Courthouse Road/Ken Combs Pier Boat Launch Renovation

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Gulfport, Mississippi

Executive Summary

The economic boom currently being experienced in coastal Mississippi has increased the usage and placed unprecedented demands on existing public access facilities along the front beach in Harrison County. Population growth and increased visitation rates from outside the coastal area have caused the existing facilities to be overtaxed and are currently insufficient to meet this demand. In one effort to reconcile this problem, a public boat launch facility has been proposed for renovation on the front beach at Courthouse Road in Gulfport. The following summarizes site development considerations that are more fully described in the assessment report.

- A 1,150-foot long pier and jetty is located on the east side of the proposed facility which will help prevent filling of the proposed channel from the predominant east to west littoral transport of sediment. However, as proposed, the site is susceptible to southerly and westerly winds. As much as 560 additional feet of jetty may be required to reduce sedimentation from other directions but more importantly, to protect boats from waves and wakes while being launched and retrieved. Consideration should be given to placing other jetties along the south and west sides of the access channel to protect the site from wave energy while maintaining water exchange through the channel.

- Approximately 6,500 cubic yards of material will have to be dredged to develop the launch basin and access channel. Preliminary sediment sampling and analysis suggest that the dredged sediments may be suitable for use as renourishment sands on the existing beach; however, vertical cores should be collected to verify that sediment grain size at depth is suitable for beach sands. The suitability of dredged sediments for renourishment to the beach can have a dramatic effect on dredging costs which might range from $5 to $15 per cubic yard.

- Ease of vehicle access and on-site parking for vehicles and vehicles with trailers are critical components of boat launch facility development. Due to the amount of traffic on Highway 90 and the inherent difficulties of driving a vehicle/trailer combination, traffic signals and turn lanes are essential for vehicles desiring to leave the facility towards the north and west or to enter from the east or north. The existing facility has adequate traffic controls and room to develop designated boat trailer parking.

- There is a potential for adverse water quality impacts at the site caused by vehicle crankcase drippings and bilge water discharge from boats. These types of impacts can be minimized by using permeable or semi-permeable materials in parking areas and configuring jetties and breakwaters in a manner that facilitates water exchange through the basin.

- Public beach users will not be displaced by the development of this area into a boating access facility. Small boat and shore-based fisherman will benefit because the rock jetty and breakwaters will serve as an artificial reef which attracts and holds marine life.

- Any boat access facility located in an unprotected area of front beach away from existing navigational channels is inherently going to be expensive due mainly to dredging requirements and jetty construction. Costs to construct the jetty can range between $500 and $1,000 per linear foot. Because this site will have to be developed to withstand high energy storm events, the cost will most likely tend toward the higher end of this range. At a cost of $800 per linear foot, the jetty, as proposed, could cost approximately $448,000. Dredging will add approximately $65,000 to the project costs.

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Background and Project Description

The economic boom currently being experienced in coastal Mississippi has increased the usage and placed unprecedented demands on existing public recreational facilities, especially along the front beach in Harrison County. Population growth and increased visitation rates from outside the coastal area have caused existing access facilities to be overtaxed and are currently insufficient to meet this demand. One of the most pressing needs is additional recreational boating access facilities. Figure 1. shows the number of registered boats in seven coastal Mississippi counties. Figure 2. shows the relative demand on salt-water boating access in relation to total boat ownership. Particular attention should be given to the number of registered boats under 25 feet in length. These boats are typically stored and transported on trailers and require the use of a boat launching facility. There is an acute shortage of boat launching facilities in coastal Mississippi with direct access to the Mississippi Sound, the offshore barrier islands and the Gulf of Mexico.

Figure 1.

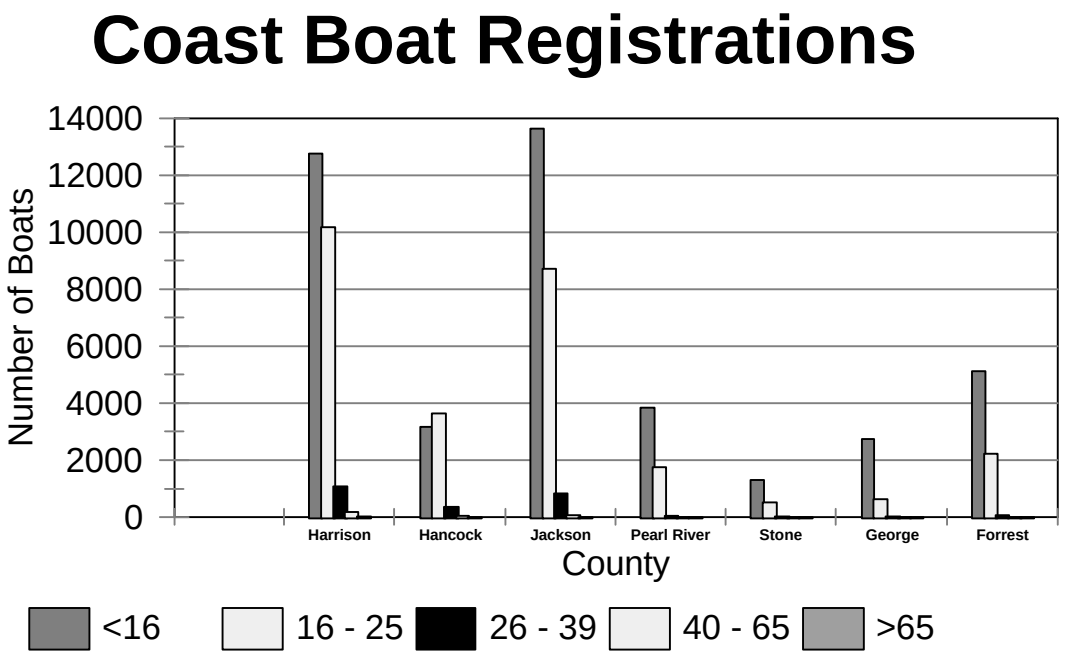
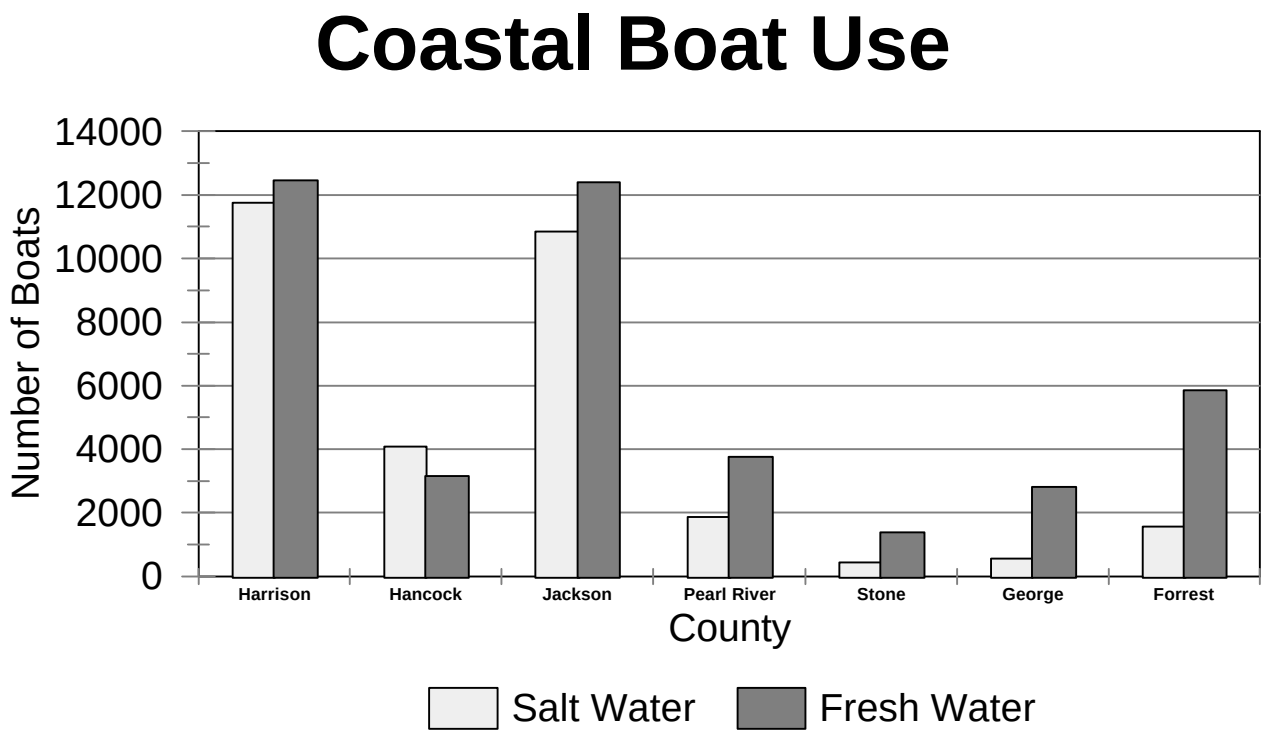


Figure 2.



As can be seen, the two counties with the highest rate of boat ownership and salt water use are Jackson and Harrison. Harrison County has had more of a problem in providing waterfront recreational access due to the tremendous amount of shoreside development associated with dockside gaming. The only boat launch facility with access to the Mississippi Sound in Gulfport is located within the Gulfport small craft harbor. The Gulfport small craft harbor facility has limited, unimproved car and trailer parking. It does have easy highway access and is protected within the enclosed harbor basin with close proximity to the Gulfport channel. Because it is the only launching facility in Gulfport with direct access to the Mississippi Sound, it frequently cannot accommodate the demand from recreational boaters, particularly on weekends and holiday periods.

The lack of recreational boat launch facilities in Gulfport restricts the ability of small boat owners to utilize many fishing and recreational locations within the Sound. In an effort to reconcile this problem, the renovation of the existing but unuseable public boat launch facility at Courthouse Road in Gulfport has been proposed. It is anticipated that the proposed facility will consist of a recreational boat launch ramp capable of launching/retrieving four boats at a time and car and boat trailer parking. Access to this facility is from Hwy. 90 or Courthouse Road.

The Mississippi State University/Coastal Research and Extension Center (CREC) was asked to provide an assessment of the feasibility of renovating the old launch facility at Courthouse Road. Specific site plans for this renovation were not available. Consequently, the comments and recommendations in this assessment are based on the assumption that the renovated project will closely mimic the original facility.

Description of Study Area

The project area is located on the artificial beach at Courthouse Road. Harrison County's 26-mile artificial beach was originally constructed in 1951-1952 to provide protection and anchorage for the existing seawall. Sand used to create the beach was dredged from plentiful deposits located immediately offshore from the seawall. Constant erosion and the devastating effects of hurricanes required the beaches to be renourished in 1972-1973 and again in 1987-1988.

The project site consists of an existing but unuseable, three-slot, boat ramp with remnant pilings that once supported finger piers protruding from the concrete. This ramp is oriented in a northeast-southwest direction. A concrete rubble jetty, approximately 300 feet long exists on the east side of the boat ramps and a wooden pier extends from the jetty about 850 additional feet into the Sound. This is referred to as the Ken Combs Pier. There is existing parking for cars only, a compact grassed area to the north of the boat ramps, a narrow fringe of marsh grasses adjacent to the ramps on the west side and a comfort station with beach showers and restroom facilities.

The nearshore slope extending from the boat ramps is very gentle, with less than a three foot vertical drop over a horizontal distance of 1,300 feet. The length of the beach to the east and west of the existing facility is interrupted with a series of shore-perpendicular storm drains that extend approximately 360 feet from Highway 90 into the Sound. These storm drains act as groins trapping sands from westward littoral drift resulting in a scallop-shaped shoreline. To the west of the project site is sand beach extending approximately 2.5 miles to the Gulfport Harbor. To the east of the proposed project area is sand beach for approximately 5 miles to the President Casino/Broadwater Marina complex.

Physical Characteristics

Wind and Waves

The annual dominant wind direction is from the easterly directions while winds from the north and south are frequent. In the spring, prevailing winds are southeast having a strong eastern component. The summer months show equal frequencies of east, southeast and southerly wind directions. The dominant spring and summer wind patterns result from the expansion of the Bermuda High causing prevalent southeast and easterly winds. The passage of continental cold fronts in the fall and winter follows the decline of the Bermuda High. At this time, the

predominant winds come from the northern quadrants. East and northeast winds prevail in the fall while in the winter months winds from the north, northeast, east and southeast occur equally. The annual resultant wind direction is from the east. In both the fall and winter seasons the resultant wind direction is east-northeasterly while in the spring, east-southeasterly winds result and in the summer, southeast. Weather station data indicate mean monthly surface winds are less than ten knots eighty percent of the time throughout the year. In addition to these macro climatic conditions, the sand beach/shore interface creates a diurnal land and sea breeze phenomenon. Differences in land and water temperatures create a landward breeze during daytime hours and a seaward flow during nighttime hours. The resultant winds along the immediate coast are often much stronger than those recorded at weather monitoring stations. This effect is most prevalent during the summer months corresponding with the peak of boating season and can create afternoon breezes in excess of 15-20 knots at the shoreline.

There are no known, comprehensive wave studies or wave data bases available for the project area. Because the barrier islands provide protection to the mainland from storm generated waves in the Gulf of Mexico, wave height and direction along the front beach of Harrison County result from the prevailing wind direction and intensity. Limited fetch across the Mississippi Sound and the overall shallow water depths limit wave height. Waves breaking on the beach are commonly less than one foot, although, higher wave heights can occur. Waves can physically approach the front beach from the eastern, southern and western directions, however, the predominant wave approach is from the east and southeast. Waves approaching the beach from these directions set up westward flowing currents and result in westward drift of sediments.

The project area is fairly well protected by the existing jetty from wind generated waves approaching from the east, southeast and southern directions. However, the jetty offers no protection from waves traveling from the southwesterly directions. These conditions are common during summer afternoons when the majority of boaters are returning from a day out on the water.

Tides

Tides in the proposed project area are microtidal i.e., the tidal range is less than 6 ft. (2 m). However, both astronomical and meteorological tides influence the area. Astronomical tides are diurnal, i.e. usually one high and one low water per day with an average tidal range of approximately 2 ft. (0.6 m). Tidal range fluctuates seasonally with a minimal range of 0 to 1.5 ft (0.5 m) during the winter months and a maximum range of 2 to 3 ft (0.6 to 0.9 m) during the summer months. Because of the minimal tide range of the area, meteorological conditions often exert a strong influence on local tide elevations. Strong southerly winds push water into the area exaggerating and often maintaining high water conditions. Strong northerly winds push water out of the area exaggerating and maintaining low water conditions often resulting in the exposure of large sandy shoal areas in the nearshore.

Sediments

Sediment all along the front beach was dredged from offshore borrow pits and deposited as part of an effort to protect the seawall and Highway 90. The sediment consists mostly of quartz sand and silt with little organic matter. Because the front beach renourishment project was completed in one effort with sediment dredged from the same sand deposit, it is assumed for purposes of this project that sediment samples taken along transects anywhere along the front beach would be comparable. Therefore, to help assess if the sediments that may be dredged for construction of the boat launch renovation can be used as potential renourishment sands on the downdrift beaches, grain size data from eleven sediment samples previously collected along a transect 6 miles to the east of the project site were used. The transect trended perpendicular to the shoreline, starting on the beach and continuing into the nearshore for 1,300 feet. Samples were taken every 200 feet or closer if deemed necessary. Standard sieve analysis was completed by Micro Methods, Inc. using one-phi mesh diameter intervals.

Grain Size Analysis

There is little variation in the size distribution of sediments collected from within the nearshore (samples 1300, 1100, 900, 700, 600, 500, 300 and 100 feet). In these samples, the modal grain size (the most frequently occurring grain diameter) is 2.75 phi (0.15 mm). This grain size comprises over 60 percent of each sample. Grain sizes of 1.75 phi (0.3 mm) and 3.75 phi (0.08 mm) comprise between 10 and 30 percent and 5 and 9 percent respectively. Each of the other grain sizes comprised less than 3 percent of the sample. The distribution of grain sizes in the swash line (foreshore) and two beach (berm) samples differed slightly from the samples collected in the nearshore. There were two modal grain sizes in the swash line sample, 0.75 and 1.75 phi (0.6 and 0.3 mm) with smaller percentages measured for the other grain sizes. This sediment is described more as medium and coarse sand. This is not surprising because higher energy levels exist in the foreshore and result in more efficient winnowing of fines from the sediment leaving the coarser sediment behind. Based on these data, these sediments are classified as fine and medium sands. In general, the grain size distribution of the sediments collected along the transect are similar. As expected, the sediments in the nearshore are slightly finer than those on the beach. The fines of the beach sediment are winnowed out by wave action and transported aerially by winds leaving higher percentages of coarser sediment.

Sediment Transport

In general, there are three forces that affect the transport of sediment on beaches: waves, wind and currents. The dominant forces along the Harrison County beaches include waves and winds. While nearshore currents also contribute to sand transport within the beach system, currents within the project site are interrupted by the jetty and are considered minimal or null.

Because the dominant wave direction is from the southeast (resulting from the prevailing winds) littoral drift processes cause alongshore sediment transport to be toward the west along the front beaches. Westward moving sediment is trapped on the east side of shore perpendicular structures e.g. the existing jetty. Consequently, sediment accretes on the east side of structures, can no

longer move toward the west and is, therefore, no longer available to replenish beaches on the downdrift side of structures. This results in erosion on the downdrift beaches of shore perpendicular structures.

Wind also results in loss of sediment from the beach system. Winds carry sediment from the beaches where they become trapped by the stepped seawall. As the steps of the seawall become progressively filled, the seawall resembles more of a ramp which then facilitates the movement of sediment off the beach. The wind blown sediment accumulates on the parking bays, medians and roadway of Highway 90. This can represent a substantial amount of sediment lost from the system if during highway sediment removal work, the sediment is not returned to the beach. While there is no sand beach directly shoreward of the existing facilities, there is sand beach on both the east and west sides.

Sediment Budget

Sediment losses from the Harrison County beaches result from longshore, offshore and airborne processes. The following estimates are from information obtained from the Harrison County Sand Beach Master Plan.

Offshore Sediment Transport. The majority of offshore sediment transport occurs during high energy events where wave energy tends to remove sediments from the berm and deposit them onto offshore bars or beyond. Offshore sediment transport resulting from this type of wave action is the most difficult to quantify. It is estimated that annual offshore losses resulting from this type of transport amount to less than 0.25 cubic yards per front foot of beach or approximately 27,000 cubic yards per year.

Airborne Sediment Transport. Airborne sediment transport results when winds are strong enough to carry sediment across the beach and ultimately over the seawall and out of the system. It is estimated that sediment losses resulting from this type of transport are on the order of 0.50 cubic yards per front foot of beach per year. This type of sediment transport is considered a loss to the system because sand removed from the parking bays and roadway is trucked to upland disposal sites and not returned to the beach. It is estimated that the airborne component of sediment transport is responsible for approximately one-half of the total sediment loss from the beach system.

Longshore Sediment Transport. Longshore sediment transport within the proposed project area is from east to west. Sediment transport rates are dependent on wave height and wave approach angle. It has been shown that for an uninterrupted beach, (i.e. a beach with no perturbations such as storm drains or harbor extensions), with waves approaching at a 15 degree angle, the sediment transport rate increases rapidly with breaking wave height. Table 1. shows this relationship. Estimates of the effective wave height is on the order of one-half to one foot and therefore, the net annual longshore sediment transport without the effects of shore perpendicular structures would range between 38,000 and 216,000 cubic yards. However, the existence of shore perpendicular structures greatly reduces these estimates. With the existence of perpendicular interruptions along the Harrison County beaches, it is estimated that annual losses due to

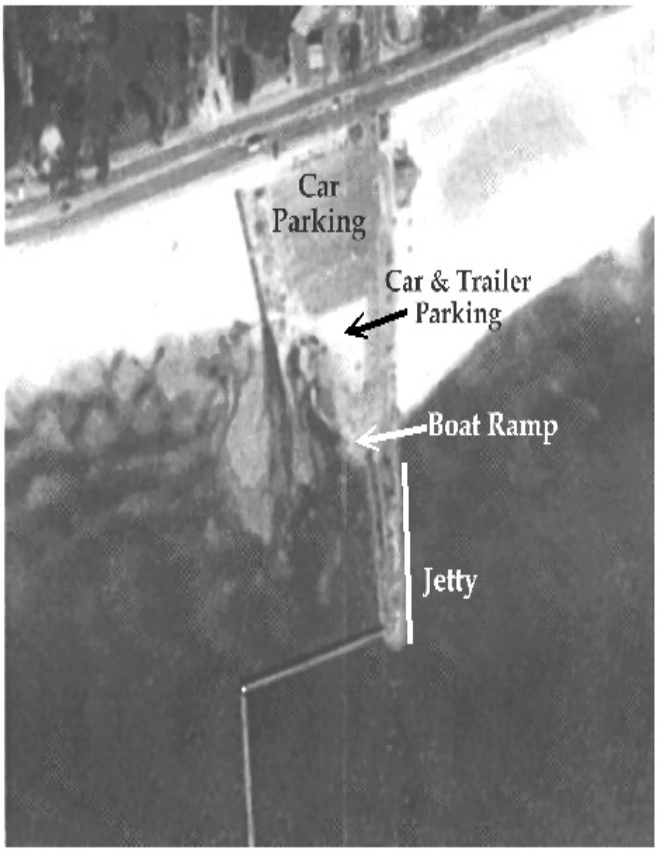
longshore sediment transport, primarily around the groin at Henderson Point, amount to approximately 20,000 cubic yards. The effects of this type of sediment transport near the proposed project site can be seen at each storm drain. Sediment is accumulating on the eastern side of the drains and erosion is occurring on the western (downdrift) side resulting in the scalloped shape of the shoreline.

Table 1. Computations of Net Annual Longshore Sediment Transport, Q. *

Wave Height H (ft)	Annual Rate of Net Longshore Sediment Transport, Q, (yd^3/yr)
0.5	38,000
1.0	216,000
1.5	596,000

* Computations are based on $Q = K H^{5/2} \sin 2á$ and a wave angle of 15 degrees where K is a constant, H = breaking wave height and á = angle of breaking wave (from Harrison County Sand Beach Master Plan 1986).

Figure 3.



Site Development Recommendations

No site design plans were available for review during this assessment. The site development considerations discussed in the next section are based on the existing site configuration shown in Figures 3 through 5. Incorporating the existing facilities and utilizing space previously developed minimizes construction and material costs, impacts to the environment and existing use of the facility. All elements of this

Figure 4.

design are schematic; all measurements and quantities are approximate. Final determinations can be made when engineered plans are available.

The degraded boat launch ramp is of sufficient size to accommodate the anticipated demand without expansion into the adjacent marsh area. Upgrading this ramp would include placing a new concrete launch ramp capable of launching/retrieving three or four boats at a time and constructing finger piers appropriately to assist boaters while launching and retrieving their boats. An access channel from the open Sound to the boat launch area would have to be dredged. Based on access channel dimensions from a boat launch facility proposed along the front beach in Biloxi, it is suggested that the channel be dredged 40 feet wide and to a depth of 5 feet. Estimates indicate that the length of the channel would be approximately 1,200 feet.

Figure 5.

The existing jetty provides sufficient protection to the boaters from waves approaching from the east and southeasterly directions. Extending the jetty toward the southwest with a detached breakwater will add protection from the southerly wave approaches and help maintain water quality by allowing flow between the end of the existing jetty and the new breakwater. Estimates from aerial photography indicate that the detached breakwater would be approximately 260 feet long. It is also suggested that an additional detached breakwater (approximately 300 feet) be constructed on the other side of the dredged access channel with an approximate northwest-southeast orientation. This breakwater would prevent wave approach from the southwesterly directions common in the afternoons during the height of boating season.

Existing parking is designed for cars only and is adequate to provide access for the public to enjoy swimming, fishing, picnicking and other beach-related activities. There is currently no area designed for car and trailer parking. A small grassed area with compacted substrate exists adjacent to the boat launch area. This location can be developed to provide car and trailer

parking for users of the renovated boat launch. The area is approximately 17,000 square feet in size and would support the installation of about 25 vehicle/trailer combination parking spaces. In addition, it appears that the existing paved parking lot is not being fully utilized so that a portion of what is currently designated as car parking might be converted to car/trailer parking.

Site Development Considerations

Dredging/Maintenance Dredging

Surface sediment samples obtained by CREC and analyzed by Micro Methods, Inc. show the predominance of fine to medium sands which are subject to littoral transport. Core samples should be obtained in order to determine if the dredged material at the designed depth (5' minimum) is suitable for deposition on the existing sand beach at the site. This could have a dramatic effect on dredging costs which might range from $5 to $15 per cubic yard. It is estimated that approximately 6,500 cubic yards of materials will have to be dredged from the access channel and launch basin. Consideration should also be given to timing the development to coincide with sand beach replenishment operations. A similar channel constructed perpendicular to the shoreline at the Broadwater Marina requires maintenance dredging every three years at an average cost of $100,000. During this time, the channel fills in reducing the desired maintenance depth by about four feet. However, it should be noted that the Broadwater channel is not protected by a jetty.

Jetties and Breakwaters

As noted above, the recommendations call for jetties to protect the channel from the predominant direction of littoral sediment drift, reduce sedimentation from other directions and more importantly, protect boats from waves and wakes while they are being launched and retrieved. Existing launch sites along the entire front beach from Biloxi Bay to Bay St. Louis protect boats by being located within harbor basins or taking advantage of existing shelter (e.g. Deer Island). This aspect of development is critical to the use of any unprotected area of the front beach shoreline. The wave energy in these areas, particularly during the times of strong afternoon sea breezes, is strong enough to make launching and retrieving boats problematic at best and could cause boat, trailer and vehicle damage at worst. The site as now configured is susceptible to southerly and westerly winds. Developers should plan on approximately 560 additional feet of breakwater at this site configured in a fashion to protect the site from wave energy while maintaining water exchange through the artificial basin. U. S. Coast Guard regulations stipulate that these structures will have to be marked with daytime/nighttime navigational aids.

Vehicle Access and Parking

Ease of vehicle access and on-site parking for vehicles and vehicles with trailers are critical components of boat launch facility development. Indeed, lack of these components is what creates underutilization at the otherwise suitable sites at Oak Street and Kuhn Street in Biloxi. The existing traffic controls and parking lot at the Courthouse Road site are positive factors

which should facilitate further development and expanded use of the facility, as well as reduce construction costs.

Water Quality

There is a potential for nonpoint source pollution to the waters at the site caused by vehicle crankcase drippings and bilge water discharge from boats. Adverse water quality impacts of this nature can be minimized by using permeable or semi-permeable material in parking areas and configuring jetties and breakwaters in a manner that facilitates water exchange through the basin. It is recommended that consideration be given to the use of permeable material such as gravel, fly-ash or shell as a paving material for the boat trailer parking area, and that the existing vegetative buffer along the adjacent shoreline be maintained.

User Conflicts

Positive benefits will accrue to fishermen because the rock jetty and breakwaters will serve as an artificial reef which attracts and holds marine life. It may be possible to incorporate a mechanism for accommodating shore-based fishermen into the design of the facility. It is suggested that some means of separating boaters from beach users on the west side of the facility be included in the development plans. This could possibly include a series of pilings with signs directing boaters to avoid the swimming area.

Cost Considerations

Any boating access facility located along the unprotected front beach away from existing navigational channels is inherently going to be expensive due mainly to increased dredging and jetty/breakwater construction requirements. For example, the current cost of a concrete rubble or rock jetty built by a commercial marine contractor ranges from $500 to $1,000 per linear foot ($100 per ton of material). Because this site will have to be developed to withstand high energy storm events, the cost will most likely tend toward the higher end of this range. At a cost of $800 per linear foot and the suggested requirement for 560 linear feet of jetties and breakwaters, this element of site development alone will cost $448,000. Dredging will add approximately $65,000 to the project costs. Other costs will include ramp renovation and parking lot expansion.

Renovating the Courthouse Road boat launch makes wise use of existing facilities and utilizes space previously developed. These actions substantially reduce construction and material costs and impacts to the environment.