East Tawas State Harbor
Final Report

For mooring Great Lakes Cruise Ships at the East Tawas State Harbor

Prepared for:
City of East Tawas, Michigan

October 28, 2010

Prepared by:

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GENERAL INFORMATION

Introduction

This report presents the Cruise Ship Feasibility Study commissioned by Develop Iosco Incorporated for the City of East Tawas, Michigan.

Entrance to East Tawas Streetscape at the beginning of the pier system

The City of East Tawas, its Tax Increment Finance Authority (TIFA), Develop Iosco Incorporated, other local and regional business interests, and the State of Michigan have long looked at the possibility of drawing cruise ships that travel the Great Lakes to stop in East Tawas State Harbor.

The area provides for diverse tourist attractions ranging from unique shops, golf courses, to site-seeing excursions, within 50 miles of the harbor.

The current companies that provide for cruises on the Great Lakes do not have a port-of-call on Lake Huron. Many of the ships have a stop in Detroit or Windsor and travel to Mackinac Island or beyond without stopping.

East Tawas, Michigan would provide for an ideal location as an additional port-of-call for any number of these cruises.

Existing Infrastructure and Condition

The East Tawas State Harbor provides for an excellent sheltered location for ships to harbor. Depths in the harbor range from approximately 20-25 feet at the entrance to the harbor to 10-12 feet adjacent to the pier and docks.

Cruise ship passenger unloading area

The existing pier in the harbor is constructed of steel sheet pile walls tied together creating a 24 feet wide pier with a concrete cap constructed by the United States Army Corps of Engineers in 1966. The pier is armored with limestone riprap along both sides to help stabilize the structure and dissipate wave action. The pier is approximately 2,100 linear feet long. The inner portion of the pier (approximately 500 feet) consists of a wood pier deck on timber cribs. These cribs are filled with stone to provide for stability and ballast.

Entrance to the Federal Pier mooring area and beginning of the timber plank

The overall condition of the pier is good. The steel sheet pile portion is in very good condition with little or no deterioration. The wood crib portion is in adequate condition. The cribs show some signs of dry rot at the water surface. The wood plank surface is warping in some places with the edges of the boards turning up, causing a potential tripping hazard along its length.

In 2003, improvements were made to the shoreline and the park area to help facilitate the public use of the marina and harbor. These improvements included a new entrance from Bay Street (US-23), a revised parking lot layout to provide additional parking, a new boat ramp and new bath house facilities. **Figure 1** depicts the existing conditions in and around the East Tawas State Harbor.

The pier and harbor is currently used by a variety of pleasure craft, commercial fishing operations, and for recreational fishing along the piers and docks. It is anticipated that the cruise ship will be moored at the pier head (either inside or outside) for no more than 12 hours at a time. No definite number of displaced fishermen or boaters can be determined because it is all subjective to many factors (weather, fish behavior, boating activity, special events, etc). The harbor is also classified as a “harbor of refuge” by the United States Army Corps of Engineers (USACOE). The mooring/operation of cruise ships within the harbor should not affect this function based on the infrequent/short duration of actual mooring. Both of these issues will be further discussed with the MDNR and USACOE at the time of permitting.

The Michigan Department of Natural Resources (MDNR) has provided ideas on a conceptual plan to upgrade the existing marina and mooring facilities within the harbor for pleasure craft.

The proposed, conceptual, MDNR improvements to the harbor are depicted in **Figure 2**.

From discussions with the Supervisor, the MDNR, and the Department of Management and Budget (MDMB) the proposed improvements may include the following.

- Replacement of all the floating docks
- Removal of the fixed dock
- Relocation of the fueling station
- Steel sheet piling retaining wall along the shoreline (including dredging in this area)
- Improved electrical and other utilities along the pier.

These ideas were considered in developing the cruise ship alternatives

ALTERNATIVE INVESTIGATION

Three alternatives were investigated as part of this study. There are as follows:

- **Alternative 1** – Moor cruise ships at outer pier head.
- **Alternative 2** – Moor cruise ships at fixed pier (current fueling station location).
- **Alternative 3** – Moor cruise ships adjacent to shore line (near pavilion/bathroom location).

Figure 3 depicts these three alternatives on the existing East Tawas State Harbor map.

To minimize the structural impact to the existing pier, no cleats or bollards are proposed to be attached to the existing structure. The "design" case was determined to be the "impact" forces of a mooring ship. Wind, wave, and ice action will not affect the proposed features as it currently does not affect the existing structure.

The proposed mooring system (**Figure 3 and Appendix A**) shall consist of a series of steel H-piles (clusters). The existing pier will be protected with timber bumpers. The number of these clusters depends on the size of vessel mooring at the pier. The larger ships (Clelia II, Pearl Seas, Pearl Mist), which range in length from 290 to 335 feet would require three of these clusters (these ships are no longer in service). The smaller ships (Grande Caribe, Grand Mariner, Niagara Prince), which reach up to 183 feet in length would require two of these clusters.

Based on initial investigation, the cruise ships do not require any special facilities other than moorings at ports-of-call. Many of the existing ports-of-call harbors do not provide utility support such as electrical, Wi-Fi, or sewage disposal. It is understood that the cruise ships are self-dependent and do not rely on the harbors for these services. This has been confirmed in initial preliminary discussions with cruise corporations.

The alternatives analyzed as part of this study center around where on the existing infrastructure they can moor with the minimal amount of impact to the pier, to the harbor (dredging), and the current use (boating, fishing, etc.)

Existing Water Depths (Dredging)

There are two sizes of ships operated by the cruise lines on the Great Lakes, see **Appendix B**.

The larger of the two carry up to 300 passengers and have an operating draft (depth below water surface) of approximately 12 feet.

The more common ship carries up to 100 passengers and have an operating draft of approximately 6.5 feet.

Information on existing water depths was gathered from the United States Army Corps of Engineers – Detroit District (USACE-Detroit) and navigational charts for the East Tawas State Harbor. Water depth adjacent to the outer pier, range from 10 feet to 12 feet. Water depth adjacent to the fixed pier (fueling station), range from 8 feet to 10 feet. Water depth adjacent to the shoreline, range in depth from 0 feet

to 6 feet. Water depth gradually increases beyond 18 feet as you move 1000 to 2500 feet out into the harbor.

Therefore, except for adjacent to the shoreline, dredging should not be required to navigate and moor the smaller cruise ships within the East Tawas State Harbor.

If at some point consideration is given for larger ships to operate within the harbor, dredging may become an issue. Studies on littoral drift and impact of dredging on the existing structures may have to be considered. More information on ship operations would be needed to determine the need for further investigation.

Alternative I: Small (or Large) Cruise Ships Mooring at Outer Pier Head

Alternative I consists of mooring small/large cruise ships at the outer pier head. The mooring location could be along the outside or inside of the pier.

Either outside or inside of the pier the small cruise ships, operating on the Great Lakes, the following improvements would be required.

- Construction of a mooring system, which includes two pile clusters and fenders.
- No improvements to the outer pier head would be required.
- No dredging adjacent to and around the proposed mooring locations would be required.

Table I provides the estimated costs for mooring the small cruise ships at the outer pier head (either inside or outside).

Table I Mooring at Outer Pier Head

Description	Quantity	Unit	Unit Price	Amount
Mooring Piling	550	LFT	$125.00	$68,750.00
Fenders	1	LS	$20,000.00	$20,000.00
Material Disposal	5,000	CYD	$5.00	$25,000.00
			SUBTOTAL	$113,750.00
			CONSTRUCTION CONTINGENCY (15%)	$17,062.50
			SURVEYING, DESIGN, & CONSTRUCTION ENGINEERING (10%)	$11,375.00
			***TOTAL**	**$142,187.50**

***For the large cruise ships, dredging (along with permitting) adjacent to the pier head may be required as well as adding an additional pile cluster and fenders. Estimated cost is $1.1 million**

- Mooring the small cruise ships inside the outer pier head would impact the current pleasure craft operations more than mooring outside the outer pier head.
- Mooring the small cruise ships inside the outer pier head would provide protection from wind and waves to the ships more than mooring outside the outer pier head.
- Neither location would adversely impact the existing outer pier head structure.

Alternative II: Small Cruise Ships Mooring at Fixed Pier (current fueling station location)

Alternative II consists of mooring small cruise ships along the fixed pier. The mooring location could be along the outside of the pier.

Mooring the small cruise ships, operating on the Great Lakes, along the fixed pier would require the following improvements.

- Construction of a mooring system, which includes two pile clusters and bumpers.
- Structural and pedestrian walking surface improvements to the fix pier would be required.
- Relocation of the current fueling station would be required (part of the conceptual MDNR harbor improvement plan).
- Minimal dredging adjacent to and around the proposed mooring locations would be required.

Table II provides the estimated costs for mooring the small cruise ships at the fixed pier.

Table II Mooring at Fixed Pier (Fueling Station)

Description	Quantity	Unit	Unit Price	Amount
Mooring Piling	550	LFT	$125.00	$68,750.00
Fenders	1	LS	$20,000.00	$20,000.00
Fixed Pier Structural Improvements	1	LS	$100,000.00	$100,000.00
Fueling Station Relocation	1	LS	$200,000.00	$200,000.00
Material Disposal	5,000	CYD	$5.00	$25,000.00
			SUBTOTAL	$413,750.00
			CONSTRUCTION CONTINGENCY (15%)	$62,062.50
			SURVEYING, DESIGN, & CONSTRUCTION ENGINEERING (10%)	$41,375.00
			TOTAL	**$517,187.50**

- Mooring the small cruise ships outside the fixed pier head would significantly impact the current pleasure craft and the current fueling station operations.
- The fueling station would need to be relocated prior to the proposed MDNR East Tawas State Harbor improvements.
- Structure improvements would be required to replace dry rot members on the pier and the pier surface would need to be removed and replaced to improve walking surface.

Alternative III: Small Cruise Ships Mooring at Shoreline (near pavilion/bathrooms)

Alternative III consists of mooring the small cruise ships, operating on the Great Lakes, along the shoreline would require the following improvements.

- Construction of steel sheet pile retaining wall along shoreline.
- Construction of a mooring system, which includes two pile clusters and bumpers.
- Considerable dredging of the inner harbor to a depth of approximately 8 feet to 10 feet.
- Construction of shoreline pedestrian access from shoreline to existing facilities.

Table III illustrates the estimated costs for mooring the smaller ships along the shoreline.

Table III Shoreline Mooring

Description	Quantity	Unit	Unit Price	Amount
Mooring Piling	550	LFT	$125.00	$68,750.00
Fenders	1	LS	$20,000.00	$20,000.00
Shoreline Steel Sheet Pile	8,000	SFT	$60.00	$480,000.00
Dredging Operations	1	LS	$250,000.00	$250,000.00
Material Disposal	50,000	CYD	$1.50	$75,000.00
			SUBTOTAL	$893,750.00
			CONSTRUCTION CONTINGENCY (15%)	$134,062.50
			SURVEYING, DESIGN, & CONSTRUCTION ENGINEERING (10%)	$89,375.00
			TOTAL	**$1,117,187.50**

- Mooring the small cruise ships along the shoreline would significantly impact the current pleasure craft and shoreline.
- Significant construction would be required along the shoreline to allow for the cruise ships to moor.
- Significant dredging would be required in the inner harbor to allow for ship maneuverability.

Improvements to Existing Piers

As was stated previously in this report, the wood plank surface area is deteriorating and should be replaced. The estimated cost of this improvement is approximately **$275,000**.

Recommended Alternative

Based on the alternative investigation completed above, the following recommendation is being made based on a cost/benefit evaluation and the overall master planning for East Tawas State Harbor.

It is recommended that the smaller sized cruise ships moor along the outside of the outer pier head. The moorings should be placed as near the bend in the pier as possible so that additional pile clusters can be added toward the pier head in the future for larger ships.

This alternative will require the least amount of funds to construct the facilities, have minimal impact to current harbor operations (pleasure craft, fishing, harbor of refuge, etc.), and will not impede any future development within the harbor. The following phases can be added as funds become available.

- If and when harbor and marina improvements are made, mooring facilities for the smaller ships could be added to the shoreline sheet pile wall.
- If and when funds became available, the pier head area and harbor could be dredged to accommodate large ships. One additional pile cluster and bumpers can be added out to pier head along the inside (structural considerations and permitting would need to be addressed)

Construction and Permitting

The alternatives utilize standard marine construction activities. Contractors providing these types of services are readily available in the Great Lakes region. Permits and coordination will be required with the USACOE – Detroit District, MDNR, MDNRE, State Historic Preservation Office (SHPO), and local officials.

There have been numerous environmental investigations on the potential dredged material located in East Tawas State Harbor. These reports identify the potential contamination and the remediation requirements in disposing of this material during a dredging project. These issues have been incorporated into the preliminary cost estimates for each alternative. If sampling at the time of construction shows that there is no contamination, sediment could be used as beach nourishment if agreed upon by the local communities. The cost estimates assume that sediment is not contaminated. More specific testing will be required prior to issuing construction permits for these types of projects.

There is no requirement for providing for customs facilities for this type of cruise ship port-of-call.

Permitting guidelines and application forms are provided for in **Appendix C**.

Funding

The uniqueness of this proposed project lends itself to any number of funding sources. These range from traditional enhancement and economic development funding sources to special legislation funding, similar to American Reinvestment and Recovery Act (ARRA) funding to private investment (cruise ships, etc.) **Appendix D** provides a list of potential sources.

The approach to funding this type of project will be to meet and present this project to as many representatives of these sources as possible. A key will be the fact that a comprehensive study and approach has been developed by East Tawas (Develop Iosco Inc., TIFA) in pursuing this project.

The Next Steps

In summary, it is feasible for cruise ships to dock in the East Tawas State Harbor, with minimal expenditure from the local agencies. Several issues still need to be resolved before this becomes a reality. The following steps need to be accomplished before construction can be started on mooring facilities within the East Tawas State Harbor.

1. Discussions need to be initiated and completed with a cruise ship line that is interested and willing to make East Tawas a port-of-call.
2. Funding sources need to be identified so that the project can move forward.
3. With an interested cruise ship and funding identified, final coordination with the stakeholders needs to be completed (MDNR, MDNRE, USACE, SHPO, etc.) on impacts to existing usage and structures.
4. Final design, construction documents, permitting needs to be completed.
5. Project advertising, bidding, and construction contract awarded.
6. Construction project completed.

These steps are very generally laid out at this time. Once more detail from each step is identified, more steps maybe added for a successful completion of the project.

APPENDIX A

STRUCTURAL ANALYSIS OF

MOORING SYSTEM

Structural Analysis of Mooring System

The following information is the preliminary analysis and structural recommendations for a mooring system for cruise ships along the pier in East Tawas State Harbor, East Tawas, Michigan.

The basis of this analysis is the existing data on the harbor and pier received through the United States Army Corps of Engineers (USACOE) – Detroit District.

Preliminary discussions were completed with the USACOE – Detroit District concerning this future project. They would be interested in review of the concept once preliminary plans were available during the construction permitting phase. They did not see any major issue with the project going forward at this time.

Design cases were looked at and it was determined that the most conservative approach would be to plan on a standalone mooring system that did not rely on the existing structure for support. Timber rub rails would be provided on the existing structure only for cosmetic protection for the ship.

The design load case was determined to be the mooring impact of the ship. Wind, wave, and ice action should not impact the proposed mooring structure anymore than they do the existing structure.

APPENDIX B

GREAT LAKES CRUISE SHIP

INFORMATION

Great Lakes Cruise Ship Information

The recommendations of this report have been provided to the various cruise ship lines of interest. Preliminary discussions have taken place and there appears to be interest in adding East Tawas as a port-of-call at some point in the future. Additional information that will be needed as discussions continue are listed (but not limited to) below:

- What operational limits do you wish to see in relation to your ships (draft depths, turning radii, maintenance, etc)?
- What would be the proposed schedule and duration of moorings?
- What accommodations would you prefer to see onshore for your passengers (taxi service, food, retail, entertainment, etc)?

APPENDIX C

PERMITTING INFORMATION

Permitting Information

The following information is being provided for the basis of permitting this project when funding becomes available and construction documents are completed on the selected alternative.

This project, depending on the alternative, could be dealing with less than 1,000 CYD of sediment dredging or up to 75,000 CYD of sediment dredging. In addition to the initial dredging for the alternative for large ships, there may need to be maintenance dredging to keep the channel open. These variables will need to be looked at in the design phase to determine the need/amount of sampling required and depending on the results, disposal requirements of the sediment.

These forms and regulations are available on-line.

APPENDIX D

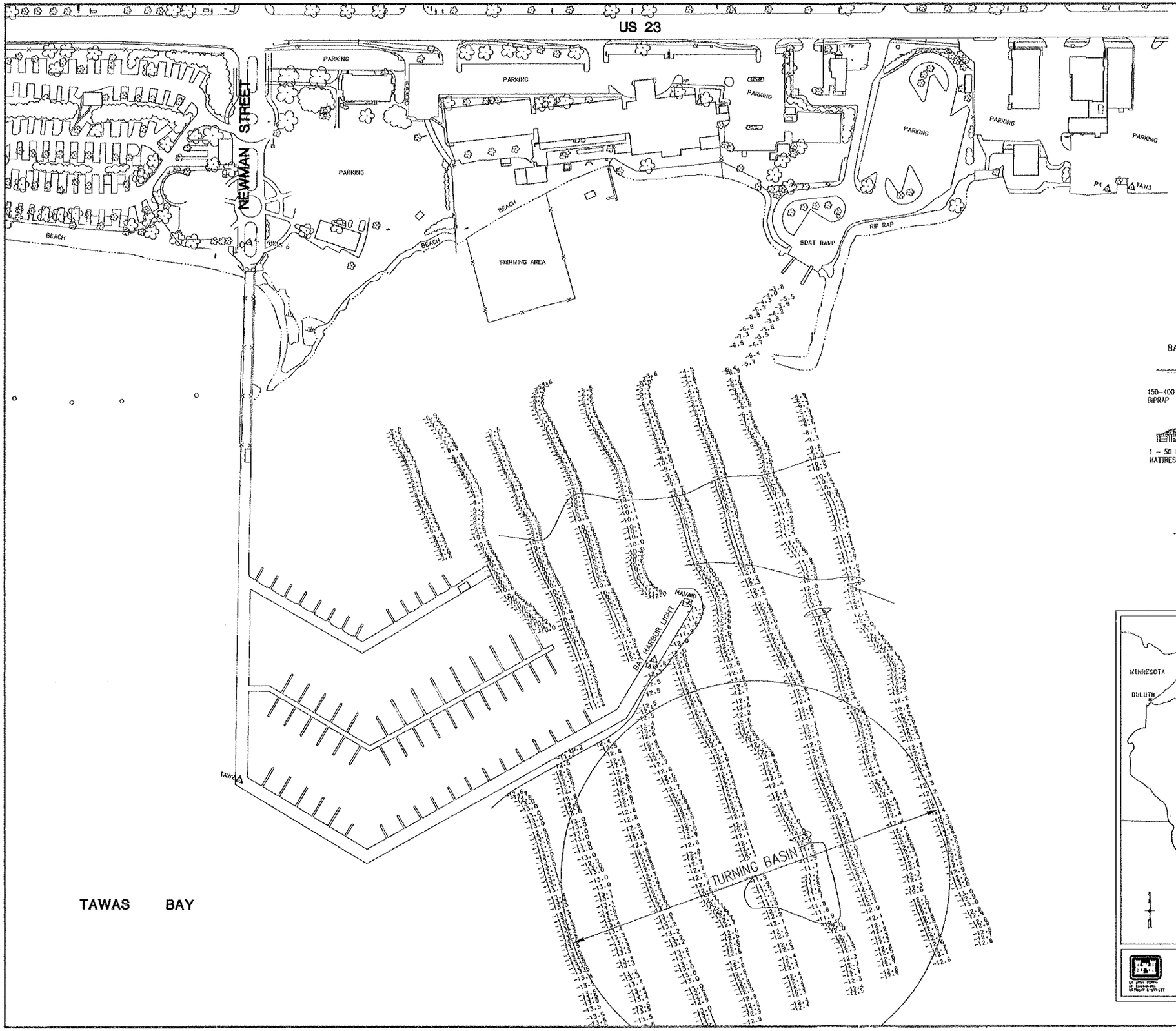
FUNDING SOURCES

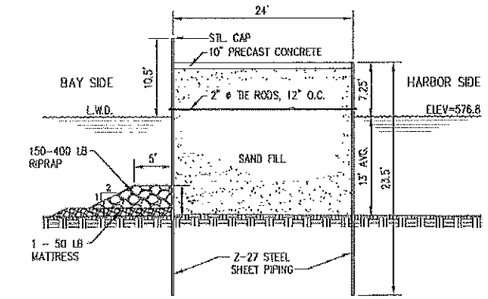
Funding Sources

Several funding sources are available for this type of project. Legislators at both the State and Federal level can and should be leveraged to back this project.

Following is a list of possible sources:

- MDNR Trust Fund Grant
- Coastal Management Grant – MDEQ
- Waterfront Redevelopment Grant – MDEQ
- Clean Michigan Initiative (CMI) – MDEQ
- Special Federal Appropriations (ARRA Type) Funding Opportunities (TIGER, CDBG, etc.)
- Economic Development Grants





TYPICAL SECTION
DOUBLE WALL BREAKWATER

SCALE: 1" = 10'

LOCATION MAP

PLAN DATE: JUNE, 2009
PROJECT MGR: R.A.F.
REVIEWER: D.A.S.
SCALE: 1" = 100'

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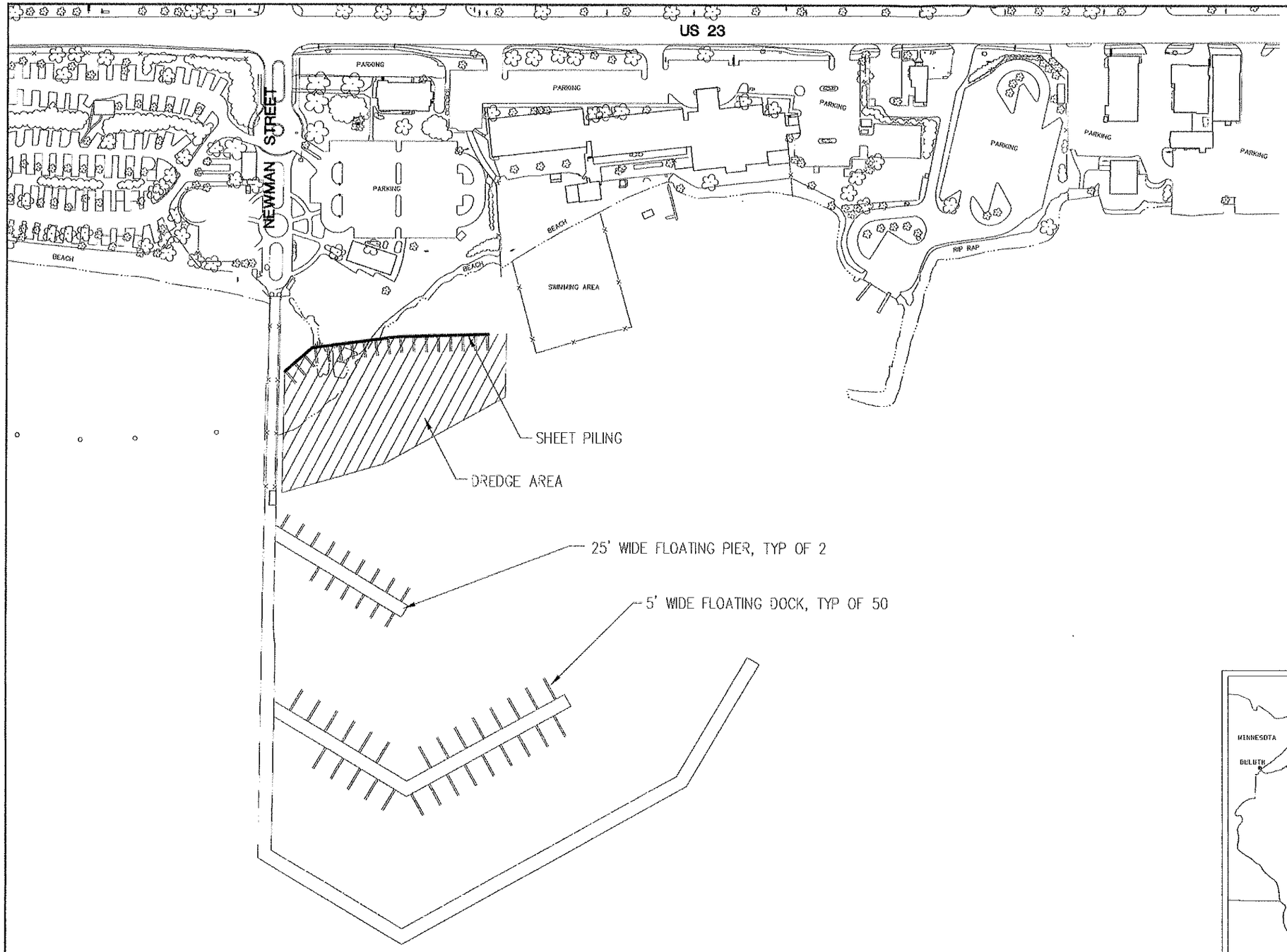
CITY OF EAST TAWAS
CRUISE SHIP FEASIBILITY
TAWAS BAY HARBOR
EXISTING CONDITIONS

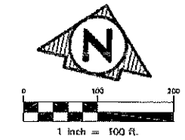
FIGURE 1

REV:

SHT# OF

JOB No: 09C0064





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PROJECT MGR: R.A.F.
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TAWAS BAY HARBOR
DNR PROPOSED LAYOUT

FIGURE 2

REV:

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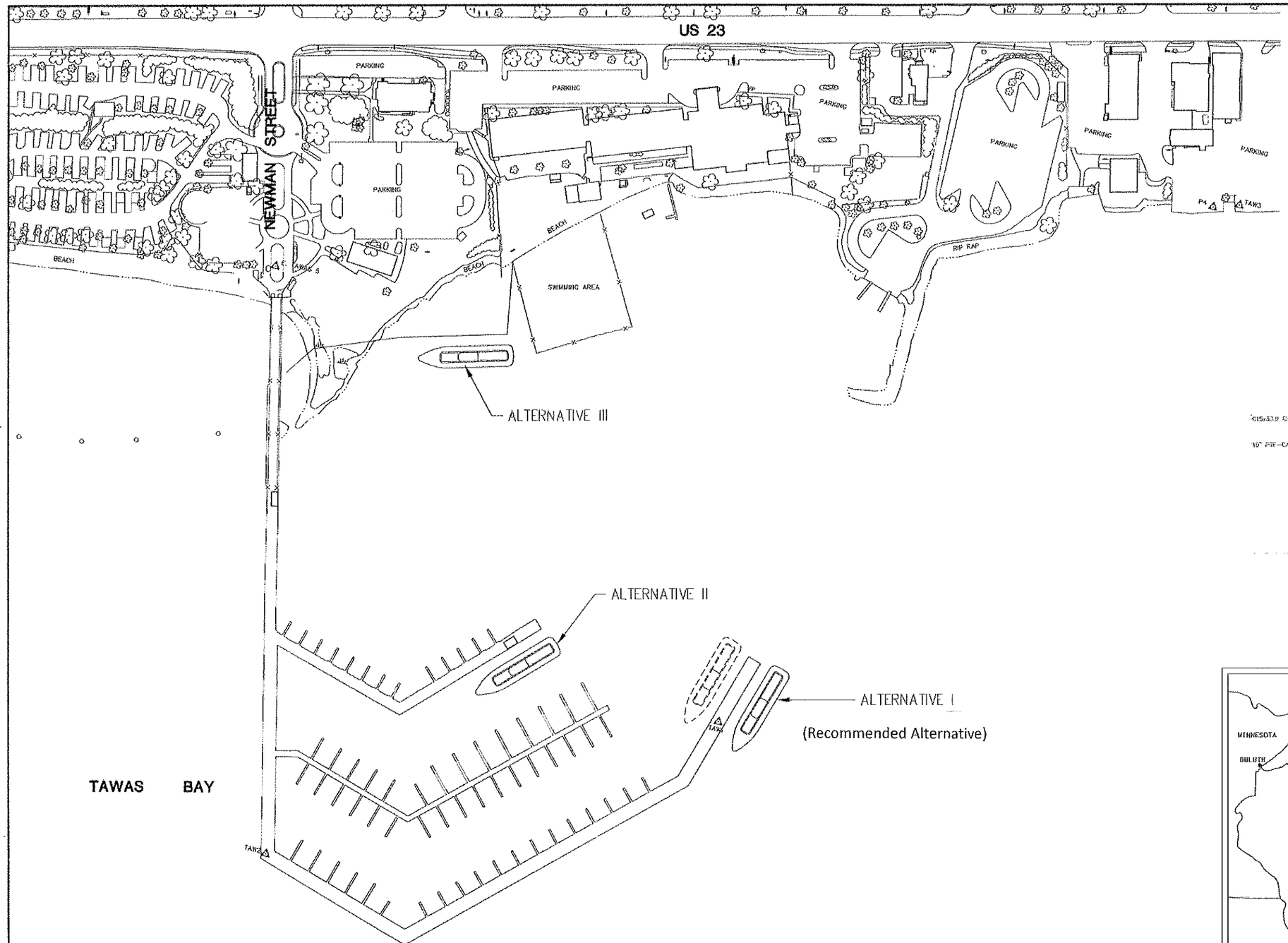
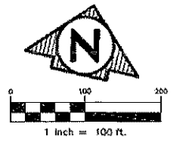
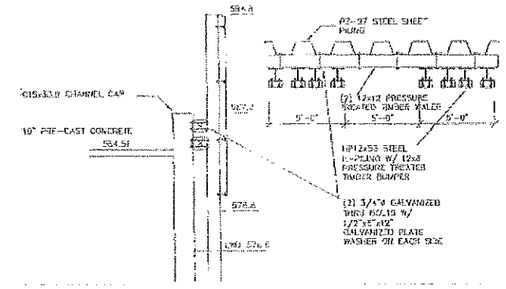
JOB No: 09C0064







MOORING DETAIL
SCALE: 1" = 5'

LOCATION MAP

PLAN DATE: JUNE, 2009
PROJECT MGR: R.A.F.
REVIEWER: D.A.S.
SCALE: 1" = 100'

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ALTERNATIVE MOORING LOCATIONS

FIGURE 3

REV:

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