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Edmands Engineering, Inc.
Civil Engineers • Land Surveyors

VETERAN'S MEMORIAL PARK
NORTH END SHORE PROTECTION STUDY
FOR THE
CITY OF BAY CITY

TC225.B39V48 1982

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EDMANDS ENGINEERING, INC.

AUGUST, 1982

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VETERAN'S MEMORIAL PARK
NORTH END SHORE PROTECTION STUDY

SCOPE

The Shore Protection Study includes the area bounded between the Veteran's Memorial bridge and Midland Street along the Saginaw River. The Study was prepared in coordination with the City staff, the Midland Street Citizens District Council and the Veteran's Park River Front Design Report by Christopher Wzacny & Associates.

PURPOSE

The Design Study provides the City with conceptual design options for shoreline reconstruction and will allow the City to seek funding sources.

SOILS

Existing soil boring data was made available by the City to indicate the general nature of the soils in the Veteran's Memorial Park area. Logs were provided for borings No. 1395, 1396, 479, 480, 481, 1374, 1375 and 1376. This information indicates that the general soils are muck, silty clay and sandy silts. The recommendations and conclusions obtained in this report are based on the limited soils information available. It is recommended that a detailed soils study be conducted along the line of the proposed shore protection at the time construction plans are prepared.

EXISTING CONDITIONS

The existing shoreline is presently lined with layered broken concrete. This concrete has been in place for approximately 20 years and is in general poor condition. The reason for the poor condition is due to the erosion that has occurred over the years caused by wave action through the broken concrete. The earth material behind the shore protection has washed out. In many places the shore protection is not high enough and is periodically flooded. Landscaping and maintenance of the area behind the shore protection is severely limited because of the periodic flooding and wet ground conditions.

SUMMARY OF ALTERNATIVES CONSIDERED

Several alternatives were considered as shore protection measures consisting of the following options:

1) Steel Sheet Piling
2) Heavy Rip Rap
3) Grouted Heavy Rip Rap
4) Broken Concrete Slab Shore Protection
5) Do Nothing

The type of shore protection ultimately selected should consider the long term usage of the area to be protected. This report has been prepared with the understanding that the southerly 1/3 of the existing Park will be left for public park use. The middle 1/3 will consist of residential apartments and condominium dwellings and the northerly 1/3 (which is north of Midland Street) would consist of a marina complex.

The estimate of cost for the considered alternatives are listed in the following cost estimates shown on Pages 1 through 6 which also include sketches of the various alternatives.

Steel Sheet Piling

Steel sheet piling shore protection offers the most permanent and best shore protection and should provide the lowest maintenance cost. Maintenance costs would consist of painting every 5-10 years.

Access to the river would be limited and it is recommended that steps be provided down the face of the steel sheet piling wall at periodic intervals to allow access to and from the river.

Some reflective wave action can be expected from a steel sheet piling wall. However, the amount of reflective wave action can be minimized by proper selection of the steel sheet piling section.

Heavy Rip Rap

Heavy rip rap consists of large broken stone laid on a prepared aggregate bed along the river bank. A fabric filter would be required to minimize the loss of backfill through the stone such has occurred with the broken concrete. Access to the river would be more available with this option because of the slope of the rip rap. Access would be available along the entire length of the shore protection.

With heavy rip rap the potential exists for rats, muskrats and other animals to live in the voids between the rip rap. In addition, the rip rap can be displaced and rolled into the river.

SUMMARY OF ALTERNATIVES CONSIDERED

Heavy Rip Rap (Continued)
The broken texture of the heavy rip rap surface provides excellent wave dissipation and provides the best protection against reflective wave action. The reflective wave action are those waves which approach the shore and bounce back into the river.

The maintenance of the heavy rip rap would consist of replacing or repiling rip rap on an annual basis. During peak use periods it may be necessary to inspect the rip rap weekly.

Grouted Heavy Rip Rap
Grouted heavy rip rap consists of filling the voids between the heavy rip rap with a concrete grout to hold the rip rap in place. This would eliminate the refuge for animals and eliminate the problems with rip rap being rolled into the river. This alternative may be subject to settlement.

Wave dissipation would not be as good as non-grouted rip rap, and would be similar to sheet piling.

Maintenance for the grouted heavy rip rap would consist of sealing the cracks that occur in the grouted surface to prevent the entry of water and subsequent damage through freeze-thaw activities. Access to the water would be available at any point along the shore protection.

Broken Concrete Slab Shore Protection
This alternative would reuse the existing concrete slabs and would require that they be removed, a bedding be prepared, along with a fabric filter and the slabs repiled. Additional broken concrete would have to be provided to raise the top elevation above the current elevations.

This option, though the least costly, will provide a harbor for rats, muskrats and other animals. Access will be limited due to the vertical face of the concrete. Vandalism is not expected to be a problem because of the weight of the slabs. Reflective wave action would be minimized.

Maintenance activities would consist of replacing slabs as needed to allow for settlement and ice damage.

Do Nothing
This alternative would result in the continued shore erosion and loss of Park lands. The area immediately adjacent to the existing boat launching facility presently requires maintenance activities. Selection of this option may require that the existing sidewalk at the boat launching ramp be removed since it is presently undermined. Selection of this option will result in a continuing maintenance problem for the Park.

RECOMMENDATIONS

The present shore protection presently ranges from elevation 581 to approximately 584. It is recommended that the selected shore protection be a minimum elevation of 584.0. The expected 100 year flood elevation of 586 would exceed the top of the shore protection, however, because of the short duration of this event, it is not considered harmful for open areas and park like surroundings.

For the residential areas, it is mandatory by State law that the residences be flood proofed or otherwise protected from the 100 year expected flood. This can be accomplished by increasing the top of the protection elevation to a maximum of 588 which allows a 2 foot freeboard or by constructing earth berms behind the shore protection which would raise the surrounding ground elevation and thus protect the dwellings.

Because of the height of the proposed shore protection above the existing water, it is recommended that earthen berms be used wherever possible to provide the required flood protection for residential units. Earthen berms would provide a better means to landscape the area and would be far less costly than increasing the height of the shore protection.

Sidewalks can be provided along the shore protection. It is recommended that the sidewalks be separated from the shore protection both physically and structurally. Where the sidewalk is immediately adjacent to the shore protection it may be desirable to provide a safety fence or railing. This same fence could also be used anywhere along shore protection where a pedestrian barrier is desirable.

The existing shore protection presently provides a beach area. All of the proposed shore protection methods can be structured to provide a beach area. At the beach area the selected shore protection would extend along the sides of the beach area leaving the beach area well protected.

It is recommended that the steel sheet piling shore protection be selected. This option leaves the maximum amount of Park land. Both of the heavy rip rap options would require nearly an acre of Park land.

The steel sheet piling provides the most permanent and best protection against shore erosion and can be readily modified to permit the mooring of small crafts along its face.

PRELIMINARY COST ESTIMATE

VETERANS MEMORIAL PARK
SHORE PROTECTION STUDY

CITY OF BAY CITY

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ESTIMATE OF CONSTRUCTION BY CONTRACT

ALTERNATE NO.	DESCRIPTION	ESTIMATED COST PER LINEAR FOOT OF SHORELINE
1.	Steel Sheet Piling Remove and dispose of existing rubble. Drive steel sheet piling with tiebacks and anchor system. Backfill, compact and grade.	$450/L.F.
2.	Heavy Rip Rap Remove and dispose of existing rubble. Backfill, compact and grade embankment, place geo-textile fabric, place heavy stone rip rap - 18" minimum dimension - place 36" thick layer minimum	$350/L.F.
3.	Grouted Heavy Rip Rap Remove and dispose of existing rubble. Backfill, compact and grade embankment, place geo-textile fabric, set heavy stone rip rap in concrete grout - 18" minimum dimension - 36" thick layer minimum	$400/L.F.
4.	Broken Concrete Slab Shore Protection Remove and salvage existing concrete shore protection. Excavate, backfill, grade as required, place geotextile filter fabric material, and place coarse graded aggregate cushion. Replace salvaged concrete slabs and add additional slabs as required to bring wall to grade. Additional broken concrete to be furnished by the City and placed by the Contractor.	$150/L.F.

Costs for additional items along the shoreline:

ITEM	DESCRIPTION	ESTIMATED COST PER LINEAL FOOT
1.	4" concrete sidewalk 6' wide	$10.00
2.	Rustic timber handrail	$12.00

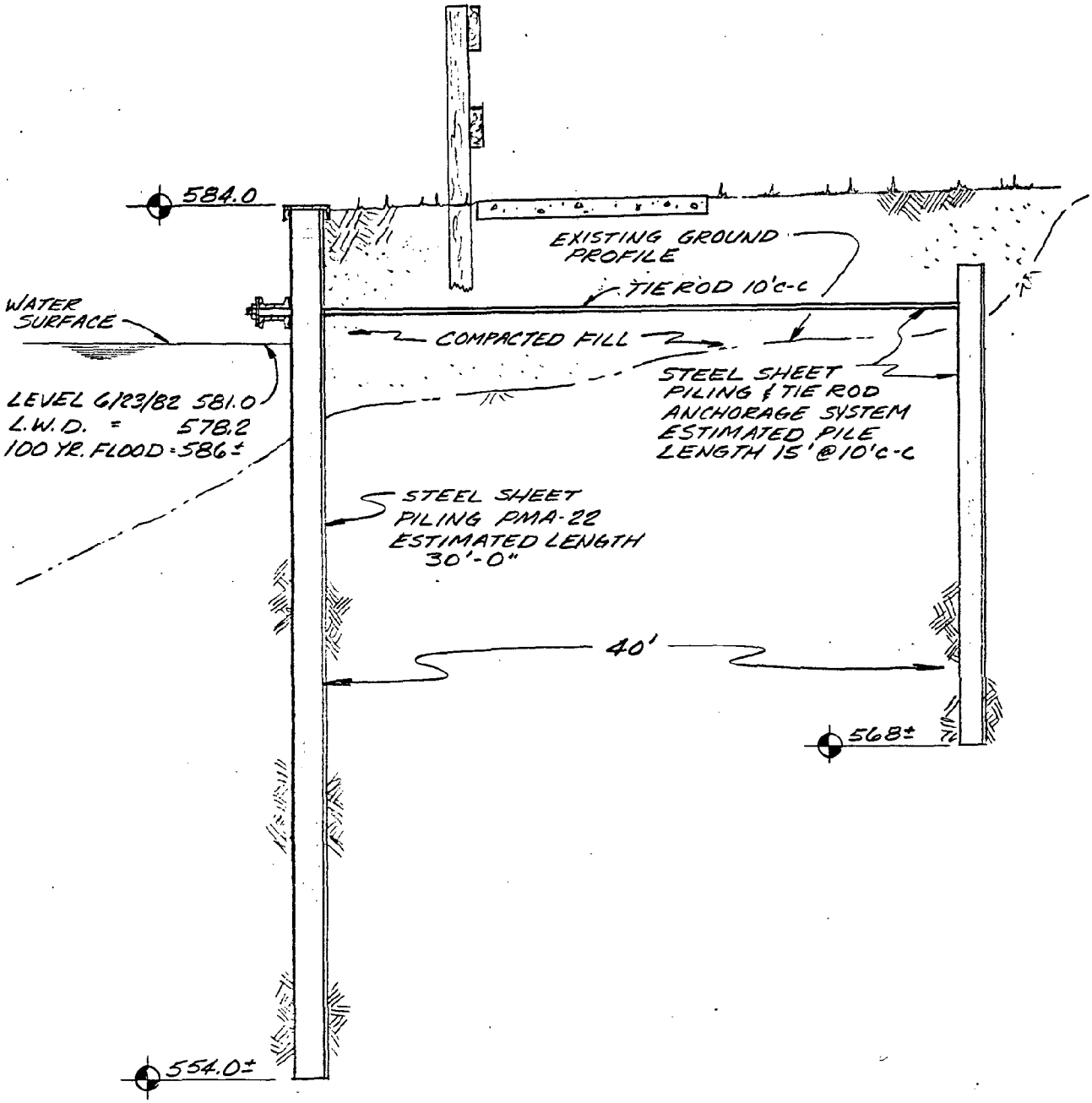
APPROXIMATE FOOTAGE OF SHORE PROTECTION

1. Midland Street to ramp	1350 L.F.
2. Ramp to end of parking lot south of bridge	500 L.F.

Donald G. Beyer Jr

Donald G. Beyer, Jr., P.E.

August 9, 1982
Date



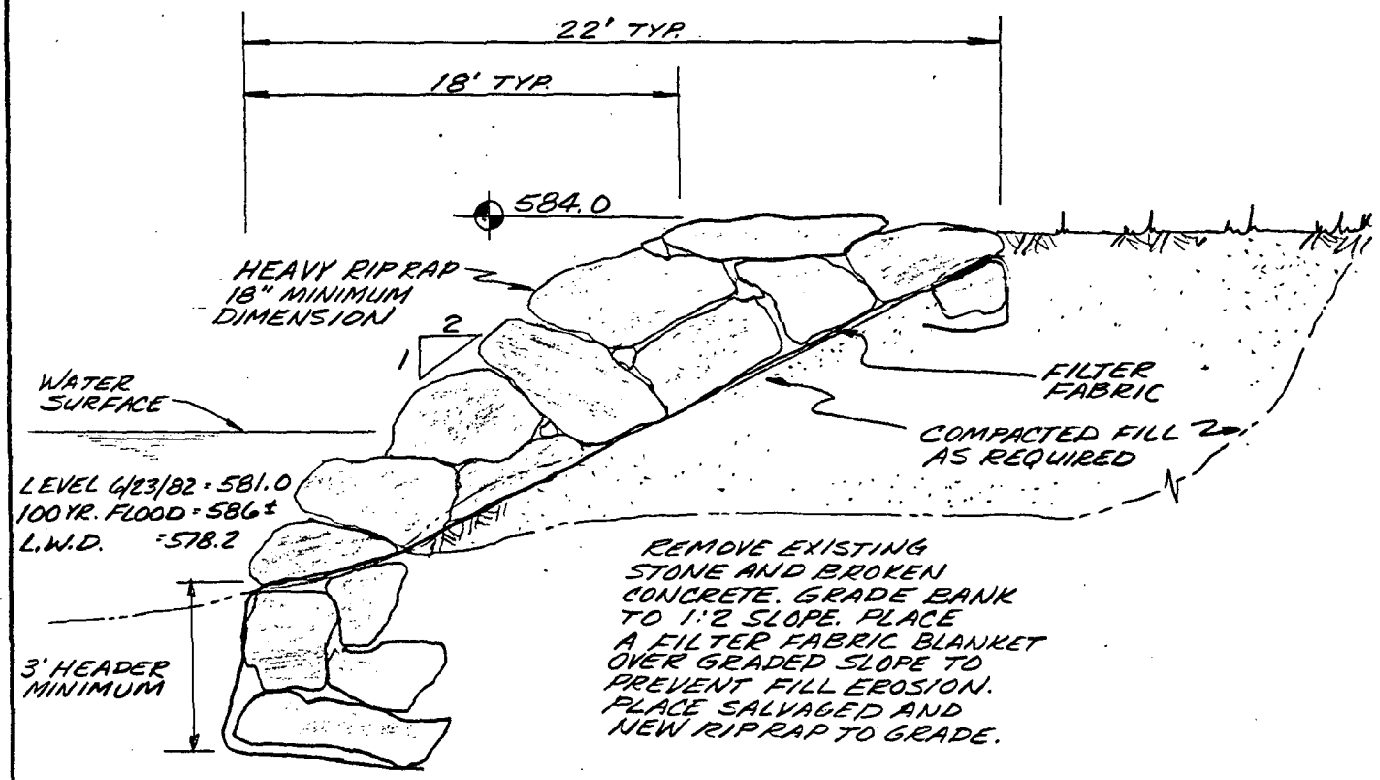
ALTERNATE No. 1

STEEL SHEET PILING WITH TIE BACK SYSTEM

CITY OF BAY CITY DATUM

NOT TO SCALE

SUBJECT VETERANS MEMORIAL PARK - SHORE PROTECTION STUDY	BY DGB	Edmands Engineering, Inc.
	DATE JUNE 1982	1501 West Thomas Bay City, Michigan 48706
CHK.	SHEET NO. 1 OF 4	File Code No. (Job No.) Owner BCC · Project 2030 · Suffix 01
DATE		



ALTERNATE No. 2

HEAVY RIP RAP
WITH FILTER FABRIC

CITY OF BAY CITY
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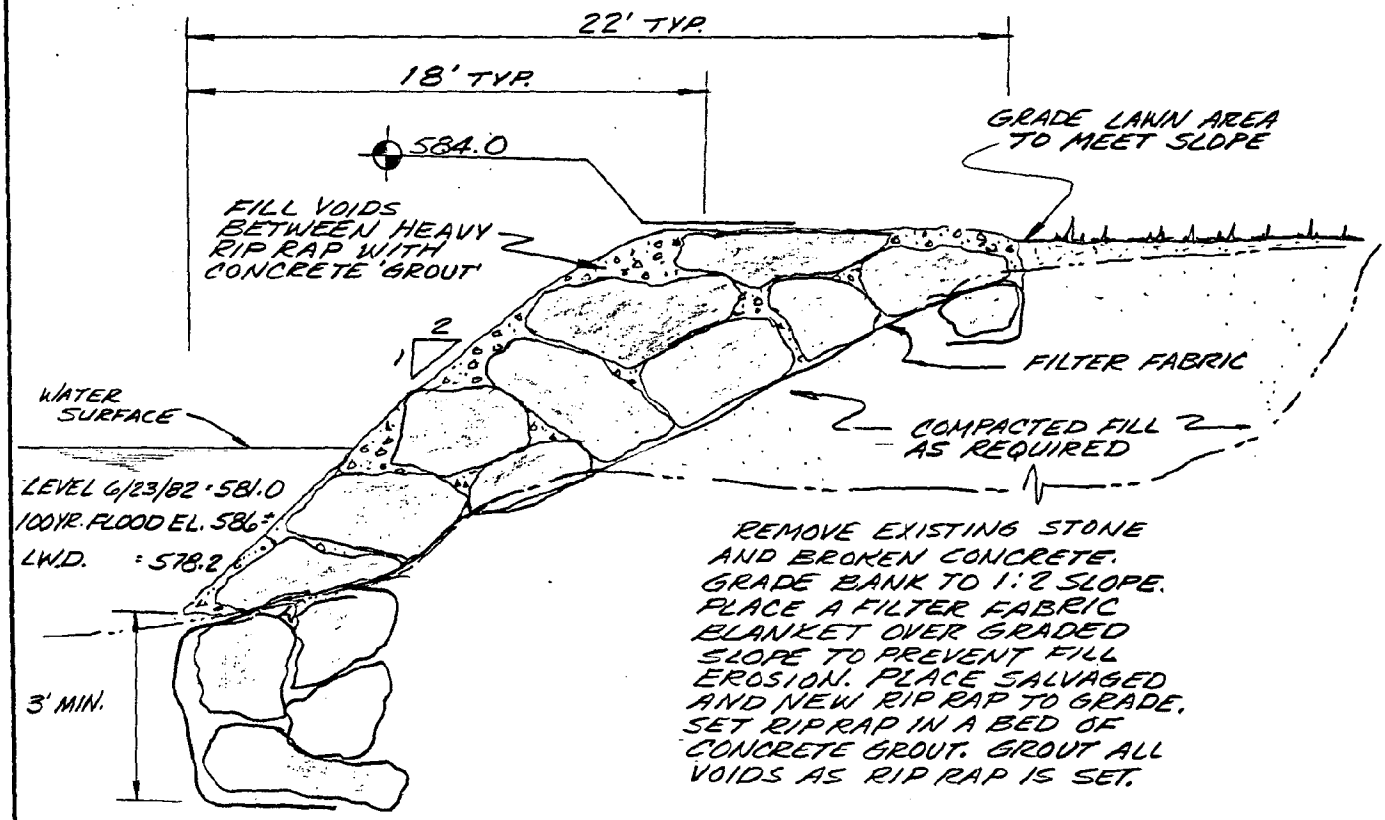
SUBJECT VETERANS MEMORIAL PARK - SHORE PROTECTION STUDY	BY DGB	Edmands Engineering, Inc.
	DATE JUNE 1982	1501 West Thomas Bay City, Michigan 48706
CHK.	SHEET NO 2 OF 4	File Code No. (Job No.) Owner BCC Project 2030 Suffix 01
DATE		



ALTERNATE No. 3
GROUTED HEAVY RIP RAP
WITH FILTER FABRIC

NOT TO SCALE

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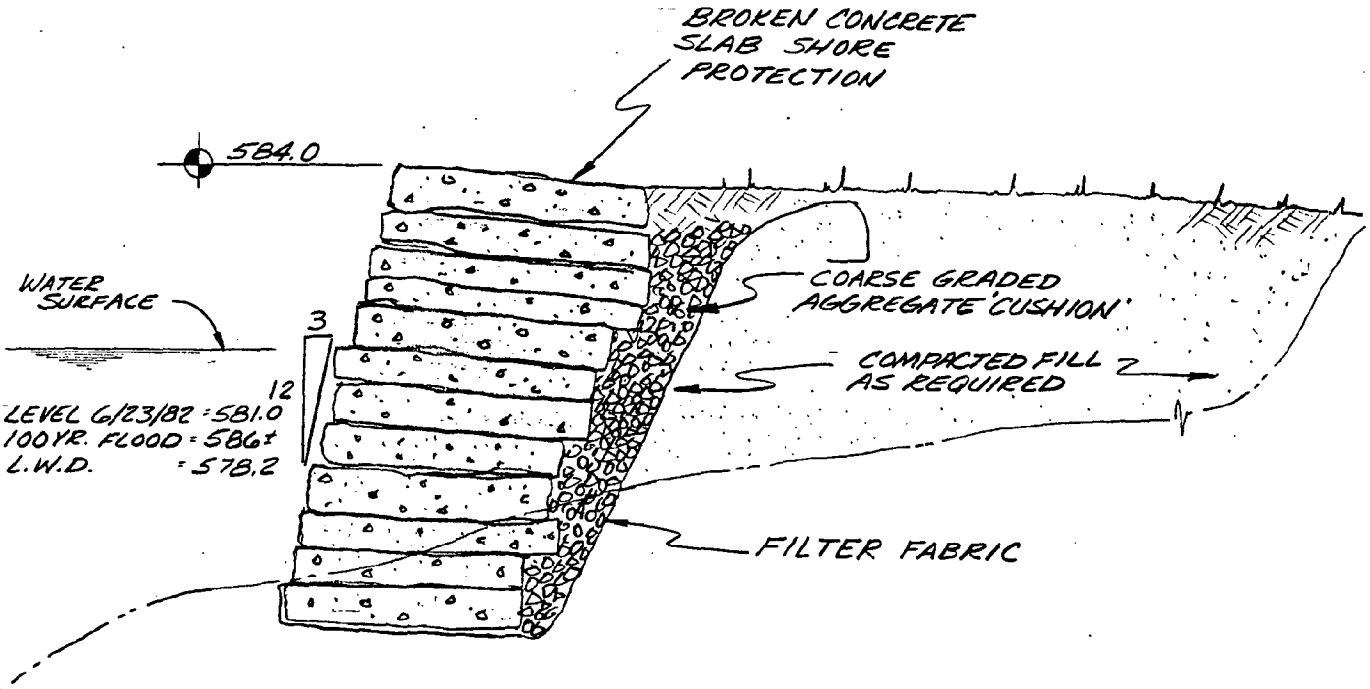
		DATE JUNE 1982	
CHK.	SHEET NO.	File Code No. (Job No.) Owner Project Suffix	
DATE	3 OF 4	BCC • 2030 • 01	



REMOVE AND SALVAGE EXISTING BROKEN CONCRETE SHORE PROTECTION. EXCAVATE, FILL AND GRADE AS REQUIRED TO PROVIDE A UNIFORM SLOPE AND SHORE LINE. PLACE FILTER FABRIC AND AGGREGATE CUSHION TO PROTECT FABRIC LINER. RE-LAY SALVAGED SLABS AND ADD ADDITIONAL SLABS AS REQUIRED TO BRING WALL TO GRADE.

ALTERNATE No. 4

BROKEN CONCRETE SLAB SHORE PROTECTION

NOT TO SCALE

CITY OF BAY CITY DATUM

SUBJECT VETERANS MEMORIAL PARK - SHORE PROTECTION STUDY	BY DGB	DATE 7/7/82
CHK.	SHEET NO. 4 OF 4	File Code No. (Job No.) Owner BCC · Project 2030 · Suffix 01
DATE		

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