND 3238 SQUARE FEET DURING PROPOSED CONSTRUCTION.

ANY CHANNELIZING OR WATER DIVERSION FOR COFFERDAM INSTALLATION AND REMOVAL OR CUTOFF SHALL BE APPROVED BY THE ENGINEER AND INCLUDED IN THE PAY ITEM "Cofferdams, Left in Place".

THE COFFERDAMS SHALL BE CUT OFF AT BOTTOM OF PROPOSED FOOTING OR A MINIMUM OF ONE FOOT BELOW THE GROUND OR STREAM BED. INCLUDED IN THE PAY ITEM "Cofferdams, Left in Place".

DISCHARGE FROM COFFERDAMS SHALL BE PUMPED INTO FILTER BAGS AND SHALL NOT BE STORED WITHIN 100 - YEAR FLOOD ELEVATION.

WITHOUT THE PREVENTIVE MEASURES SHOWN ON THESE PLANS, THERE IS A POSSIBILITY THAT STREAM BED SCOUR MAY OCCUR. THE ESTIMATED TOTAL CONTRACTION SCOUR DEPTH IS CALCULATED TO BE 2.9 FEET AT ABUTMENTS A AND B. THESE DEPTHS ARE BASED ON A 100 YEAR RUNOFF EVENT.

CONCRETE SURFACE COATING SHALL BE APPLIED TO THE DECK FASCIA, BRUSH BLOCK AND OUTSIDE AND BOTTOM OF FASCIA BEAMS (SEE SPECIAL PROVISION FOR TEXTURING CONCRETE).

SIMULATED STONE MASONRY SHALL APPLY TO THE ENTIRE VERTICAL EXPOSED SURFACES OF ABUTMENTS AND RETAINING WALLS (SEE SPECIAL PROVISION FOR TEXTURING CONCRETE).

COFFERDAMS SHALL BE ADJUSTED IF NECESSARY TO AVOID BATTERED PILES.

PLACEMENT OF UNDERDRAIN, FDN SHALL BE ADJUSTED TO AVOID CONFLICT WITH TIE RODS.

REVISIONS

NO.	DESCRIPTION	DATE	BY

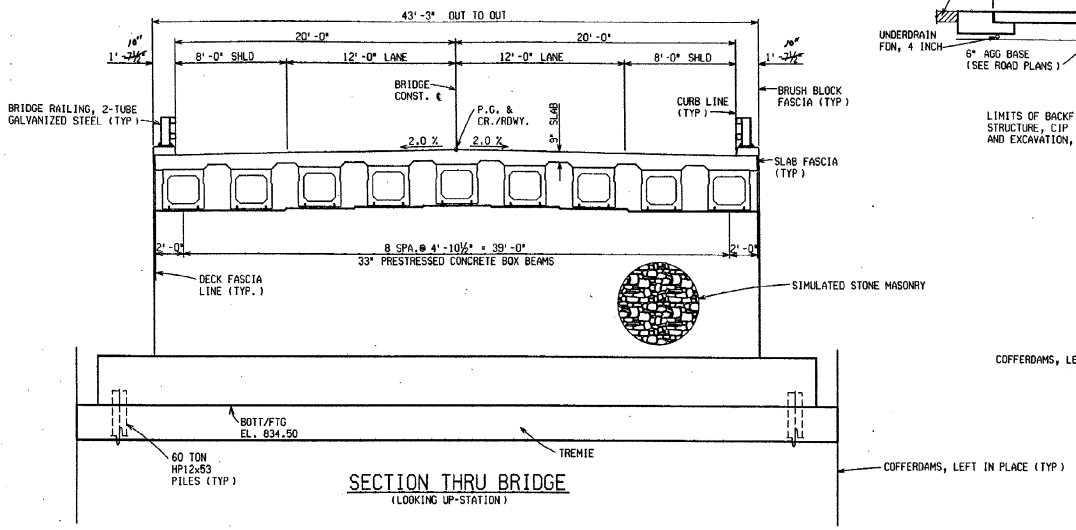
MDOT Michigan Department of Transportation

GENERAL PLAN OF STRUCTURE M-20 OVER WHITE RIVER

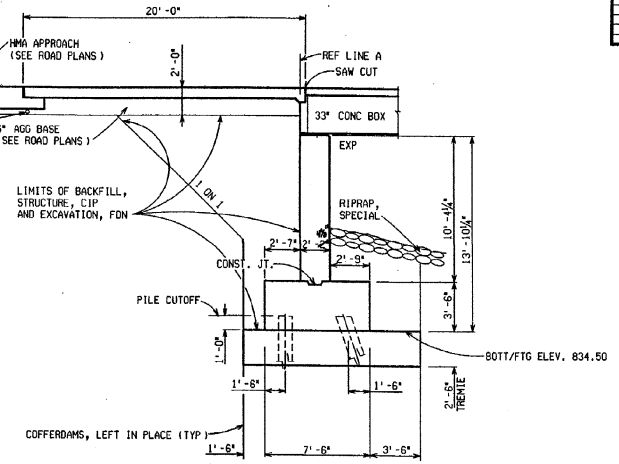
DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	5 OF 29

DRAWN BY: R.K.OLIN CHECKED BY: AM DATE: 02-04 DATE: 12-9-04 CORRECTED BY: R.K.OLIN DATE: 5-23-05

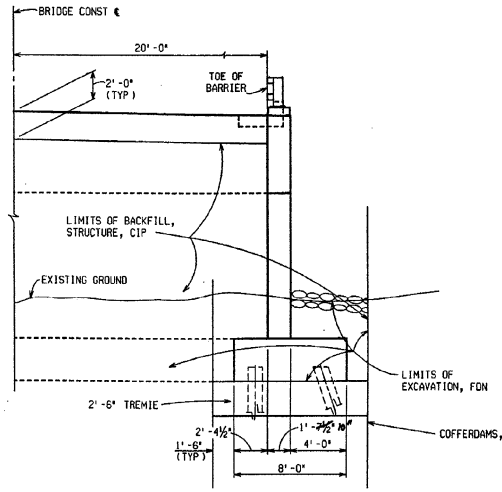
FILE NAME: b0162015st.dgn



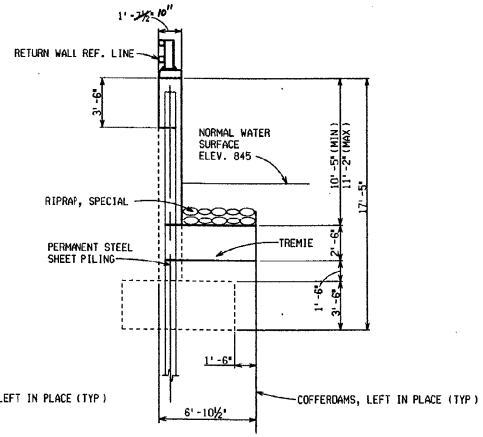
SECTION THRU BRIDGE
(LOOKING UP-STATION)



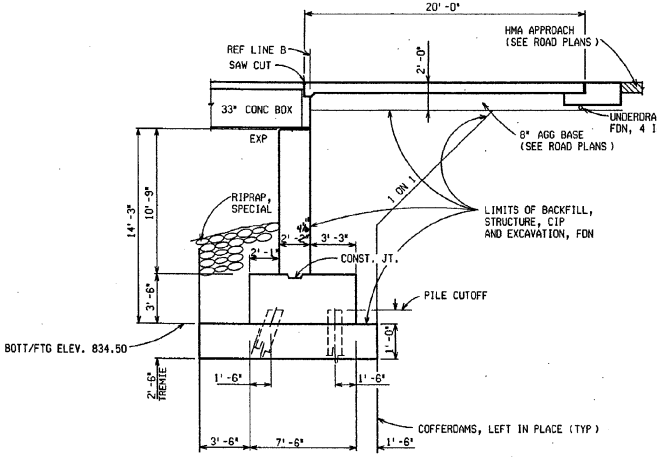
SECTION THRU ABUTMENT A
DO NOT BACKFILL ABOVE BRIDGE SEAT UNTIL DECK IS CAST.



TYPICAL APPROACH SECTION



SECTION THRU ABUTMENT B
RETAINING WALL



SECTION THRU ABUTMENT B
DO NOT BACKFILL ABOVE BRIDGE SEAT UNTIL DECK IS CAST.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

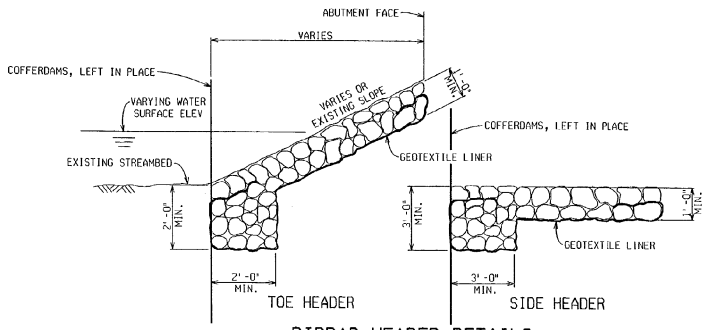
MDOT Michigan Department of Transportation

GENERAL PLAN OF STRUCTURE
M-20 OVER WHITE RIVER

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	6 OF 29

DRAWN BY: R.K.OLIN DATE: 02-04 CHECKED BY: AM DATE: 12-9-04 CORRECTED BY: R.K.OLIN DATE: 5-23-05

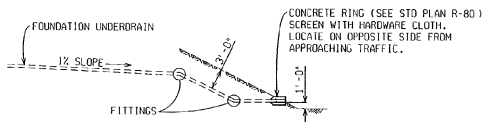
FILE NAME: b0162015s1.dgn



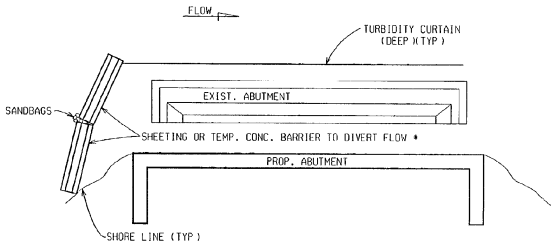
RIPRAP HEADER DETAILS

TOP OF RIPRAP MUST BE AT OR BELOW EXISTING STREAMBED/ SLOPE ELEVATION.

THE RIPRAP SCHEME SHOWN IS A MINIMUM REQUIREMENT FOR SCOUR.



DETAIL FOR DRAINAGE INTO DITCH



PLAN OF DIVERSION FOR PLACING RIPRAP

COFFERDAM SHALL REMAIN IN PLACE AND CUT OFF AFTER RIPRAP PLACEMENT IS COMPLETED. TEMPORARY CONCRETE BARRIER OR SHEETING AS NECESSARY TO INSTALL TURBIDITY CURTAIN AND PLACE RIPRAP WILL NOT BE PAID FOR SEPERATELY, BUT SHALL BE INCLUDED IN THE PAYMENT FOR RIPRAP. ALTERNATE METHODS OF WATER DIVERSION SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

* IF WATER IS SHALLOW, TEMP. CONC. BARRIER OR SANDBAGS CAN BE USED TO DIVERT FLOW.

NO TEMPORARILY EXCAVATED MATERIAL SHALL BE PLACED IN FLOOD PLAINS OR WETLANDS

REVISIONS

NO.	DESCRIPTION	DATE	BY

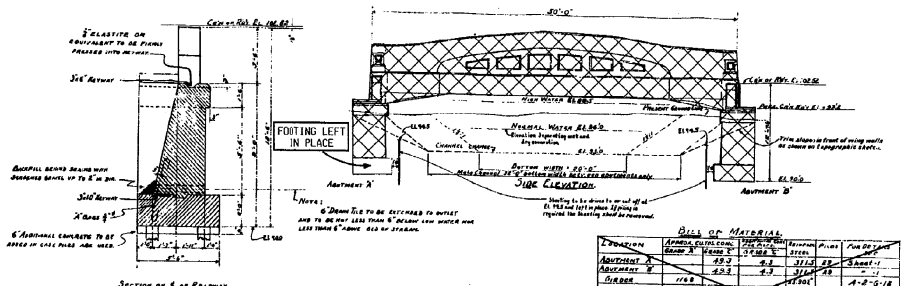
MDOT Michigan Department of Transportation

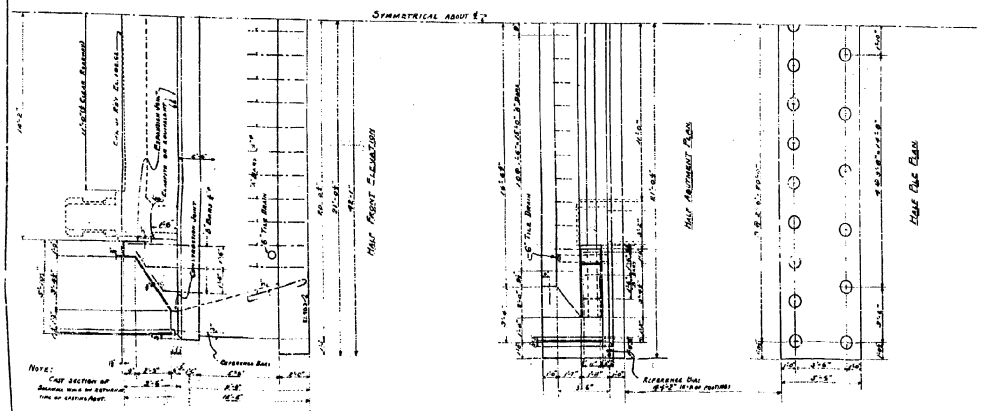
GENERAL PLAN OF STRUCTURE
M-20 OVER WHITE RIVER

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	7 OF 29

DATE: 5-23-05
DATE: 12-9-04 CORRECTED BY:R.K.OLIN
DATE: 02-04 CHECKED BY: AM
DRAWN BY: R.K.OLIN
FILE NAME: s012015s.dgn

REVISIONS			
NO.	DESCRIPTION	DATE	BY





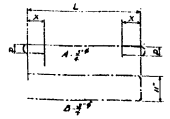
BILL OF MATERIAL

DESCRIPTION	APPROX. CU.YDS. CONC. GRADE 'A'	REINF. STEEL LBS.	PILING	FOR DETAILS SEE
ABUTMENT 'A'	49.3	4.2 / 311.5	28	SHEET-1
ABUTMENT 'B'	49.3	4.2 / 311.5	28	" -1
GIRDER	116.8	41,305		A-2-6-12
MAIN ℄ REVISION				A-1-P-1
SITUATION PLAN				SHEET-1
FOUNDATIONS				A-1-F-11
PAVEMENT SEAT	13			A-1-6-3
TOTALS	118.1	986 / 86	56	

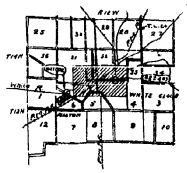
Wet Excavation - 140 Cu.Yds. Dry Excavation - 75 Cu.Yds. Channel Change - 1600 Cu.Yds.
Extra Wet Excavation (if piles are required) - 13 Cu.Yds.

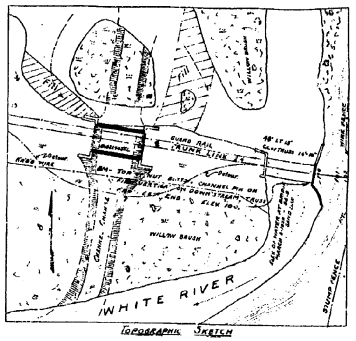
BILL OF REINFORCING STEEL FOR TWO ABUTMENTS.

LOCATION	MARK	L	X	B	LENGTH	NO.	SIZE	GRADE	WEIGHT
FOOTING	A	3'-0"	1'-0"	2'-0"	5'-1"	22	#6	BAR	2.05
ABUTMENT WALL	B	3'-0"	1'-0"	2'-0"	12'-0"	12	#6	BAR	2.15
								TOTAL	4.2



BAR BENDING DIAGRAM.





NOTES.

EXCAVATIONS AS TABULATED HAVE BEEN COMPUTED FROM THE 10'-0" TOPOGRAPHICAL PLAN AND ARE RELATIVELY APPROXIMATE, BUT HAVE BEEN CAREFULLY CHECKED. EXCAVATION QUANTITIES ARE NOT GUARANTEED. EXCAVATION WILL NOT BE PAID FOR AS A UNIT BASIS BUT WILL BE CONSIDERED AS INCLUDED IN THE UNIT PRICE BID FOR "STRUCTURAL CONCRETE".

ALL MATERIALS AND WORKMANSHIP TO BE IN ACCORDANCE WITH MICHIGAN STATE HIGHWAY DEPARTMENT'S SPECIFICATIONS FOR STEEL AND CONCRETE HIGHWAY BRIDGES, 1942 EDITION, REVISED TO DATE.

ALL SECTIONS SHOWN AS DISTANCE UNITS ON THESE PLANS ARE TO BE MEASURED IN CIVIL CONTINUOUS RUN.

NO UNDERWATER GRAVEL WILL BE PERMITTED.

PILES WILL NOT BE REQUIRED UNLESS STORAGE OF THE EMBANKMENT AFFECTS THE DRAIN PIPES. IF PILES ARE REQUIRED THEY SHALL BE DRIVEN TO A CAPACITY OF 18 TONS.

ALL EXPOSED SURFACES ARE TO BE RUBBED WITH CARBORUNDUM BRICK IN THE MANNER PRESCRIBED AND WITHIN THE TIME SPECIFIED IN PARAGRAPH 109 OF THE SPEC.

BRASS REFERENCE DIAL 5" X 5" WAS FURNISHED BY THE STATE HIGHWAY DEPARTMENT, AND IS TO BE CAREFULLY SET BY THE ENGINEER IN THE POSITIONS SHOWN, SO AS TO PROJECT 2" FROM THE SURFACE. AFTER PLANTS, THE INSPECTOR IS TO FURNISH A DIAGRAM, WITH THE ELEVATIONS OF THE DIAL AND TWO BATCHES FROM REFERENCE LINES USING INSTRUMENT PLAN TO BE FURNISHED BY THE BRIDGE ENGINEER.

TRAFFIC TRAVEL IS TO BE MAINTAINED USING THE PRESENT BRIDGE AND A DETOUR FOR ONLY THE CONTRACTOR WILL BE HELD IN FAULT OF AND BEHIND THE NEW ABUTMENTS TO THE NATURAL GROUND SURFACE IN FILLING OF EXCESS MATERIAL AS THE ENGINEER MAY DIRECT SHOWING THE APPROACHES OF THE NEW BRIDGE TO FIT ALIGNMENT OF THE CONTRACT.

FOR REAMS PILE BEARING DETAILS SEE SHEET A-1-P-1. THIS SUPERSEDES DETAIL SHOWN ON A-2-6-12.

THE CONTRACTOR IS TO MAKE THE CHANNEL CHANGE AS SHOWN ON THE PLANS, DISPOSING OF EXCAVATED MATERIAL IN FILLING THE OLD CHANNEL OR DISPOSING OF IT AS THE ENGINEER MAY DIRECT. ABOUT 1600 CU.YDS. OF EARTH ARE INVOLVED IN THE CHANNEL CHANGE.

The Contractor will dispose of material excavated from the channel change in filling the old channel as directed by the Resident Engineer. Maximum haul 1500 ft.

MICHIGAN STATE HIGHWAY DEPARTMENT
SEC. 4, T. 14 N., R. 14 W., WILCOX TWP., NEWAYGO CO.
BRIDGE FILE 62-60-031, ON STL. 24 OVER WHITE RIVER.
30'-0" C. GIRDER 22' ROADWAY 12°-7½" PLAIN ABUTMENTS
ABUTMENT DETAILS.

M

CORRECT _____ BRANCH ENGINEER
APPROVED _____ BRIDGE ENGINEER

DRAWN BY	WWV	11-24-04
TRACED BY	WWV	11-24-04
CHECKED BY	GWV	1-6-05
CHKD BY	GWV	2-8-05

Br 1 of 62-24-2

JOB NO. (60572A)

THE ONLY ITEMS OF WORK TO BE DONE FROM THIS SHEET ARE IDENTIFIED BY USING THE LEGEND BELOW, LABELED WITH THIS PROJECTS JOB NUMBER.

PROPOSED WORK

DENOTES REMOVAL PORTIONS

MDOT Michigan Department of Transportation

REMOVAL DETAILS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	8 OF 29

DRAWN BY: T. DUDA DATE: 09/15/03 CHECKED BY: DATE: CORRECTED BY: H.K. DLIN DATE: 4-13-05

FILE NAME: b0162015sh.dgn

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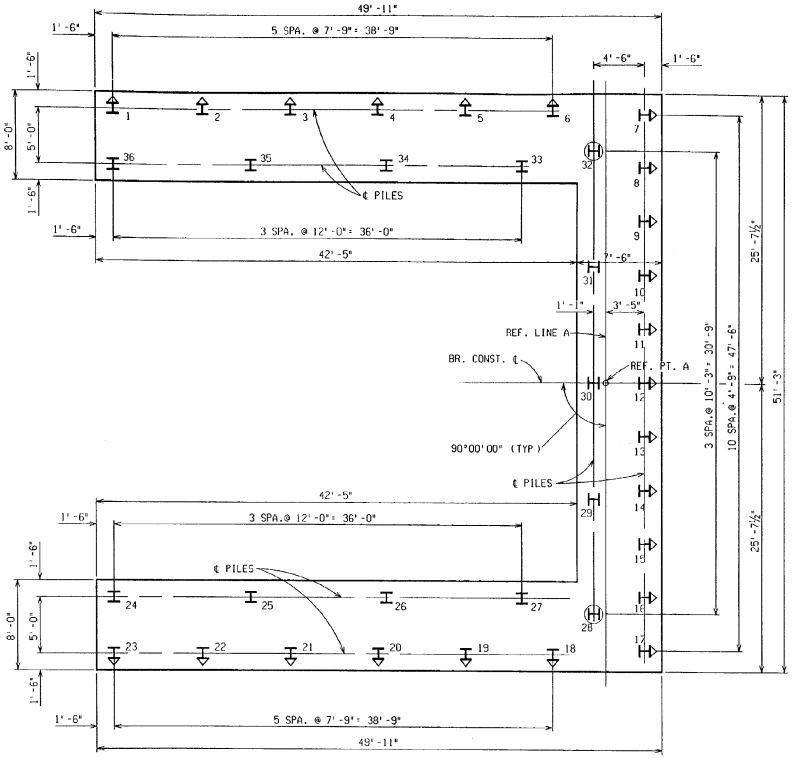
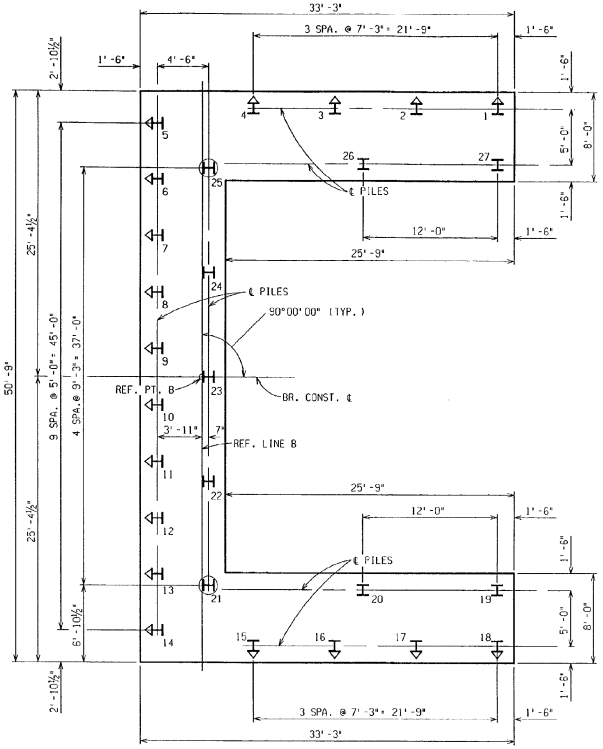




MISCELLANEOUS QUANTITIES

1 LS	Pile Driving Equipment, Furn (B01-62015)
4160 Ft	Pile, Steel, Furn and Driven, 12 Inch
4 Ea	Test Pile, Steel, 12 Inch

PILE LAYOUT

60 TON CAPACITY HP 12x53 PILES							
LOCATION	PILE TYPE	NUMBER OF PILES	ESTIMATED LENGTH FURNISHED & DRIVEN		PILE POINTS (EACH)	SPLICES (EACH)	CUT-OFF ELEV.
			EACH LFT	TOTAL LFT			
ABUT A	TEST	2	70	140			835.50
	VERTICAL	11	60	660			835.50
	BATTERED	23	65	1495			835.50
ABUT B	TEST	2	75	150			835.50
	VERTICAL	7	65	455			835.50
	BATTERED	18	70	1260			835.50
TOTAL				4160			

NOTES:

H --DENOTES VERTICAL PILES.

H --DENOTES BATTERED PILES.

(H) --DENOTES VERTICAL TEST PILES.

(H) --DENOTES BATTERED TEST PILES.

ALL PILES SHALL BE DRIVEN TO A MINIMUM BEARING CAPACITY OF 60 TONS.

THE ESTIMATED PILE LENGTH IS BASED ON THE STATIC FORMULA.

BATTER PILES FOR ABUTMENTS A & B SHALL BE DRIVEN TO A 3V:1H BATTER ANGLE.

STEEL PILES SHALL BE HP 12x53.

PILES ARE TO BE DRIVEN TO SUCH ACCURACY THAT THE ENDS OF THE PILES TO BE EMBEDDED IN THE CONCRETE ARE WITHIN 3" OF THE LOCATION SHOWN ON THE PLANS.

MDOT Michigan Department of Transportation

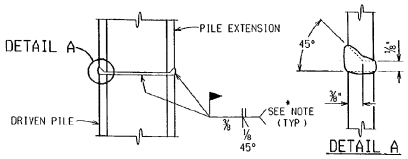
PILE DETAILS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	9 OF 29

REVISIONS

NO.	DESCRIPTION	DATE	BY

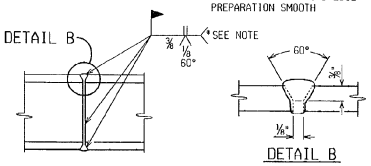
DATE: 5-23-05 DATE: 12-9-04 CORRECTED BY: R.K.OLIN DATE: 03/04 CHECKED BY: AM DRAWN BY: R.K.OLIN FILE NAME: b01 62015p1.dgn



SPLICE DETAILS

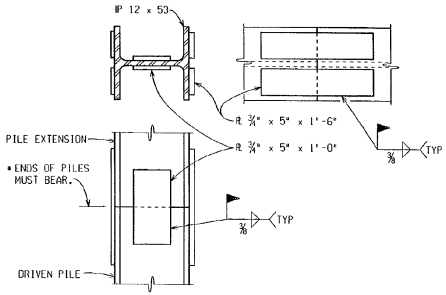
FOR PILES IN PLACE (HORIZONTAL JOINT)

* BACK GOUGE AND GRIND EDGE PREPARATION SMOOTH



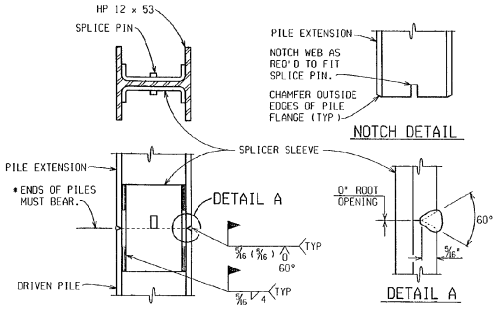
SPLICE DETAILS

FOR PILES IN HORIZONTAL POSITION



SPLICE DETAILS

* SET PILE EXTENSION IN PLACE WITH SPLICE PLATES ATTACHED, TAP SEVERAL TIMES WITH THE HAMMER TO IMPROVE BEARING CONTACT, THEN COMPLETE WELDING OF PLATES TO THE LOWER SECTION.



ALTERNATE SPLICE DETAILS

* SET PILE EXTENSION IN PLACE WITH SPLICE PLATES ATTACHED, TAP SEVERAL TIMES WITH THE HAMMER TO IMPROVE BEARING CONTACT, THEN COMPLETE WELDING OF PLATES TO THE LOWER SECTION.

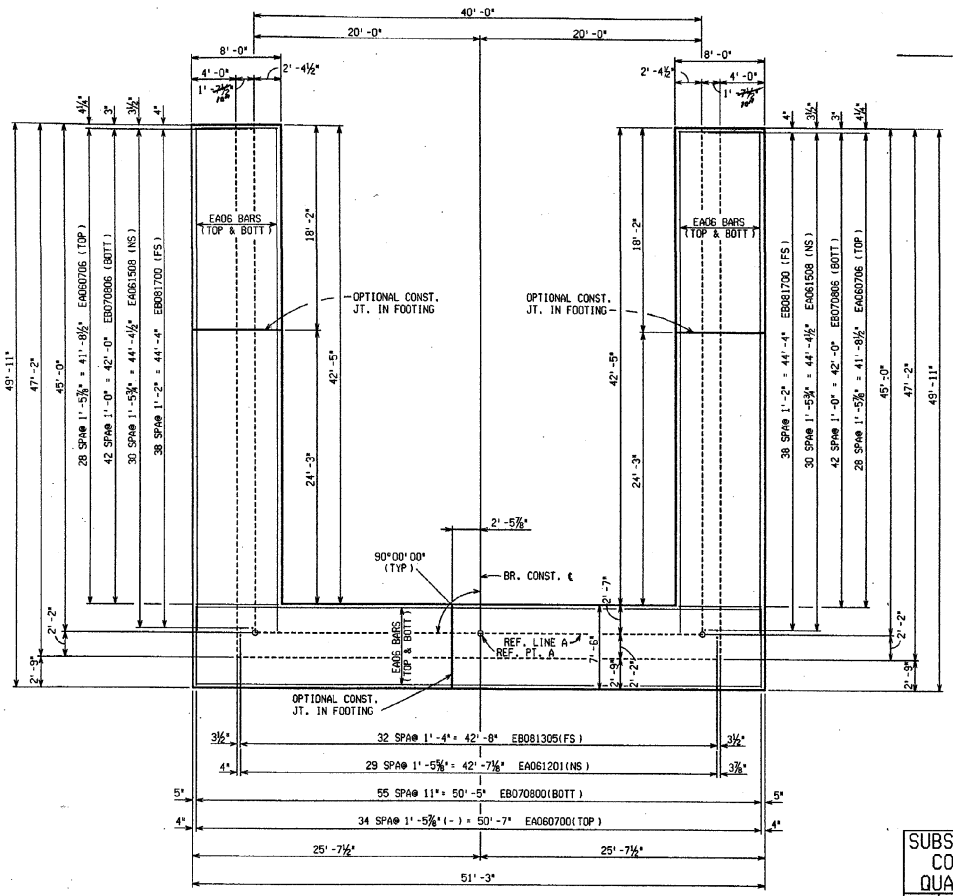
REVISIONS			
NO.	DESCRIPTION	DATE	BY

MDOT Michigan Department of Transportation

PILE DETAILS

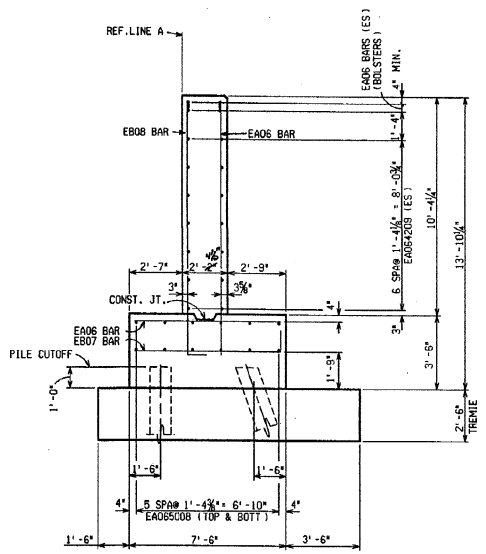
DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	10 OF 29

FILE NAME: b01 62015pl.dgn DRAWN BY: R.K.OLIN DATE: 09/04 CHECKED BY: DATE: CORRECTED BY: R.K.OLIN DATE: 5-23-05



PLAN OF FOOTING-ABUTMENT A

NOTE: VERTICAL STEEL SPACING WILL BE ADJUSTED AT CONSTRUCTION JOINTS TO PROVIDE A 3" MINIMUM CLEARANCE.



SECTION THRU ABUTMENT A

MISCELLANEOUS QUANTITIES

292 Cyd	Conc. Grade T
443 Cyd	Substructure Conc
146 Sft	Joint Waterproofing
47 Syd	Substructure Horizontal Surface Sealer

SUBSTRUCTURE CONCRETE QUANTITIES

POUR	ABUT. A	ABUT. B
A	66.7	49.1
B	71.5	53.7
C	31.6	33.5
D	35.9	37.6
E	11.0	6.7
F	11.0	6.7
G	6.2	2.0
H	6.2	
I	4.1	
J	4.1	
K	1.3	
L	1.3	
M	1.4	
N	1.4	
TOTAL	253.7	189.3
GRAND TOTAL	443	CYD

NOTES:

JWP DENOTES JOINT WATERPROOFING.

NS DENOTES NEAR SIDE.

FS DENOTES FAR SIDE.

ES DENOTES EACH SIDE.

FOR BEVEL AND MOLDING DETAILS, SEE STANDARD PLAN B-103-SERIES.

FOR PILE QUANTITIES, LAYOUT AND NOTES, SEE SHEET 9.

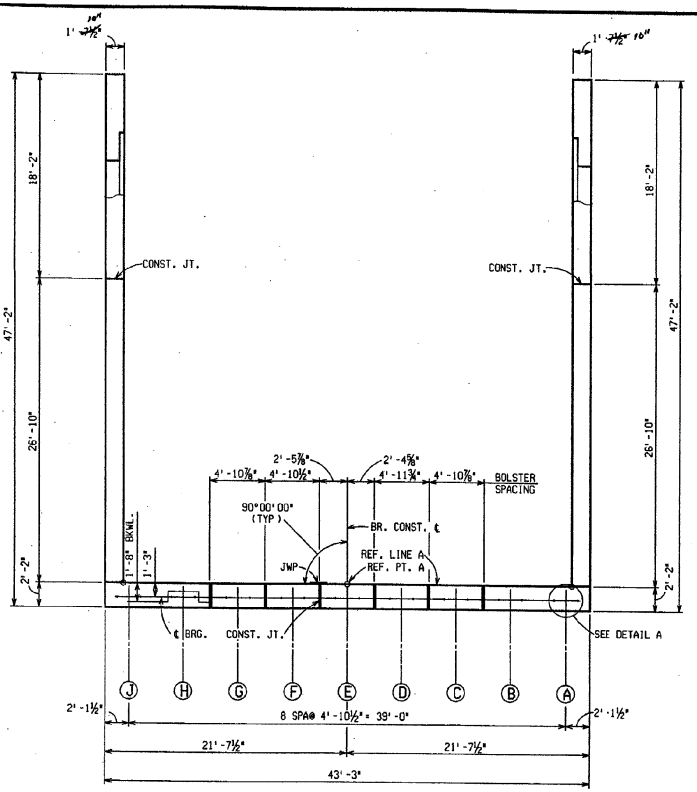
LOW TEMPERATURE PROTECTION OF CONCRETE SHALL BE APPLIED ACCORDING TO SECTION 706.03J, OF THE STANDARD SPECIFICATIONS FOR CONSTRUCTION. LOW TEMPERATURE PROTECTION OF CONCRETE WILL NOT BE PAID FOR SEPARATELY, BUT WILL BE INCLUDED IN THE BID ITEM "Substructure Conc".

SUBSTRUCTURE HORIZONTAL SURFACE SEALER SHALL BE APPLIED TO THE TOP OF ABUTMENT A AND B AFTER THE ELASTOMERIC REARINGS HAVE BEEN PLACED IN FINAL POSITION ON THE STRUCTURE.

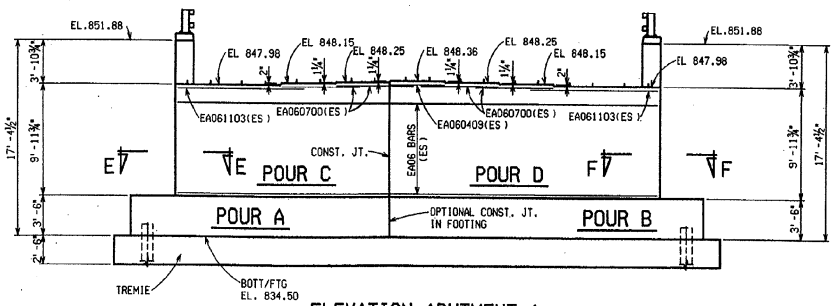
MDOT Michigan Department of Transportation

ABUTMENT DETAILS

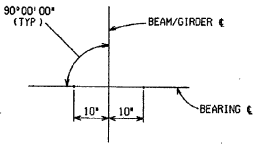
DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	10 OF 28



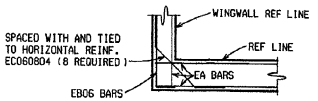
PLAN OF WALL-ABUTMENT A



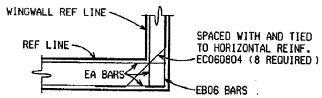
ELEVATION-ABUTMENT A



DETAIL A



SECTION E-E



SECTION F-F

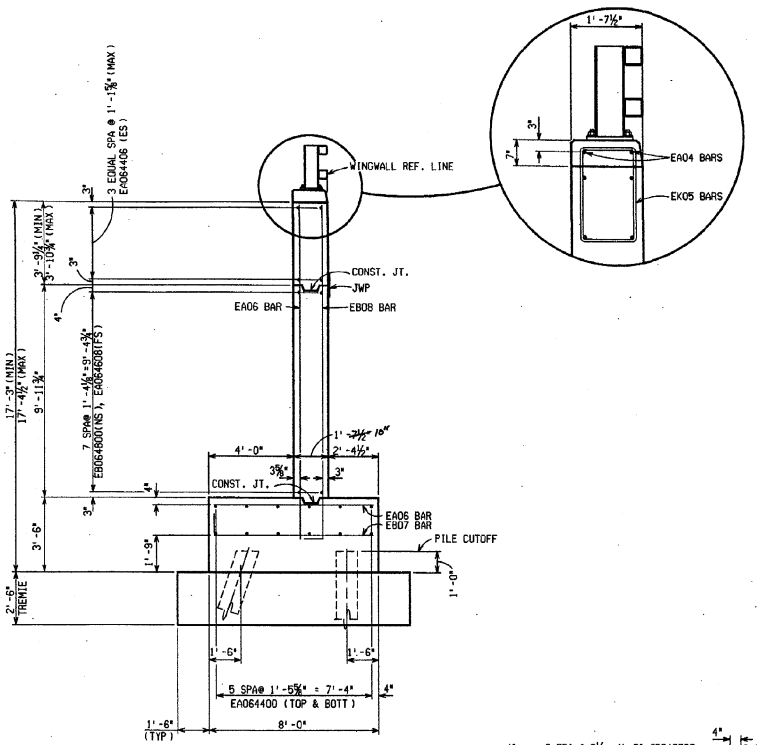
REVISIONS			
NO.	DESCRIPTION	DATE	BY

MDOT Michigan Department of Transportation

ABUTMENT DETAILS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	12 OF 28

DATE: 5-23-05
CORRECTED BY: R.K.OLIN
DATE:
CHECKED BY:
DATE: 09/04
DRAWN BY: R.K.OLIN
FILE NAME: b01 62015ab.dgn



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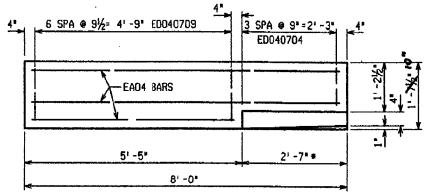
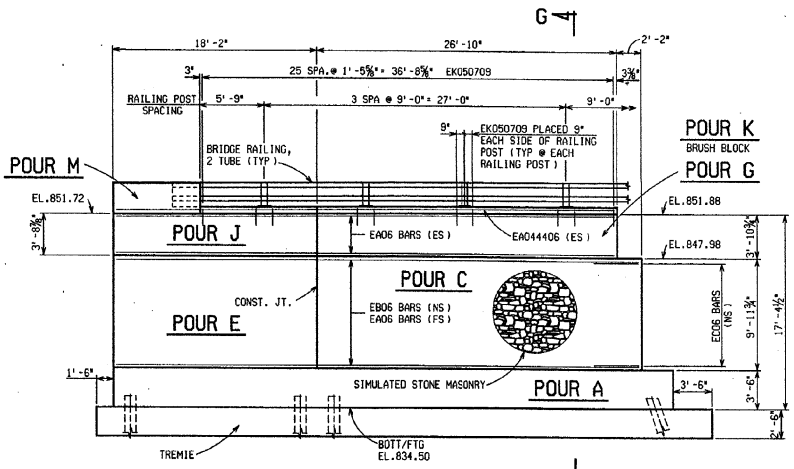
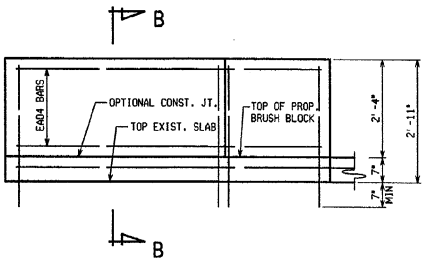


PLAN

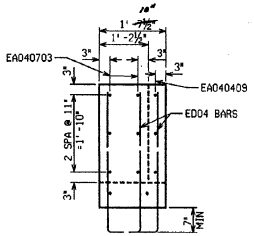
*TRANSITION CURB FACE FROM SLOPED TO VERTICAL



ELEVATION SOUTH RETURN WALL ABUTMENT A



ELEVATION



SECTION B-B

DETAILS OF CONCRETE END BLOCK

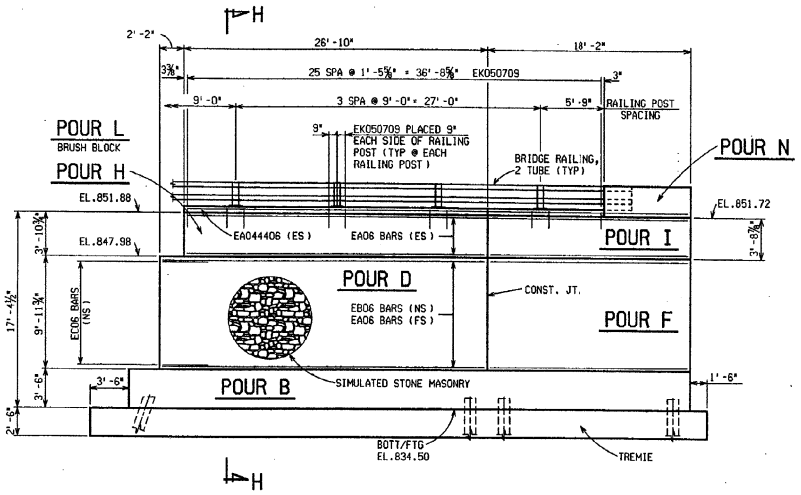
REVISIONS			
NO.	DESCRIPTION	DATE	BY

MDOT Michigan Department of Transportation

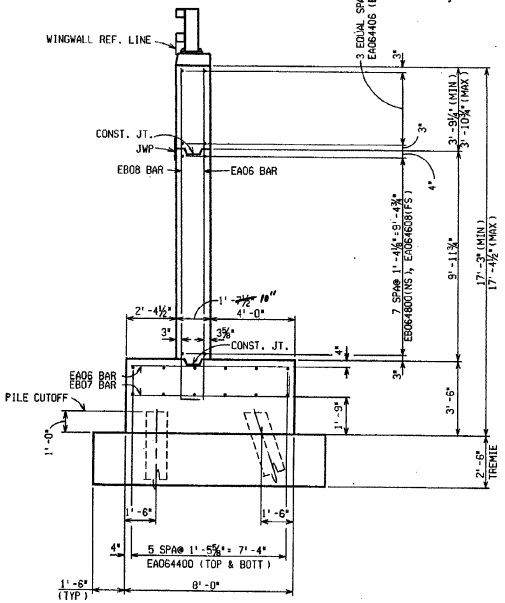
ABUTMENT DETAILS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	13 OF 23

FILE NAME: b01 62015ab.dgn DRAWN BY: R.K.OLIN CHECKED BY: DATE: 09/04 DATE: CORRECTED BY: R.K.OLIN DATE: 5-23-05



ELEVATION NORTH RETURN WALL
ABUTMENT A



SECTION H-H

REVISIONS			
NO.	DESCRIPTION	DATE	BY

MDOT Michigan Department of Transportation

ABUTMENT DETAILS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	14 OF 29

DRAWN BY: R.K.OLIN DATE: 09/04 CHECKED BY: DATE: CORRECTED BY: R.K.OLIN DATE: 6-23-05

FILE NAME: b01 62015ab.dgn

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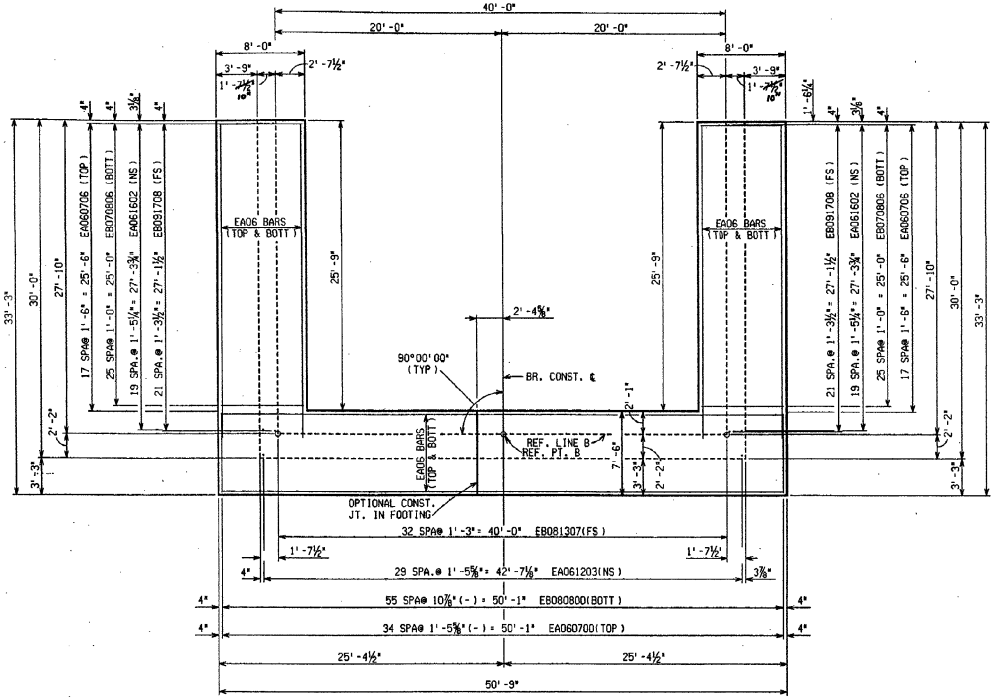
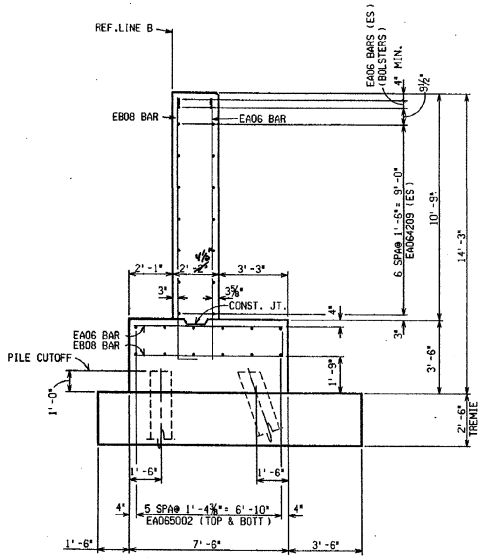


PLAN OF FOOTING-ABUTMENT B

NOTE: VERTICAL STEEL SPACING WILL BE ADJUSTED AT CONSTRUCTION JOINTS TO PROVIDE A 3" MINIMUM CLEARANCE.



SECTION THRU ABUTMENT B

REVISIONS			
NO.	DESCRIPTION	DATE	BY

MDOT Michigan Department of Transportation

ABUTMENT DETAILS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	15 OF 29

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DATE:
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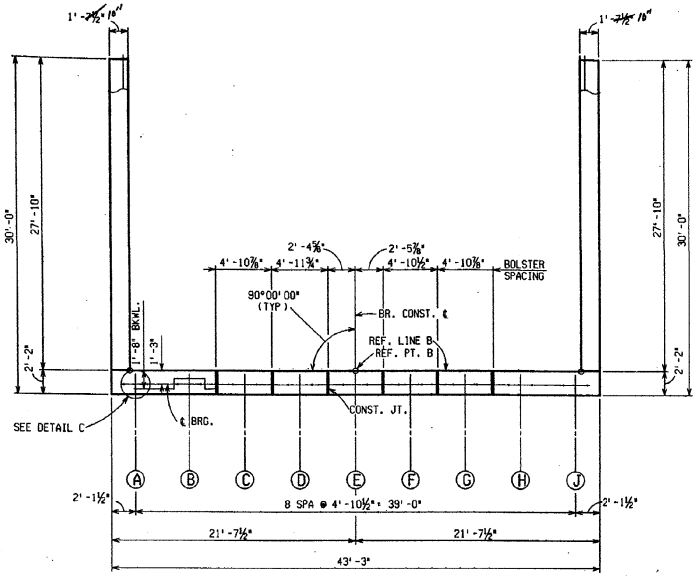
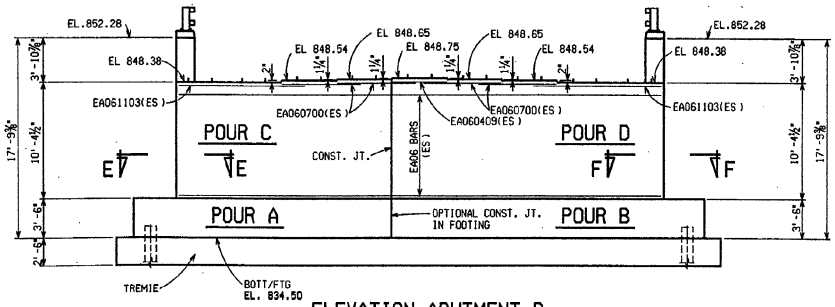
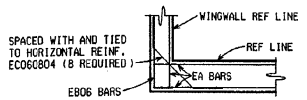
DRAWN BY: R.K.OLIN
FILE NAME: b01 62015ab.dgn



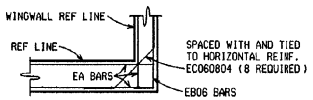
PLAN OF WALL-ABUTMENT B



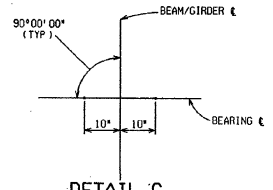
ELEVATION-ABUTMENT B



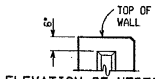
SECTION E-E



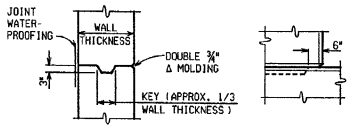
SECTION F-F



DETAIL C



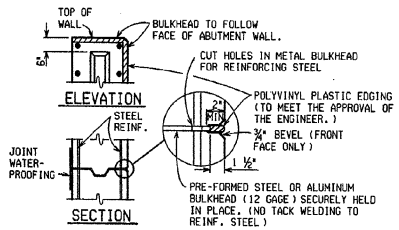
ELEVATION OF VERTICAL JOINT



SECTION ELEV. OF HORIZ. JOINT

CONSTRUCTION JOINT DETAILS

NOTE: WHERE OPTIONAL CONSTRUCTION JOINTS ARE USED, THERE WILL BE NO PAYMENT FOR THE REQUIRED JOINT WATERPROOFING.



METAL BULKHEAD DETAILS

NOTES: METAL BULKHEAD MAY BE USED AS ALTERNATE CONSTRUCTION JOINT AT CONTRACTOR'S EXPENSE. CARE IS TO BE USED IN CASTING CONCRETE TO PREVENT DISLOCATION OR MISALIGNMENT OF THE BULKHEAD.

REVISIONS			
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MDOT Michigan Department of Transportation

ABUTMENT DETAILS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	16 OF 29

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

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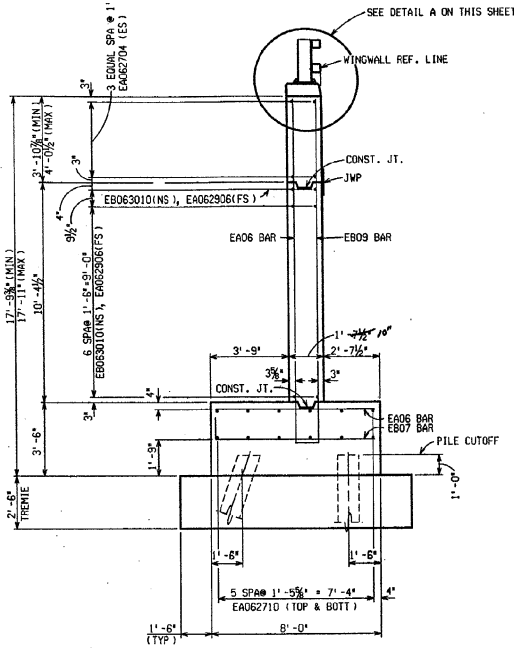
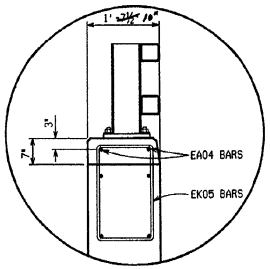
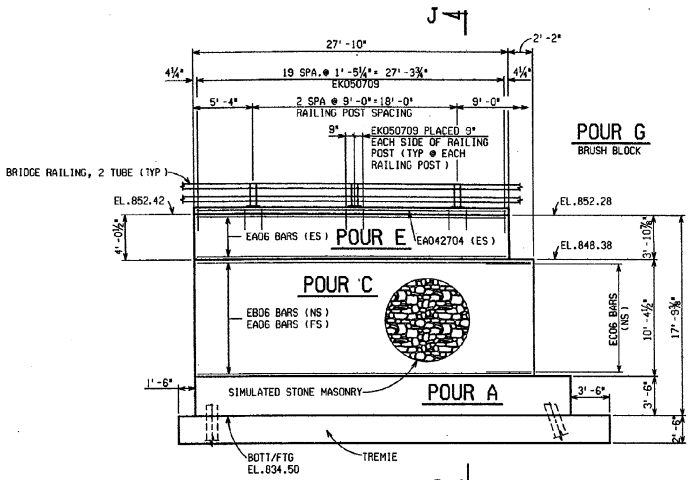


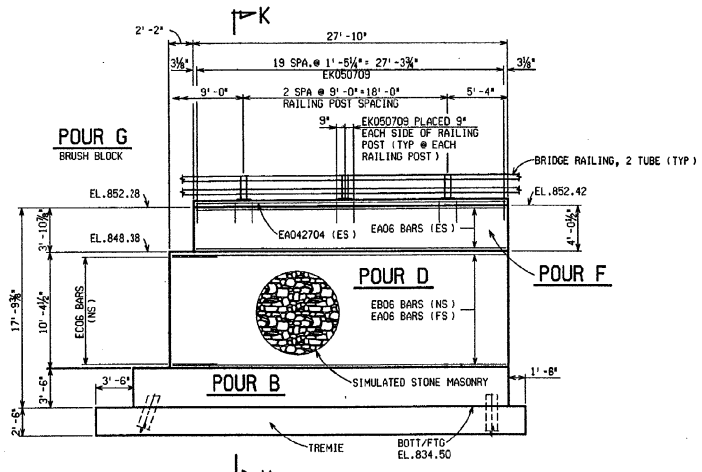
SECTION J-J



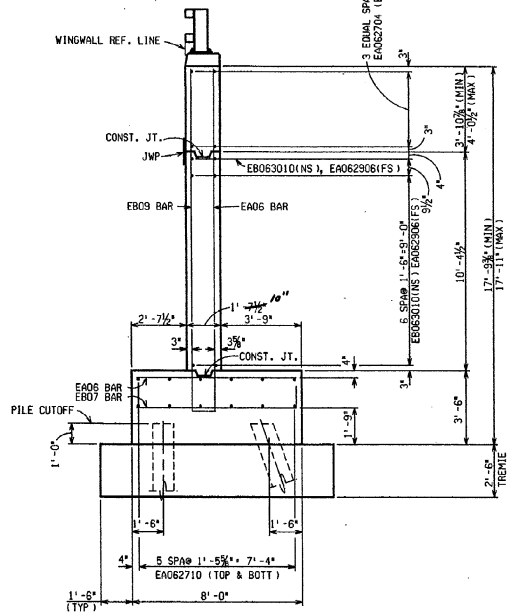
DETAIL A



ELEVATION NORTH RETURN WALL
ABUTMENT B



ELEVATION SOUTH RETURN WALL
ABUTMENT B



SECTION K-K

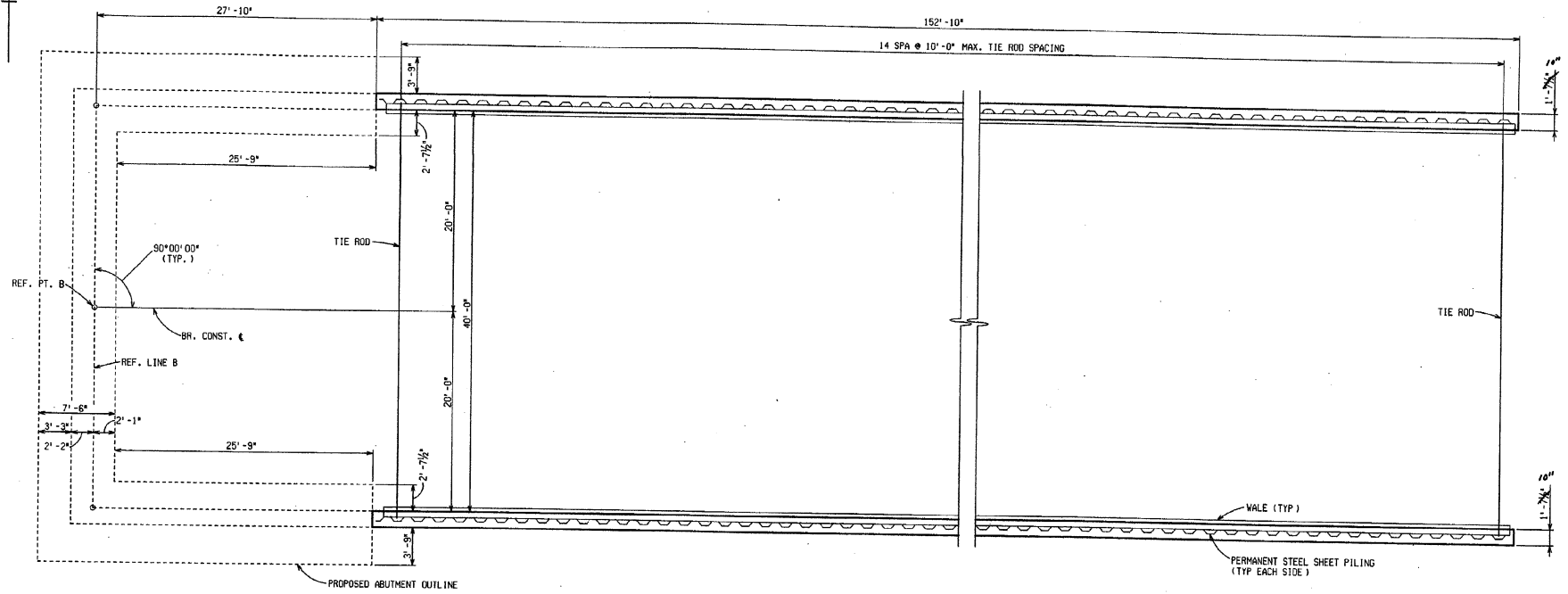
REVISIONS			
NO.	DESCRIPTION	DATE	BY

MDOT Michigan Department of Transportation

ABUTMENT DETAILS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	17 OF 291

DATE: 5-23-05
CORRECTED BY: R.K.OLIN
DATE:
CHECKED BY:
DATE: 09/04
DRAWN BY: R.K.OLIN
FILE NAME: b01 62015sb.dgn



PLAN OF RETAINING WALL

MISCELLANEOUS QUANTITIES	
9170 Sft	Steel Sheet Piling, Permanent
177 Cyd	Substructure Conc
114 Cyd	Conc, Grade T
1 LS	Shear Developers (B01-62015)

SUBSTRUCTURE CONCRETE QUANTITIES	
POUR	RETAINING WALL
A	82.0
B	1.4
C	5.1
D	82.0
E	1.4
F	5.1
GRAND TOTAL	177 CU YDS

NOTES:

THE SUBSTRUCTURE EXCAVATION AND CONCRETE QUANTITIES TAKE INTO CONSIDERATION THE ADDITIONAL CONCRETE AND EXCAVATION NECESSARY TO EXCAYATE AND POUR TO THE PERMANENT STEEL SHEET PILING.

ALL PERMANENT STEEL SHEET PILING SHALL BE ASTM A-328, PZ-22. WHERE ALLOWED BY THE ENGINEER, SELECT ALTERNATE HOT ROLLED SHEET PILING WITH A NOMINAL SECTION MODULUS OF AT LEAST 18.1 CUBIC INCHES PER FOOT OF WALL OR COLD ROLLED SHEET PILING WITH A NOMINAL SECTION MODULUS OF AT LEAST 26.8 CUBIC INCHES PER FOOT OF WALL.

THE EXPOSED FACES OF THE RETAINING WALLS SHALL HAVE SPECIAL ARCHITECTURAL TREATMENT ACCORDING TO SUBSECTION 706.03 OF THE STANDARD SPECIFICATIONS.

ALL WALERS, TIE RODS, CONNECTION APPARATUS, LABOR AND OTHER MATERIALS REQUIRED FOR CONSTRUCTION OF THE PERMANENT STEEL SHEET PILING WITH TIE RODS WILL NOT BE PAID FOR SEPARATELY, BUT INCLUDED IN THE PAYMENT FOR "Steel Sheet Piling, Permanent".

TIE RODS SHALL BE PLACED AND TENSIONED BEFORE CASTING THE CONCRETE FACING.

MUCKING SHALL BE COMPLETED PRIOR TO PLACEMENT OF TIE RODS.

MDOT Michigan Department of Transportation

RETAINING WALL DETAILS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	18 OF 29

REVISIONS

NO.	DESCRIPTION	DATE	BY

DATE: 5-23-05 CORRECTED BY: R.K.OLIN DATE: 12-9-04 CHECKED BY: AM DATE: 09/04 DRAWN BY: R.K.OLIN FILE NAME: b01 62015w1.dgn

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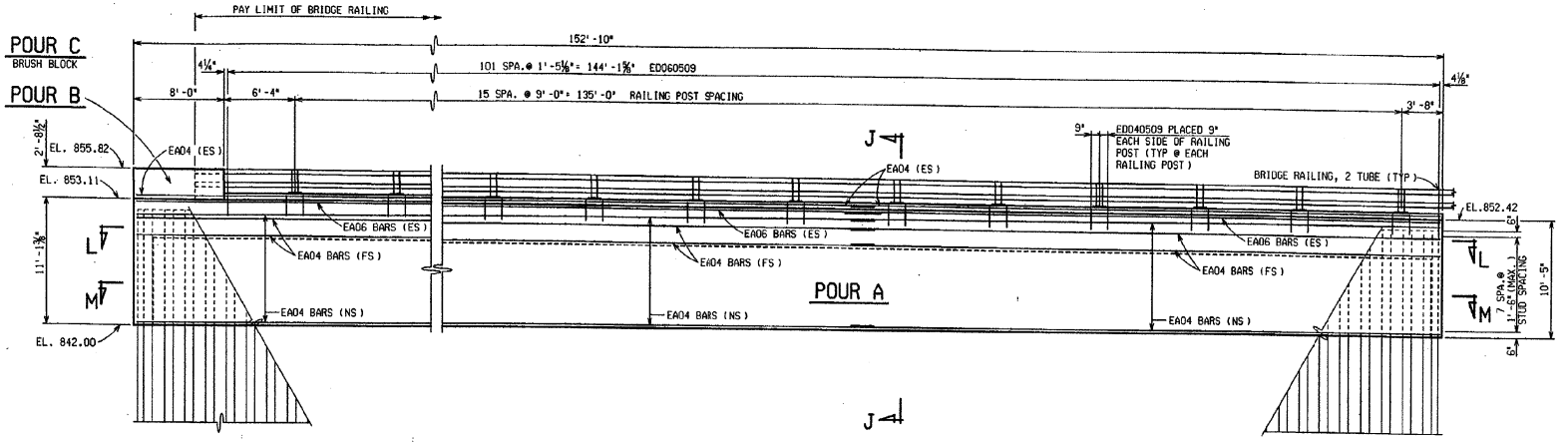
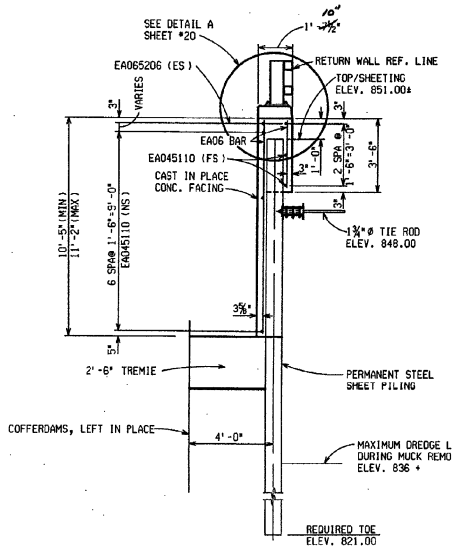
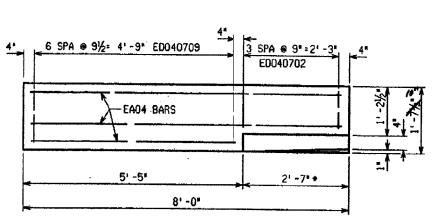


ELEVATION NORTH RETAINING WALL
ABUTMENT B

MIN. LAP TABLE	
EA04	1'-7"
EA06	2'-6"

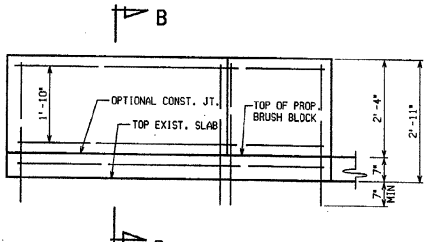


SECTION J-J

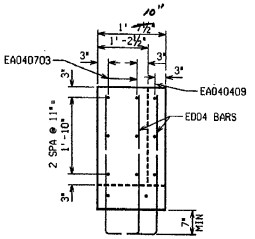


PLAN

*TRANSITION CURB FACE FROM SLOPED TO VERTICAL



ELEVATION

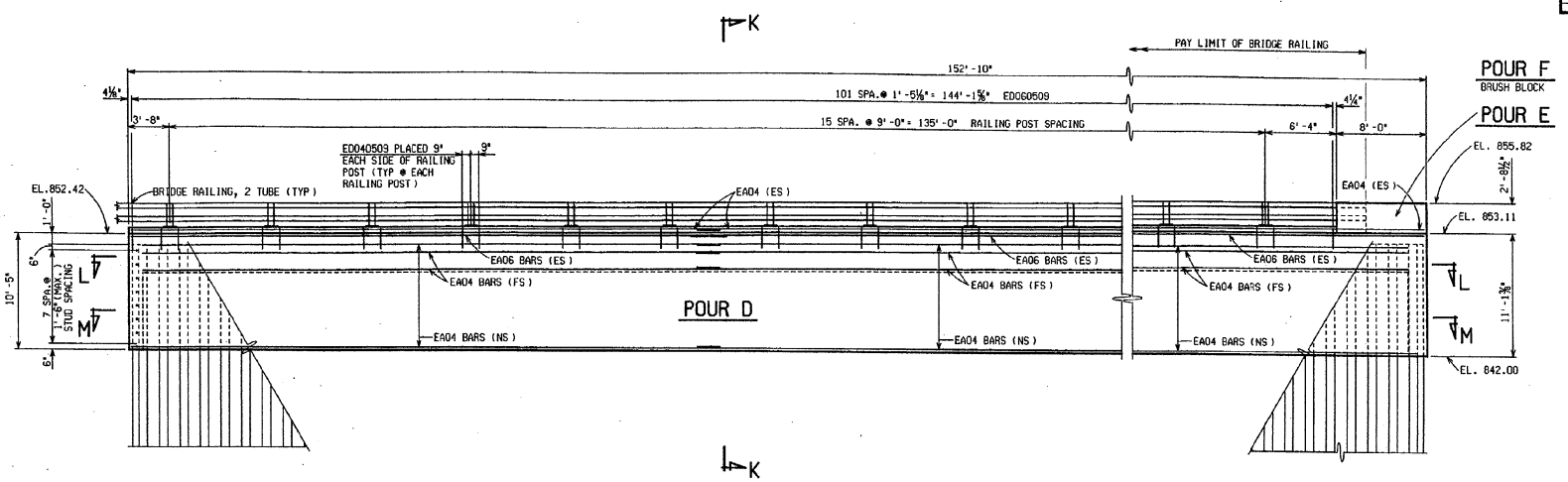


SECTION B-B

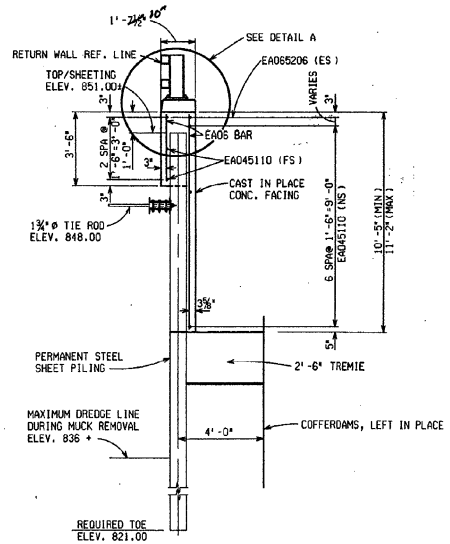
DETAILS OF CONCRETE END BLOCK

MDOT Michigan Department of Transportation	RETAINING WALL DETAILS				
	DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
	7-15-05	B01 OF 62015	60572A	MAHDAVI	19 OF 29

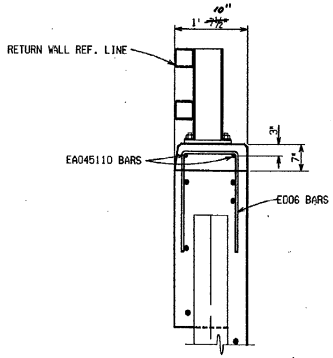
FILE NAME: b01 62015wl.dgn DRAWN BY: R.K.OLIN DATE: 09/04 CHECKED BY: AM DATE: 12-9-04 CORRECTED BY:R.K.OLIN DATE: 5-23-05



ELEVATION SOUTH RETAINING WALL ABUTMENT B



SECTION K-K



DETAIL A

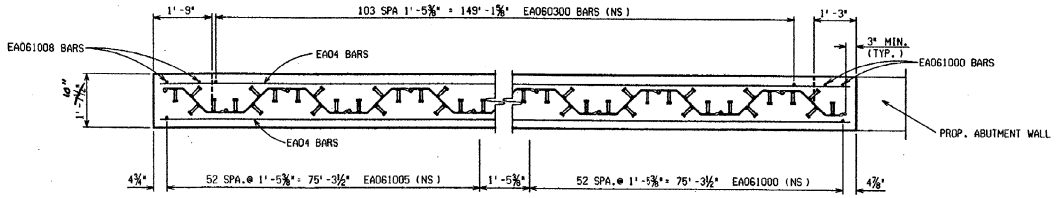
REVISIONS			
NO.	DESCRIPTION	DATE	BY

MDOT Michigan Department of Transportation

RETAINING WALL DETAILS

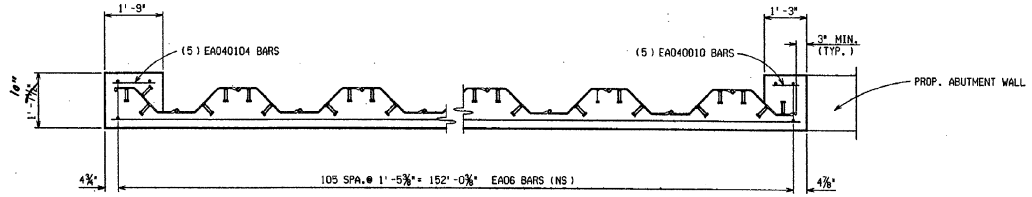
DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	20 OF 29

DATE: 5-23-05
DATE: 12-9-04 CORRECTED BY:R.K.OLIN
DATE: 09/04 CHECKED BY: AM
DRAWN BY: R.K.OLIN
FILE NAME: b01 62015d1.dgn



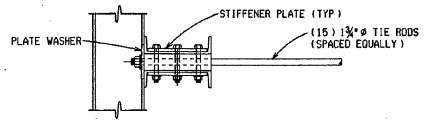
SECTION L-L

PLACEMENT OF TOP TWO ROWS OF STUDS

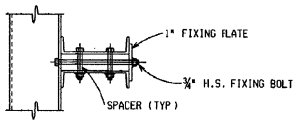


SECTION M-M

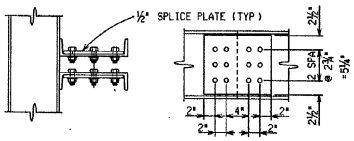
PLACEMENT OF BOTTOM SIX ROWS OF STUDS



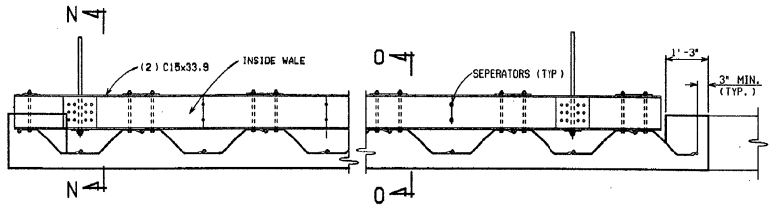
SECTION N-N



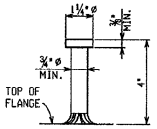
SECTION O-O



SPLICE DETAILS



TYPICAL WALE AND ANCHOR ROD DETAILS



STUD SHEAR DEVELOPER DETAILS

REVISIONS			
NO.	DESCRIPTION	DATE	BY

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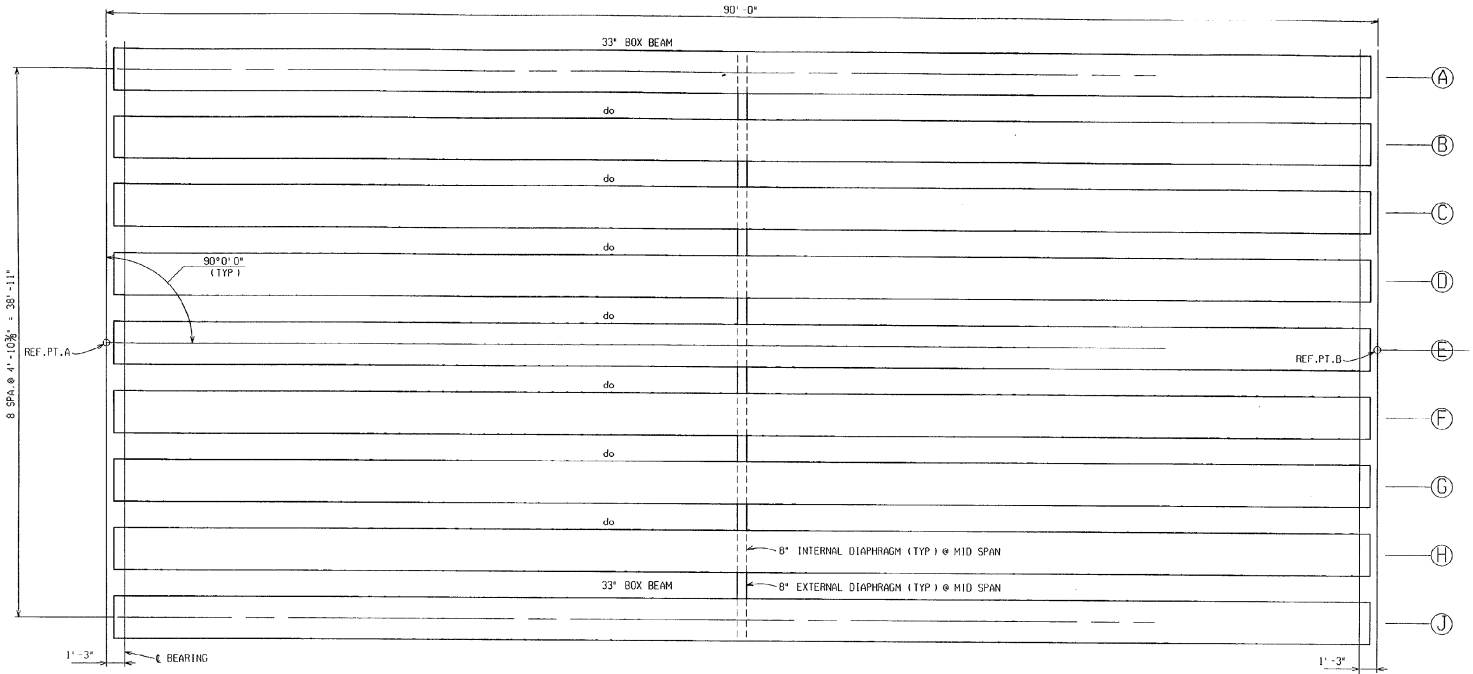
RETAINING WALL DETAILS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	21 OF 291

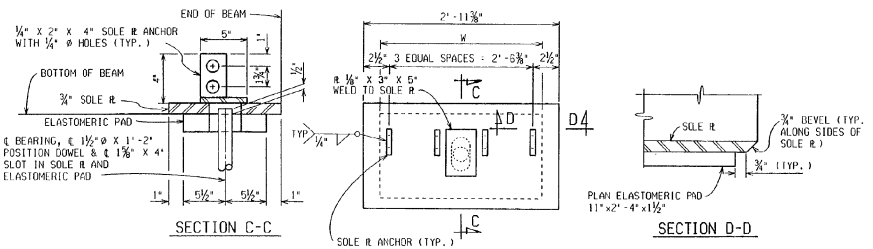
DRAWN BY: R.K.OLIN DATE: 09/04 CHECKED BY: AM DATE: 12-9-04 CORRECTED BY: R.K.OLIN DATE: 5-23-05

FILE NAME: b01 62015sl.dgn



ERECTION DIAGRAM

SPAN	REQUIRED CONCRETE COMPRESSIVE STRENGTH (PSI)		CAMBER AT MIDPOINT (IN.)	WEIGHT (TONS)
	28 DAYS	AT RELEASE		
1	6500	6000	--	--



BEARING DETAILS

MISCELLANEOUS QUANTITIES

801 Ft	Prest Conc Box Beam, Furn, 33 Inch
801 Ft	Prest Conc Box Beam, Erect, 33 Inch
52 Sft	Bearing, Elastomeric, 1½inch

NOTES:

PRESTRESSING STRANDS SHALL BE GIVEN AN INITIAL PRESTRESS AS FOLLOWS: 0.6" DIA. - 44,000 LBS PRESTRESS

CONCRETE INSERTS SHALL BE ¾" DIAMETER; RICHMOND, TYPE T2 OR TYPE TL2F; DAYTON SUPERIOR, TYPE B-1 HEAVY OR TYPE B-18; WILLIAMS, TYPE C 12 OR TYPE C -19; MEADOW STEEL, TYPE CT-2 OR TYPE CX-4; OR EQUAL. INSERTS SHALL BE CAST WITH THE BEAMS. FIELD INSTALLATION OF INSERTS IS NOT ALLOWED.

TOTAL ESTIMATED CHANGE OF LENGTH OF BOTTOM FLANGE AT TRANSFER OF PRESTRESS FORCE IS ¾".

THE ESTIMATED BEAM CAMBER AT RELEASE IS 2½". THIS CAMBER IS DUE TO PRESTRESS AND DEAD LOAD OF THE BEAM ONLY AND IS MEASURED IN THE ERECTED POSITION.

THREADING OF REINFORCEMENT AND INSTALLATION INTO CONCRETE INSERTS IS INCLUDED IN THE BID ITEM "Prest Conc Box Beam, Furn, 33 inch".

LIFTING DEVICES SHALL BE REMOVED AFTER BEAMS ARE ERECTED. REMOVAL IS INCLUDED IN THE BID ITEM "Prest Conc Box Beam, Erect, 33 inch".

POSITION DOWELS SHALL BE HOT-DIP GALVANIZED ACCORDING TO AASHTO M 232. POSITION DOWELS ARE INCLUDED IN PAYMENT FOR PRESTRESSED CONCRETE BEAMS.

PRESTRESSING STRAND SHALL BE 0.6" NOMINAL DIAMETER MEETING THE REQUIREMENTS OF AASHTO M203 (ASTM A416), GRADE 270, LOW RELAXATION STRAND.

REVISIONS

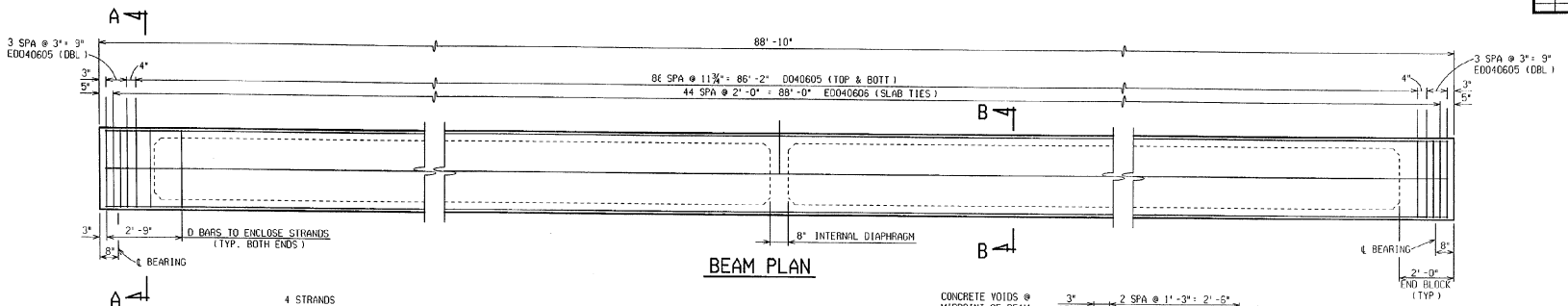
NO.	DESCRIPTION	DATE	BY

MDOT Michigan Department of Transportation

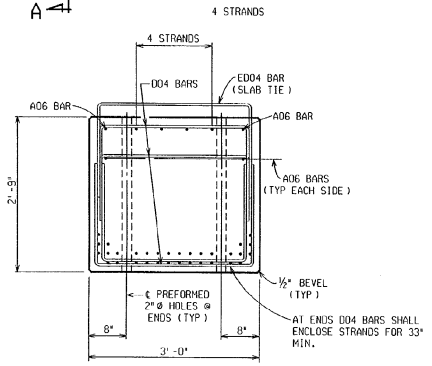
33" BOX BEAM DETAILS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	22 OF 29

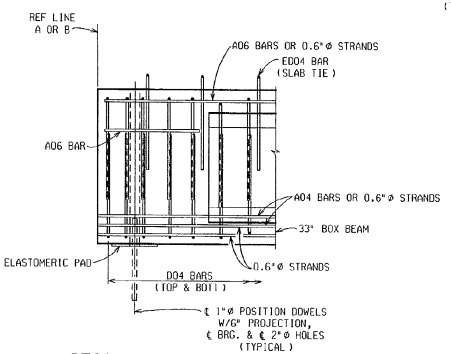
DATE: 5-23-05 CORRECTED BY: R.K.OLSEN DATE: DATE: 09/04 CHECKED BY: DRAWN BY: R.K.OLSEN FILE NAME: b01b0150sb.dgn



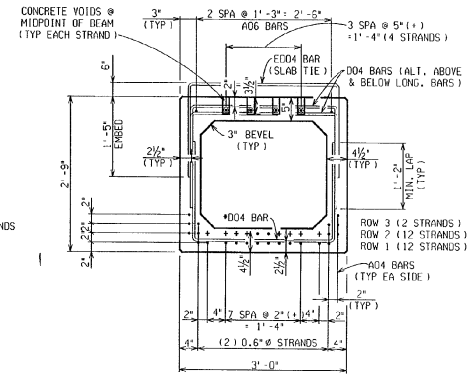
BEAM PLAN



SECTION A-A



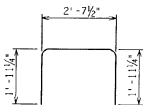
SECTION THRU END BLOCK



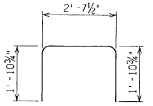
SECTION B-B

* AT CENTER D04 BARS MAY BE PLACED UNDER STRANDS

+ DEBOND 2 STRANDS FOR 21'-0" (EACH END)
+ DEBOND 2 STRANDS FOR 13'-0" (EACH END)
+ DEBOND 4 STRANDS FOR 6'-6" (EACH END)
* DEBOND 4 STRANDS FOR 44'-5" (CENTER)
& CUT AT CENTER



ED040606
SLAB TIES



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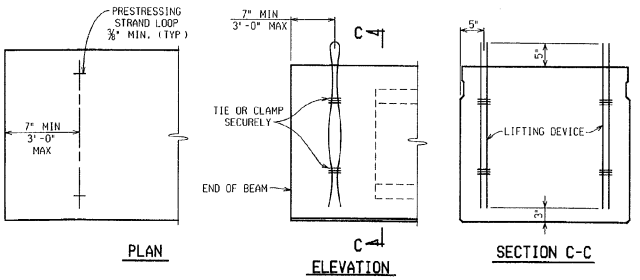
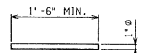
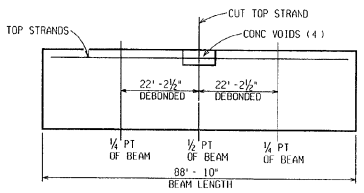


DETAILS OF LIFTING DEVICE

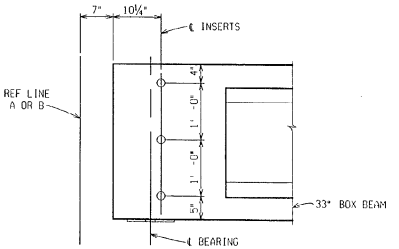
NOTE: LIFTING OF BEAM SHALL BE BY EQUAL LOADS TO EACH PAIR OF LIFTING DEVICES. OTHER TYPES OF LIFTING DEVICES MAY BE USED SUBJECT TO APPROVAL BY THE MICHIGAN DEPARTMENT OF TRANSPORTATION.



POSITION
DOWEL DETAIL
(36 REQUIRED)
NOT PAID FOR SEPARATELY
BUT INCLUDED IN PAYMENT FOR
"Prest Conc Box Beam, Furn, 33 inch"



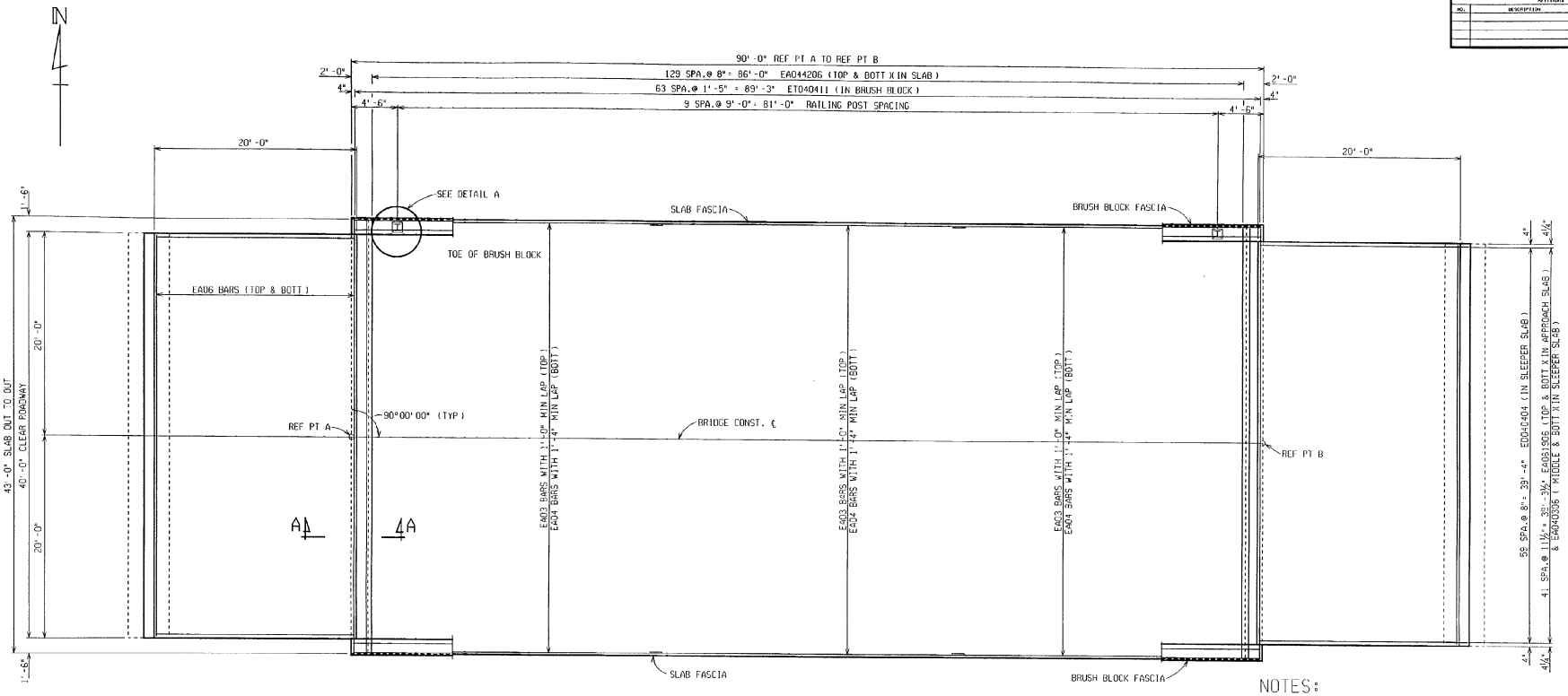
CUT DETAIL FOR TOP STRANDS



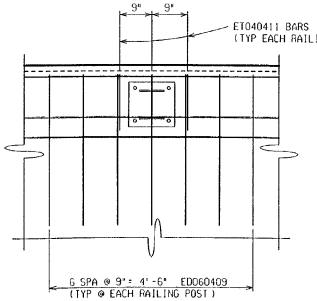
THREADED INSERT LOCATION

MDOT Michigan Department of Transportation	33" BOX BEAM DETAILS				
	DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
	7-15-05	B01 OF 62015	60572A	MAHDAVI	23 OF 29

DRAWN BY: R.K.OLIN DATE: 09/04 CHECKED BY: DATE: CORRECTED BY: R.K.OLIN DATE: 8-31-05
FILE NAME: b01601.dgn



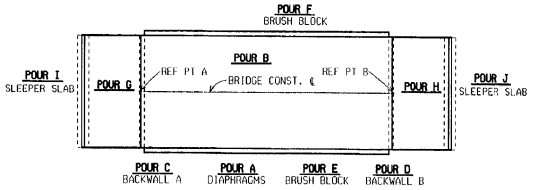
PLAN OF DECK



DETAIL A

MISCELLANEOUS QUANTITIES

184 Cyd	Superstructure Conc, Night Casting
1 LS	Superstructure Conc, Form, Finish, and Cure, Night Casting (B01-62015)
598 Ft	Bridge Railing, 2 Tube
38 Cyd	Superstructure Conc
1 LS	Superstructure Conc, Form, Finish, and Cure (B01-62015)
1 LS	Bridge Ltg, Furn and Rem (B01-62015)
184 Cyd	Bridge Ltg, Oper and Maintain



POUR DIAGRAM

NOTES:

LOW TEMPERATURE PROTECTION OF CONCRETE SHALL BE APPLIED ACCORDING TO SECTION 706.03 J. OF THE STANDARD SPECIFICATIONS FOR CONSTRUCTION. LOW TEMPERATURE PROTECTION OF CONCRETE WILL NOT BE PAID FOR SEPARATELY, BUT WILL BE INCLUDED IN THE BID ITEM "Superstructure Conc" & "Superstructure Conc, Night Casting".

DO NOT POUR DECK CONCRETE UNTIL DIAPHRAGM CONCRETE ATTAINS A COMPRESSIVE STRENGTH OF 3,000 PSI.

THE CONTRACTOR MAY USE METAL STAY IN PLACE FORMS. IF USED, THE CONTRACTOR MAY OMIT THE POLYSTYRENE FROM THE CORRUGATIONS AND FILL THE FORMS FULL DEPTH. THE EXTRA CONCRETE REQUIRED TO FILL THE CORRUGATIONS WILL NOT BE PAID FOR.

JWP DENOTES JOINT WATERPROOFING.

HPJS DENOTES HOT-POURED JOINT SEALANT.

FOR BRIDGE RAILING, ANCHORAGE FOR GUARDRAIL AND NAME PLATE MOUNTING DETAILS, SEE STANDARD PLAN B-21-SERIES. BARRIER RAILING IS TO BE BRIDGE RAILING, 2 TUBE. FOR DETAILS OF NAME PLATES, MOLDINGS AND BEVELS, SEE STANDARD PLAN B-103-SERIES.

FOR NAME PLATE LOCATION, SEE GENERAL PLAN OF STRUCTURE SHEET.

"EDGE" OR "GROOVE" DENOTES EDGING OR GROOVING WITH AN APPROVED TOOL.

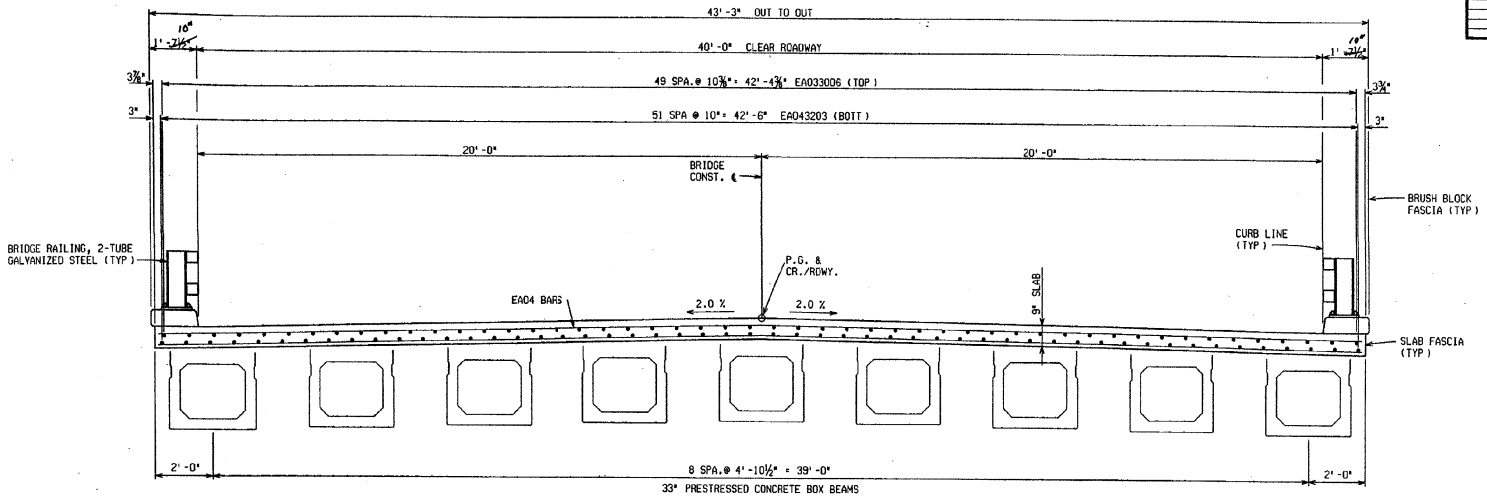
MDOT Michigan Department of Transportation

SUPERSTRUCTURE DETAILS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	24 OF 29

DRAWN BY: R.K.OLIN DATE: 10-04 CHECKED BY: DATE: CORRECTED BY: R.K.OLIN DATE: 5-23-05

FILE NAME: b062015sk.dgn

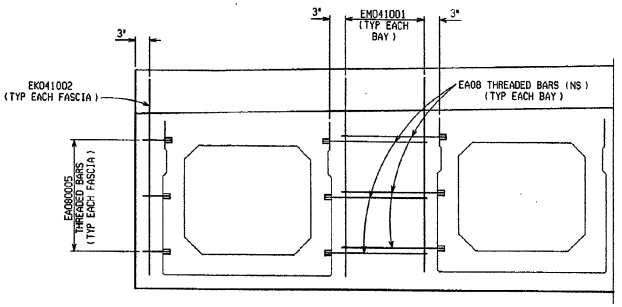


TYPICAL DECK SECTION

(LOOKING UP STATION)

SUPERSTRUCTURE CONCRETE NIGHT CASTING QUANTITIES	
POUR	AMT (CYDS)
B	129.4
G	27.3
H	27.3
TOTAL CONC.= 184.0 CYDS	

SUPERSTRUCTURE CONCRETE QUANTITIES	
POUR	AMT (CYDS)
A	1.1
C	7.5
D	7.5
E	3.15
F	3.15
I	7.8
J	7.8
TOTAL CONC.= 38.0 CYDS	



TYPICAL BACKWALL ELEVATION

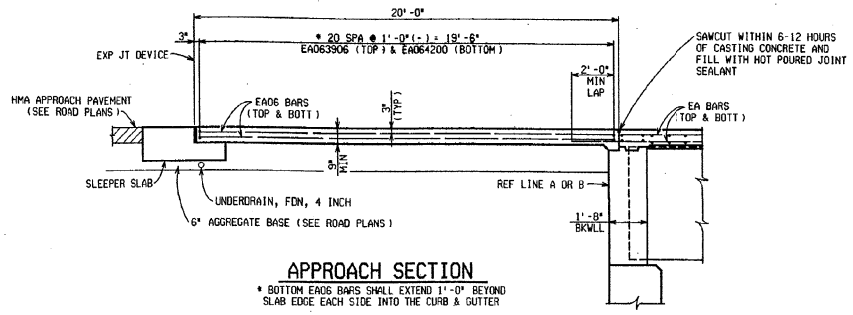
REVISIONS			
NO.	DESCRIPTION	DATE	BY

DATE: 5-23-05
CORRECTED BY: R.K.OLIN
DATE:
DATE: 10-04
CHECKED BY:
DRAWN BY: R.K.OLIN
FILE NAME: b0162015dk.dgn

MDOT Michigan Department of Transportation

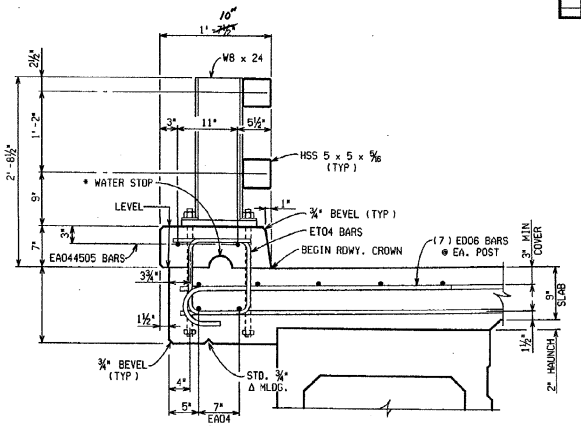
SUPERSTRUCTURE DETAILS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	25 OF 28



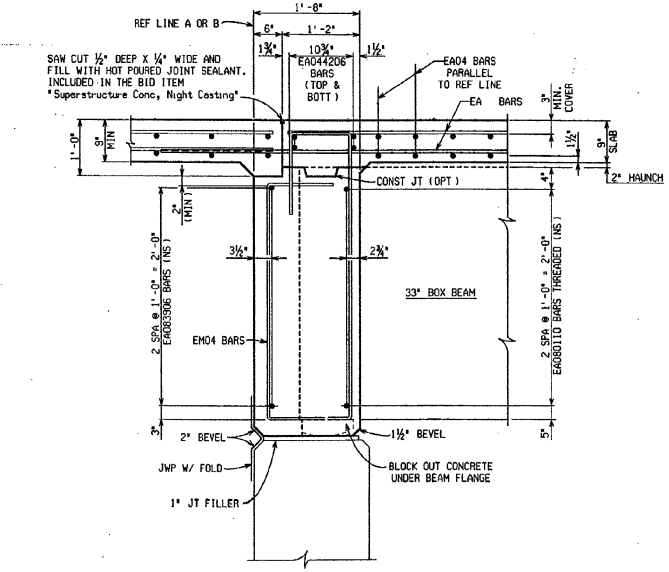
APPROACH SECTION

* BOTTOM EA06 BARS SHALL EXTEND 1'-0" BEYOND SLAB EDGE EACH SIDE INTO THE CURB & GUTTER



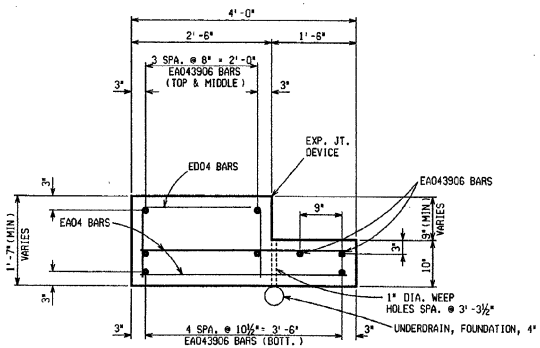
TYPICAL RAILING SECTION

* 2" HIGH x 4" LONG (±), FORMING NOT REQUIRED



SECTION A-A

IF A CONSTRUCTION JOINT IS USED, CAST THE LOWER PORTION OF THE BACKWALL PRIOR TO PLACING DECK REINFORCEMENT. THERE WILL BE NO PAYMENT FOR THE REQUIRED JOINT WATERPROOFING.

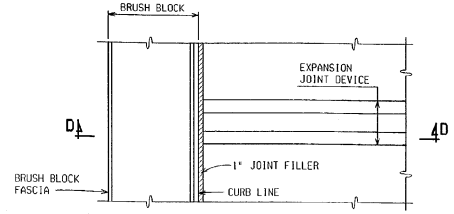


TYPICAL SECTION THRU SLEEPER SLAB

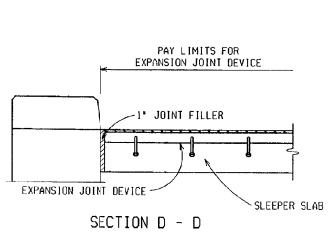
REVISIONS			
NO.	DESCRIPTION	DATE	BY

MDOT Michigan Department of Transportation	SUPERSTRUCTURE DETAILS				
	DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
	7-15-05	B01 OF 62015	60572A	MAHDAVI	26 OF 29

DATE: 5-23-05
DATE: 12-10-04 CORRECTED BY: R.K.OLIN
DATE: 10-04 CHECKED BY: AM
DRAWN BY: R.K.OLIN
FILE NAME: b01620154k.dgn



PLAN AT 2 TUBE & 4 TUBE (BICYCLE) STEEL RAILING



SECTION D - D

BRUSH BLOCK TREATMENT

REVISIONS

NO.	DESCRIPTION	DATE	BY

NOTES:

JOINT TYPES

THE EXPANSION JOINT DEVICE SHALL BE OF A TYPE THAT INCLUDES A CONTINUOUS NEOPRENE (OR EQUIVALENT) SEAL ACROSS THE DECK. UNLESS OTHERWISE NOTED ON THE PLANS, THE CONTRACTOR HAS THE OPTION OF USING ANY OF THE DEVICES LISTED BELOW:

DEVICE	MANUFACTURER
WABO STRIP SEAL - TYPE M	WATSON-BOWMAN & ACME, INC.
WABO STRIP SEAL - TYPE A	WATSON-BOWMAN & ACME, INC.
STEELFLEX-SSA2	D.S. BROWN
STEELFLEX-SSCM	D.S. BROWN
ONFLEX 40 SS	STRUCTURAL RUBBER PRODUCTS CO.

THE MODEL OF THE JOINT TYPE SELECTED SHALL BE SUITABLE TO ACCOMMODATE THE TOTAL MOVEMENT NOTED ON THE PLANS.

COMPLETE WORKING DRAWINGS OF ALL DETAILS OF FABRICATION OF THE EXPANSION JOINT DEVICE SHALL BE SUBMITTED FOR REVIEW IN ACCORDANCE WITH STANDARD SPECIFICATION 104.02. THIS REQUIREMENT IS WAIVED FOR EXPANSION JOINT DEVICES FOR WHICH A SET OF STANDARD INSTALLATION DETAILS HAS BEEN APPROVED. STANDARD INSTALLATION DETAILS CAN BE OBTAINED FROM THE DESIGN SUPPORT AREA.

FABRICATION AND INSTALLATION

THE EXPANSION JOINT SHALL BE SHOP FABRICATED TO CONFORM TO THE CONTOUR OF THE BRIDGE DECK, BARRIERS, ETC. IT SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS SUBJECT TO NOTES HEREIN AND THE APPROVAL OF THE ENGINEER.

THE TOP OF THE EXPANSION JOINT DEVICE SHALL BE SET ⅛" - ¼" BELOW THE CONCRETE SLAB (PAVEMENT) WITH A TOLERANCE OF ± ⅛".

THE STEEL ANCHORAGE FOR STRIP SEAL GLANDS SHALL BE HOT DIP GALVANIZED IN ACCORDANCE WITH SUBSECTION 707.03C.16 OF THE STANDARD SPECIFICATIONS.

THE AREA OF THE STEEL ANCHORAGE AND SEALING GLAND WHICH WILL BE IN CONTACT WITH A SEALANT, OR LUBRICANT-ADHESIVE SHALL BE CLEANED WITH TOLUENE OR OTHER APPROVED SOLVENT.

WHERE THE SEALING GLAND IS LOCKED INTO A STEEL ANCHORAGE, A LUBRICANT-ADHESIVE CONFORMING TO STANDARD SPECIFICATION 914.04D SHALL BE REQUIRED BETWEEN THE SEAL AND STEEL ANCHORAGE.

IN THE EVENT THAT SPLICING IS REQUIRED OF THE SEALING GLAND, IT SHALL BE SPLICED BY AN APPROVED METHOD (SUCH AS COLD VULCANIZATION) BY A TRAINED REPRESENTATIVE OF THE MANUFACTURER.

DETAILS AT CURBS OR BARRIERS

THE DETAILS ON THIS SHEET SHOW AN APPROVED MEANS OF TERMINATING THE EXPANSION JOINT DEVICE AT CURBS OR BARRIERS. VARIATIONS OR ALTERNATIVE SCHEMES WILL BE CONSIDERED AND MAY BE USED IF APPROVED BY THE ENGINEER.

MATERIALS

THE COST OF ALL MATERIALS AND LABOR REQUIRED FOR PROPER INSTALLATION OF THE EXPANSION JOINT AND THE TERMINAL ASSEMBLIES AT THE CURBS, SIDEWALKS, OR BARRIERS IS INCLUDED IN THE PAYMENT FOR THE EXPANSION JOINT DEVICE.

STRUCTURE NUMBER	ANGLE OF CROSSING TO NEAREST 10°	LOCATION OF JOINT	MIN. TOT. TRAVEL ALONG CENTERLINE OF BRIDGE	REQUIRED LENGTH OF EXPANSION JOINT DEVICE
B01-62015	90°	SLEEPER		40'
B01-62015	90°	SLEEPER		40'

QUANTITY		
ITEM	UNIT	AMOUNT
Expansion Joint Device	Ft	80

MDOT Michigan Department of Transportation

EXPANSION JOINT DETAILS
EJ3X (04/28/2004)

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	27 OF 29

DATE:
CORRECTED BY:
DATE:
CHECKED BY:
DATE: 12-04
DRAWN BY: R.K.OLIN
FILE NAME: b01623.5a.dgn

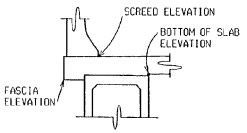
BOTTOM OF SLAB ELEVATIONS

REF.A — SPAN 1 — REF.B

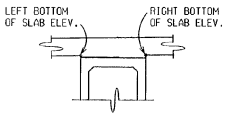
		0	1	2	3	4	5	6	7	8
A	FASCIA	850.82	850.98	851.12	851.23	851.30	851.33	851.32	851.27	851.21
	RIGHT	851.18	851.34	851.48	851.59	851.66	851.69	851.68	851.64	851.57
B	LEFT	851.21	851.37	851.51	851.62	851.69	851.72	851.71	851.66	851.60
	RIGHT	851.28	851.44	851.58	851.69	851.76	851.79	851.78	851.73	851.67
C	LEFT	851.31	851.47	851.61	851.72	851.79	851.82	851.80	851.76	851.70
	RIGHT	851.38	851.54	851.68	851.79	851.86	851.89	851.87	851.83	851.77
D	LEFT	851.40	851.56	851.71	851.82	851.89	851.91	851.90	851.86	851.80
	RIGHT	851.47	851.63	851.78	851.89	851.96	851.98	851.97	851.93	851.87
E	LEFT	851.50	851.66	851.80	851.91	851.98	852.01	852.00	851.96	851.89
	RIGHT	851.50	851.66	851.80	851.91	851.98	852.01	852.00	851.96	851.89
F	LEFT	851.47	851.63	851.78	851.89	851.96	851.98	851.97	851.93	851.87
	RIGHT	851.40	851.56	851.71	851.82	851.89	851.91	851.90	851.86	851.80
G	LEFT	851.38	851.54	851.68	851.79	851.86	851.89	851.87	851.83	851.77
	RIGHT	851.31	851.47	851.61	851.72	851.79	851.82	851.80	851.76	851.70
H	LEFT	851.28	851.44	851.58	851.69	851.76	851.79	851.78	851.73	851.67
	RIGHT	851.21	851.37	851.51	851.62	851.69	851.72	851.71	851.66	851.60
J	LEFT	851.18	851.34	851.48	851.59	851.66	851.69	851.68	851.64	851.57
	FASCIA	850.82	850.98	851.12	851.23	851.30	851.33	851.32	851.27	851.21

SCREED ELEVATIONS

LEFT	851.89	852.03	852.17	852.27	852.34	852.37	852.36	852.33	852.28
CENTER	852.29	852.43	852.57	852.67	852.74	852.77	852.76	852.73	852.68
RIGHT	851.89	852.03	852.17	852.27	852.34	852.37	852.36	852.33	852.28



TYPICAL FASCIA SECTION



TYPICAL INTERIOR SECTION

(LOOKING UP STATION)

BULKHEAD ELEVATIONS

	ABUT.A	ABUT.B
A	851.89	852.29
B	851.99	852.39
C	852.09	852.49
D	852.19	852.58
E	852.28	852.68
F	852.19	852.58
G	852.09	852.49
H	851.99	852.39
J	851.89	852.29

NOTES:

BOTTOM OF SLAB ELEVATIONS ARE AT RIGHT ANGLES TO THE BEAM CENTERLINE AND ARE BASED ON THE CONDITION THAT THE BEAMS AND DIAPHRAGMS ARE COMPLETELY ERECTED WITH NO OTHER LOADS APPLIED. THESE ELEVATIONS INCLUDE ALLOWANCE FOR VERTICAL CURVE AND DEFLECTION DUE TO FORMS, STEEL REINFORCEMENT, CONCRETE SLAB, RAILING AND UTILITIES.

SCREED ELEVATIONS ARE BASED ON THE CONDITION THAT NO SLAB CONCRETE HAS BEEN CAST AND THAT FORMWORK AND STEEL REINFORCEMENT ARE IN PLACE AND THE TEMPORARY SUPPORTS ARE BROUGHT TO A SNUG FIT UNDER EACH BEAM.

SCREED RAILS FOR FINISHING OF STRUCTURAL CONCRETE SHALL BE LOCATED OVER FASCIA BEAMS.

SECTIONS FOR BOTTOM OF SLAB AND/OR SCREED ELEVATIONS ARE GIVEN ALONG BEAM CENTERLINES FROM CENTERLINE OF BEARING TO CENTERLINE OF BEARING AT EQUAL SPACINGS.

REVISIONS

NO.	DESCRIPTION	DATE	BY

DATE: 4-13-05
CORRECTED BY: R.K.OLIN
DATE:
CHECKED BY:
DATE:
DRAWN BY: R.K.OLIN
FILE NAME: b02015ss.dgn

MDOT Michigan Department of Transportation

SLAB AND SCREED DETAILS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	28 OF 29

ABUTMENT A

BAR	DIMENSIONS a	b	c	d	e	f	g	h	j	k	m	p	NO. REQ'D	TOTAL WT.
EA040409	4'-9"												6	19
EA040703	7'-3"												12	58
EA044406	44'-6"												4	119
EA060409	4'-9"												2	14
EA060700	7'-0"												43	452
EA060706	7'-6"												58	653
EA061103	11'-3"												4	68
EA061201	12'-1"												30	544
EA061508	15'-8"												62	1459
EA064209	42'-9"												14	899
EA064400	44'-0"												24	1586
EA064406	44'-6"												16	1069
EA064608	46'-8"												16	1121
EA065008	50'-8"												12	913
EB064800	46'-8"	1'-4"											16	1154
EB070800	7'-0"	1'-0"											56	916
EB070806	7'-6"	1'-0"											86	1494
EB081305	12'-1"	1'-4"											33	1182
EB081700	15'-8"	1'-4"											78	3540
EC060804	1'-6 3/8"	4'-0"	1'-6 3/8"	1'-6 3/8"	2'-2"	1'-6 3/8"	2'-2"						16	200
ED040704	3'-3"	10"	3'-3"										8	39
ED040709	3'-3"	1'-3"	3'-3"										14	72
EK050709	2'-1"	1'-2"	1'-2"	1'-3"									68	550

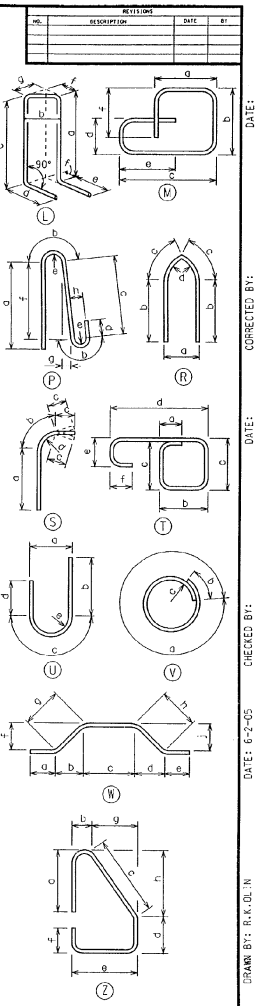
ABUTMENT B

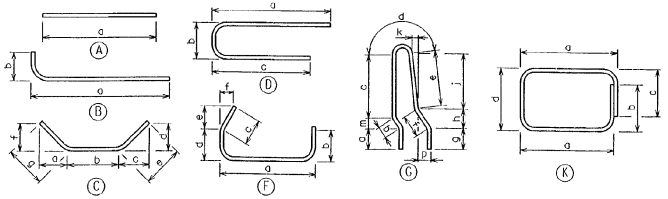
BAR	DIMENSIONS a	b	c	d	e	f	g	h	j	k	m	p	NO. REQ'D	TOTAL WT.
EA042704	27'-4"												4	73
EA060409	4'-9"												2	14
EA060700	7'-0"												43	452
EA060706	7'-6"												36	406
EA061103	11'-3"												4	68
EA061203	12'-3"												30	552
EA061602	16'-2"												40	971
EA062704	27'-4"												16	657
EA062710	27'-10"												24	1003
EA062906	29'-6"												16	709
EA064209	42'-9"												14	899
EA065002	50'-2"												12	904
EB063010	29'-6"	1'-4"											16	741
EB070806	7'-6"	1'-0"											52	903
EB080800	7'-0"	1'-0"											56	1196
EB081307	12'-3"	1'-4"											33	1197
EB091708	16'-2"	1'-6"											44	2643
EC060804	1'-6 3/8"	4'-0"	1'-6 3/8"	1'-6 3/8"	2'-2"	1'-6 3/8"	2'-2"						16	200
EK050709	2'-1"	1'-2"	1'-2"	1'-3"									52	420

NORTH & SOUTH RETAINING WALLS

SUPERSTRUCTURE

BAR	DIMENSIONS a	b	c	d	e	f	g	h	j	k	m	p	NO. REQ'D	TOTAL WT.
EA040010	0'-10"												10	6
EA040104	1'-4"												10	9
EA040409	4'-9"												6	19
EA040703	7'-3"												12	58
EA045110	51'-10"												66	2285
EA060300	3'-0"												208	937
EA061000	10'-0"												110	1652
EA061005	10'-5"												106	1658
EA061008	10'-8"												4	64
EA065206	52'-6"												12	946
ED040509	2'-4"	1'-1"	2'-4"										64	246
ED040702	3'-3"	10"	3'-3"										8	38
ED040709	3'-3"	1'-3"	3'-3"										14	72
ED060509	2'-4"	1'-1"	2'-4"										204	1762
EA033006	30'-6"												150	1720
EA040306	3'-6"												168	393
EA043203	32'-3"												156	3361
EA043906	39'-6"												30	792
EA044206	42'-6"												268	7609
EA044505	45'-5"												8	243
EA061906	19'-6"												168	4921
EA063906	39'-6"												42	2492
EA064200	42'-0"												42	2650
EA080005	0'-5"		THREADED										12	13
EA080110	1'-10"		THREADED										96	470
EA083906	39'-6"												6	633
ED040404	1'-2"	2'-0"	1'-2"										120	347
ED060409	3'-9"	6"	6"										140	999
EK041002	1'-3 1/2"	2'-2 3/4"	2'-2 3/4"	3'-1 1/2"									4	27
EM041001	10 1/4"	3'-1 1/2"	1'-3 1/2"	2'-3"	1'-0 3/4"	1'-6"							32	216
ET040411	10 1/2"	10 1/2"	1'-0 1/2"	1'-1"	0"	0"							168	552





MISCELLANEOUS QUANTITIES

69319 lb	Reinforcement, Steel, Epoxy Coated

EPOXY COATED
BAR SIZE
BAR LENGTH (FT)
BAR LENGTH (IN)
EA064700
BAR SHAPE
BAR LEGEND

REINFORCEMENT SHALL BE BUNDLED AND TAGGED AS TO THE LOCATION AS SHOWN ON THIS SHEET.

MDOT Michigan Department of Transportation

STEEL REINFORCEMENT DETAILS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
7-15-05	B01 OF 62015	60572A	MAHDAVI	29 OF 29

REVISIONS

NO.	DESCRIPTION	DATE	BY

DATE:
CORRECTED BY:
DATE:
CHECKED BY:
DATE: 6-2-05
DRAWN BY: R.K.OLSEN
FILE NAME: B01E62015rs.dgn

MICROFILM CONTENT SHEET

BATCH 07-6C **OUT TO MICROFILM 6/15/2007**

Control Section	Structure	Job Number	Sheet Number	Let Date	Region	Total Sheets	Plan Set	Box
62015		60572	(ONE ROLL)	9/9/2005	GRAND	104		1
62015	B01	60572						
			AS CONSTRUCTED					
	LOCATED IN CITY OF WHITE CLOUD, NEWAYGO COUNTY. 0.62 MILES OF ROAD RECONSTRUCTION INCLUDING SUBBASE, AGGREGATE BASE, HOT MIX ASPHALT PAVEMENT, CONCRETE CURB AND GUTTER, SAFETY UPGRADES AND BRIDGE REPLACEMENT. M-20 OVER THE WHITE RIVER.							

Appendix D

Full Page Format Renderings

View Looking North from S. State Street

White River Restoration

White Cloud, MI

Views are for Illustrative Purposes only.

View Location Map

February 10, 2022

Prepared by:

ELEMENTS | STUDIO LANDSCAPE ARCHITECTURE

View Looking South from S. State Street

White River Restoration

White Cloud, MI

Views are for Illustrative Purposes only.

View Location Map

February 10, 2022

Prepared by:

ELEMENTS | STUDIO LLC
LANDSCAPE ARCHITECTURE