Primary Battery File

National Archives, Washington D.C.

Record Group 77

Correspondence of the Chief of Engineers

Entry 103

File, Fort, Battery:

61757

Chesapeake Bay
Middle Ground Project
1905-12

Copy of 54140/232.

W/K

ENGINEER OFFICE, U.S.ARMY,
Room 2, Custom House,
Norfolk, Va.,November 1,1905.

Brig. Gen. A. Mackenzie,
Chief of Engineers, U.S.Army,
Washington, D.C.

General:

1. In reply to Department's letter of October 16,1905 (54140), I have the honor to submit a rough estimate of the cost of constructing an artificial island on the Middle Ground north of Cape Henry,Va.

2. This estimate can only be considered as a very rough one, as there has not been sufficient time for a thorough consideration of the character of sea-wall and breakwater to be constructed, or the proper type of foundation for the batteries.

3. In the letter above referred to, the area of the island to be constructed is stated as about 50 acres, which will require a perimeter of about 6,000 feet. The island should be made of sand, and be built up to at least ten (10) feet above mean low water. It will have to be inclosed within a substantial sea-wall, and, on the most exposed sides a detached breakwater may be necessary. All buildings and batteries would have to be constructed on pile foundations, but I have no data upon which to determine the length of the piles needed.

4. The following figures are offered as an approximate estimate of the cost:

6,000 linear feet of sea-wall, a $100----------	$600,000
2,000,000 cubic yards sand filling, a 50¢----------	1,000,000
5,000 linear feet detached breakwater, a $200----------	1,000,000
Four 12-inch emplacements, a $200,000----------	800,000
Four 6-inch emplacements, a $70,000----------	280,000
Four 3-inch emplacements, a $17,500----------	70,000
Total----------	$3,750,000

Very respectfully,
Your obedient servant,
E. Eveleth Winslow
Captain, Corps of Engineers,
U. S. Army.

1541 C.H.
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61,757/17

THE NATIONAL COAST DEFENSE BOARD.

Washington.

February 23, 1907.

Hon. William H. Taft,
Secretary of War,
President of the Board.

Sir:

The First Committee of the Board has the honor to submit the following supplemental report bearing on * * * * the artificial island proposed for the entrance to Chesapeake Bay.

* * * * * * *

Artificial Island at the Entrance to Chesapeake Bay.

In its report of Feb. 1, 1906, the Committee stated that for the defense of the entrance to Chesapeake Bay it is proposed to construct an artificial island about 50 acres in extent on the Middle Ground.

The most important of the three artificial islands which are utilized in the defense of the entrance to the Gulf of Tokio is only large enough to emplace the armament. In 1903, the General Board of the Navy recommended the construction of a breakwater in the vicinity of Cape Henry, Va., to afford a shelter for torpedo boats. With these facts in view the Committee recommends:

1. That the artificial island to be constructed on the Middle Ground between Capes Henry and Charles have a sheltered harbor sufficient in size to hold torpedo boats, submarines, and supply boats for garrison needs.

2. That the island be limited to the smallest size which will furnish emplacements for the armament recommended, for shelter for the stores and ammunition and parade ground enough to encamp the garrison.

3. That the General Board of the Navy be requested to indicate the amount of water space needed for the naval boats to be accommodated in the artificial harbor.

4. That all the heavy guns on this island have as far as practicable an all-around fire.

These considerations will modify the estimates heretofore presented for construction of this island; a revision will be made and submitted by the Chief of Engineers.

The proceedings of the Committee are hereto appended.

J. P. Story
Major General, U. S. Army.

C. S. Sperry
Rear Admiral, U. S. Navy.

William Crozier
Brig.Gen.,Chief of Ordnance,U.S.Army.

A. Mackenzie
Brig.Gen.,Chief of Engineers,U.S.Army.

Arthur Murray
Brig.Gen.,Chief of Artillery,U.S.Army.

Geo. W. Goethals
Major,General Staff, U.S.Army.

Approved:
Wm. H. Taft
Secretary of War.

Inclos. 15,16 4/Gen Map Files, Dr. 54, Sh. 26.

(Wrapper on 61757/4)

Wrapper on 10 H.R.

OFFICE OF CHIEF OF ENGINEERS

JAN 17 1907

61757/13

WAR DEPARTMENT.

Nos. 14-16 tracings

5 incs. E.D. No. 18, 6 p

Incs. 4-6, 9-12 accompg.

1st indorsement.

WAR DEPARTMENT,

OFFICE OF THE CHIEF OF ENGINEERS,

WASHINGTON.

January 10, 1907.

1. Respectfully referred to Maj. J.E.Kuhn, Corps of Engineers, who is requested to prepare and forward to this office the description called for in 4th indorsement.

2. There are inclosed a blue print of a rough pencil sketch on which the Taft Board estimates were based, and a copy of a report of November 1,1905, by Major E. E. Winslow, Corps of Engineers.

3. The metes and bounds, defined by reference to permanent and known points, such as the two light-houses at Cape Henry and Cape Charles, should form part of the description, and a plat showing the 50-acre area, in a shape to accommodate the armament shown on the blue print, should accompany. The blue print will fit on Coast and Geodetic Survey Chart 131, approximately.

By command of Brig. Gen. Mackenzie.

Francis V. Greene

Lieut. Col., Corps of Engineers.

A 61757 7-12; copy of 54140/232, 4 pp. from

O/K 2nd indorsement.
Engineer Office, U.S.Army,
Norfolk, Va., Jan.16,1907.

1. Respectfully returned to the Chief of Engineers, U.S.Army.

2. Complying with instructions in preceding indorsement, there is sent herewith a tracing, No. ~~1~~ 2, made from Coast Survey Chart 131, showing location of 50-acre tract, which coincides as nearly as possible with that indicated on blue-print sketch of the Taft Board. On tracing No.3 is shown an enlarged plat of the 50-acre tract, as recommended, with description by metes and bounds, the initial point being referred to existing light-houses on Capes Henry and Charles and on Thimble Shoal. On tracing No.3 are shown roughly the locations of the armament proposed by the Taft Board, the rectangles being the areas required for type batteries in accordance with the latest mimeographs. For the 14-inch battery the area required for 12-inch guns was taken, and the linear dimensions increased 50 per cent.

3. The shape of the 50-acre tract was taken as a square, with sides facing the main channels. The square form was selected as giving a minimum perimeter of seawall, and because this form appears to have been contemplated by Major Winslow in his report of November 1,1905.

4. In view of the small scale of the Coast Survey Chart and possible changes that may have occurred since its publication, a definite location for the proposed 50-acre artificial island is somewhat unsatisfactory. For this reason, and because the Act of the Legislature of Virginia authorizes the Governor to cede not to exceed 500 acres, it is suggested that it might perhaps be well to request cession of a much larger tract than 50 acres, so that some latitude will exist for locating the artificial island in the best possible position as may be determined by a future survey, and at the same time provide for room for any breakwaters which may be constructed about the island.

5. To enable the Department to avail itself of this suggestion, should it see fit to do so, a tracing, No. ~~2~~ 3, is transmitted, showing plot of 459 acres, suitably described by metes and bounds.

Joseph E. Kuhn

Major, Corps of Engineers,
U.S.Army.

Wrapper on 10 H.R.
10 H.R., and inclos. 1-8 accompg., and 9-11 (tracings, addl. 2nd indt.) in sep. pkge.

61,757/13

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
WASHINGTON.

February 28, 1907.

Maj. Joseph E. Kuhn,
Corps of Engineers,
Norfolk, Va.

Major:

1. A deed of conveyance from the Governor of Virginia for the 459.1 acres of submerged land at the entrance to Chesapeake Bay has been received, and has been sent by the Secretary of War to the Attorney General with request for his opinion on the title.

2. Your original tracing showing the land was attached to the Governor's deed. A blue print from this tracing is sent herewith, with the tracing sent with your letter of February 2, 1907, as a copy of the former.

3. It will be noticed that the tracing sent as a copy does not agree with the earlier drawing in several respects; the description of site in upper left hand corner is omitted; the shore lines are omitted; the degrees of latitude and longitude are differently marked, and the tracing is marked No. 2 while the earlier drawing was marked No. 1. The references to your tracings Nos. 1 and 2 in paragraphs 2 and 5 of your indorsement of January 16, 1907 (wrapper on your 10 H.R.), were reversed.

4. You are requested to make the inclosed tracing agree with the blueprint of the original drawing, and to return both to this office, retaining such copies as you may desire.

By command of Brig. Gen. Mackenzie:
Very respectfully,

Lieut. Col., Corps of Engineers.

61757
Inc.22 and b.p. of Inc.14
in sep. roll.

Subject:—

THE BOARD OF ENGINEERS.

ARMY BUILDING.

New York City December 14, 1907.

Major E. Eveleth Winslow,

Corps of Engineers,

Office of the Chief of Engineers,

Washington, D.C.

My dear Major:

I have yours of the 12th instant. We received back on the 11th the Board's letter of November 12, 1907, to the Department requesting information as to the amount of water space needed for the Navy in the artificial harbor to be constructed in Chesapeake Bay on which is indorsed information as to the area desired by the Navy for its probable use including space for supply boats for garrison needs in the artificial harbor, with a sketch showing suggested arrangement of torpedo piers and openings in the breakwater. It is assumed that these are the plans to which you refer.

Very truly yours,

D W Lockwood

Colonel, Corps of Engineers,

Senior Member of Board.

Chesapeake Bay 1/11

61,757/40

OFFICE OF CHIEF OF ENGINEERS

DEC 17 61757 1907

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WAR DEPARTMENT.

New York, N. Y.,
Dec. 14, 1907.

COL. D. W. LOCKWOOD, SENIOR MEMBER,
THE BOARD OF ENGINEERS.

Acknowledges receipt of certain mentioned plans, and states that it is assumed that these are the plans referred to in Major Winslow's letter of Dec. 12, 1907.

A

O/K

Chesapeake Bay 1/1

THE BOARD OF ENGINEERS
RECEIVED NOV 4 1907
Rec'd back, The Board of Engrs June 29/08

ENGINEER OFFICE, U. S. ARMY,
ROOM 2, CUSTOMHOUSE.

Norfolk, Va., October 23, 1907.

Brig. Gen. A. Mackenzie,

Chief of Engineers, U. S. Army,

Washington, D. C.

General:

1. Complying with instructions contained in letter from the Office of the Chief of Engineers dated July 2, 1907, file number 54140, 360 I have the honor to submit the following report relative to an estimate for the construction of an artificial island at the entrance to Chesapeake Bay, including all Engineer work involved in the defenses at this point.

2. As any estimate, to be reliable, must be based upon fairly definite plans, preliminary drawings have been prepared, showing, in a general way, what is proposed to meet the conditions imposed by the armament to be emplaced and by the approved recommendations of the National Coast Defense Board.

SIZE AND SHAPE OF THE ISLAND.

3. The size and shape of the proposed artificial island will necessarily be governed by the following considerations:

(a) Provision for emplacing the prescribed armament so as to permit of the most effective fire.

(b) Provision for the needed space for the various accessories to the fortifications, such as electric power plant, range-finding stations, and searchlights, and for the accommodation of a garrison,

including a water supply.

(c) Economy of construction.

4. As the National Coast Defense Board has made no recommendation as to the manner in which the designated armament shall be disposed, it becomes necessary, in the first instance, to give consideration to this most important matter, which, more than anything else, influences the shape and size of the island.

5. The National Coast Defense Board has recommended that all-round fire carriages be employed as far as practicable. As no all-round fire carriages have as yet been provided by the Ordnance Department for any calibre larger than 10-inch, and as it would be impossible to utilize all-round fire without firing over adjacent guns on so restricted a site, it has been assumed that all-round fire carriages are not practicable, and that L. F. carriages will afford as great a field of fire as is needed or desirable under the conditions as to site.

6. In the absence of any type plans for 14-inch batteries, it has further been assumed that these will resemble, in general, the latest type plans for 12-inch batteries, the dimensions of the former exceeding those of the latter 15%.*

7. After considerable study to reconcile conflicting requirements, the tentative disposition outlined on sheet A herewith is recommended for adoption. The 14-inch guns, with the 6-inch guns in second line, are placed to sweep the main channel on the Cape Henry side, while the 10-inch and 3-inch guns bear on the water areas on the Cape Charles side. Both the 14-inch and 10-inch guns are capable of fir-

*NOTE: The type 12-inch battery is 12% greater front and 8% greater depth than the type 10-inch battery.

ing through 170° feet of arc, and all batteries are separated so that they cannot fire over one another. The 14-inch and 10-inch batteries mutually cover each other, while the smaller batteries are fairly sheltered by the larger ones. In the intervals between batteries there is ample room for the construction of bombproof casemates to serve as battle quarters for the garrison and to shelter the electric power plant and the military stores.

8. The fields of fire of the several batteries, and the guns bearing on the various water areas, are indicated on Sheet C.

9. With the batteries located as shown, the smallest island to contain them will be obtained by circumscribing a perimeter at a distance from the foot of the outer slopes sufficient to avoid a surcharge on the retaining wall, and to insure protection of these slopes from any waves splashing over the sea-wall. A distance of 50 feet has been allowed for this purpose. The resulting island will contain a total of 21.521 acres, of which about 10 acres will be occupied by the batteries, leaving about 12 acres available for garrison purposes, which is deemed sufficient. As a potable water supply from artesian wells seems doubtful, it is proposed to collect the rain water falling on the upper concrete slopes of the batteries and store the same in sunken cisterns located behind the batteries where they will be fully protected.

10. As already stated, the intervals between batteries afford abundant space for bomb-proof casemates to shelter troops in time of battle, the electric power plant, and the reserve military stores.

11. The horizontal dimensions of the island will be insufficient to provide a horizontal base to meet the requirements of the range

and position-finding systems, and it will be difficult to locate stations giving suitable intersections over all the water areas to be defended. Stations on the artificial island, in conjunction with stations at Cape Henry and on Fisherman's Island, will, however, cover the outer water areas sufficiently well. Any range stations required on the artificial island may be located advantageously in chambers sunk in the parapet in the intervals between batteries.

SEA-WALL.

12. The sea-wall enclosing the island must fulfill the following conditions:

(a) Possess stability sufficient to prevent overturning from the pressure of the fill.

(b) Be capable of resisting wave action.

(c) Be sufficiently tight to prevent escape of the sand fill.

13. As the island will be but partially surrounded by a breakwater, it will be exposed to considerable wave action throughout a portion of its circumference. The greatest low water depth at the site is about 16 feet, with a mean rise of tide of about 2.7 feet. With this depth of water, and with the considerable fetch of the wind from all quarters, waves of some height must be reckoned with on all sides. Under the heading of the breakwater, it will appear that protection from waves must be provided by a breakwater covering the north and east sides of the island, and that on the south and west sides the breakwater may be omitted. No data exist as to wave heights to be expected with southerly and westerly winds, but, considering the maximum fetch of the wind in these quarters, and comparing with observed effects at other localities where similar con-

ditions exist, it is assumed that waves in excess of 7 feet will not be encountered. In the case of shallow water waves, such as are under consideration, the crest will be about 2/3 of the wave height above still water level. Considering, then, a 7-foot wave at high tide (elevation 18.7), the crest of the waves will be, approximately, 23.4 feet above mean low water. This would indicate that the top of the sea-wall should be at an elevation of at least 26.0, or 10 feet above mean low water, to prevent flooding of the island, and this height is taken as the minimum permissible. Even with this height, waves will break over the sea-wall on the exposed sides, and will necessitate some form of paving or rip-rap on top of the sand fill adjacent to the wall to prevent displacement of the fill. In calculating the stability of the sea-wall against overturning, it has been assumed that, owing to capillary action, breaking waves, and rain, the sand fill may become saturated to such an extent as to permit of a fluid pressure against the back of the wall equal to a head of 26 feet. The cross-sections shown on Sheet A will give a concrete wall possessing a factor of safety of 2 against overturning under the worst possible conditions, a factor of safety none too large to resist blows from waves, and to provide a margin for possible surcharges. The proposed wall contains 9.67 cubic feet of concrete per lineal foot, if founded directly upon the sand. It is proposed to build the mass of the wall of concrete in the proportion of 1 cement, 2-1/2 sand, and 5 broken stone, with about 1/3 of the volume composed of stones of about 500-pounds weight. For the sea face the concrete will be made somewhat richer for a depth of about one foot to obtain a more durable wearing surface.

14. On the sides of the island protected by the breakwater, it is believed that wave action will be practically negligible, but on the exposed sides it is deemed expedient to rip-rap the outside toe of the wall, as shown on the cross-section, to protect the bottom from scour by reflected waves.

15. The exposure and depth of water at the site present serious difficulties, and a certain and economical method of constructing the sea-wall is not easy of solution. The deposit of concrete blocks under water will leave open joints through which the sand fill can escape, and this method is accordingly deemed injudicious. Re-inforced caissons to be floated into position and sunk, if made of sufficient strength to resist blows from waves, will not possess sufficient buoyancy to permit of their being floated directly into position, and would have to be buoyed by some means such as pontoons. Steel caissons possessing sufficient strength will be quite expensive. After considering a number of feasible methods, I am of the opinion that a coffer-dam, using some form of interlocking steel sheet-piling, offers the most promising solution, as, if successful, it will permit the sea-wall to be founded directly on the bottom, with a tight joint, and admit of accurate control of the work. Before attempting to pump out the ~~caisson~~ coffer-dam, it is proposed to deposit about 5 feet depth of concrete under water, either in bags, or from special buckets adapted to the purpose.

THE BREAKWATER.

16. From a consideration of the map C herewith, it will be noted that the site of the proposed island and breakwater is an elongated shoal, having a general direction from N. W. to S. E. Within the

18-foot contour this shoal is about 9 miles long, with a maximum width of about 2,500 feet. The shoal lies almost exactly midway between Capes Charles and Henry, and 6 miles from either. On the northerly side of the shoal the ocean bottom slopes quite gradually, averaging about 5 feet per 1,000 feet, while on the southerly side the slope is more steep, being about 25 feet in the first 1,000 feet.

17. In considering the exposure from different directions, consideration should be given, not only to the direction of the prevailing storms, but to the protection afforded by outlying shoals and the limit to the fetch of the wind.

18. From the north, around by the west, to the south, there are shoal areas, and the fetch of the wind is limited by the distance to the nearest mainland. From the northeast to the southeast the site is exposed to the greatest fetch of the wind, and it is in this sector that the heaviest waves will be encountered. With the wind anywhere between northeast and southeast, the heavy ocean waves roll in through the entrance between the capes and attain their greatest height.

19. A study of the wind records covering the years 1905 and 1906 reveals the fact that the wind travel from the northerly half of the compass greatly exceeds that from the southerly half. A study of the records of exceptionally heavy storms for 10 years past shows that these storms likewise all ~~course~~ come from the northerly half of the compass.

20. On Sheet B herewith there will be found, plotted to scale, the number of miles of wind travel during 1905 and 1906, considering only those winds which attained a velocity of 20 miles per hour, and a

duration of one hour or more. Separate diagrams on the same sheet show also the number of wind storms for 1905 and 1906 in which the wind travel exceeded 500 miles in 24 hours. A consideration of these diagrams shows plainly that the prevailing heavy winds all come from the northerly half of the compass. Fortunately, owing to the shoals to the west, northwest and north, and the comparatively short fetch of the wind from these quarters, the exposure is not so great as would appear from the wind records. On the other hand, all winds with an easterly component, especially northeast winds, give rise to heavy easterly swells, which call for substantial protection.

21. After a due consideration of all the data bearing on the matter, I am of the opinion that the artificial island should be protected by a breakwater from the northwest to the southeast quarter, essentially as shown on Sheet A, the cross-section being varied to suit the degree of exposure. The breakwater is shown with the outer crest of the superstructure at a distance of 400 feet from the sea-wall. This distance was determined from a consideration of providing anchorage and maneuvering space for torpedo boats, and of keeping the breakwater in as shoal water as possible. This distance is also thought to be sufficient to permit of the dissipation of waves breaking over the breakwater before they reach the sea-wall.

22. In considering the cross-section of the breakwater, consideration has been given to the fact that full and complete protection of the water area behind it is unnecessary, and that its function is to break the force of the waves only partially. The several cross-sections proposed are shown on Sheet A. The substructure is a rubble mound, the sea face having a slope of 1/3, and the harbor face a

slope of 1/1. The exterior slopes are protected by quarry blocks not less than 6 tons for the sea face, nor less than 4 tons for the harbor face, the greatest dimensions of the facing blocks to be not greater than three times the least dimension. The mass of the substructure consists of rubble stones not less than 250 pounds weight. The superstructure consists of concrete blocks built in situ, each layer to be 3 feet thick and to measure from 12 to 30 feet along the axis of the breakwater.

FOUNDATIONS.

23. Accurate data as to the character of the material underlying the site of the island and breakwater are, unfortunately, not available, and cannot be procured without systematic borings at considerable cost. The formation of the subsoil at Fort Monroe has been well established by borings, but this is of no value for a site over 16 miles distant. So far as revealed by soundings, the material of the shoal is hard and compact. A single boring, made for the purpose of this report, with the floating plant available in this district, established the fact that for a depth of 16 feet below the bottom the material consists of a fine, dark-grey sand, with only a slight trace of mud at the lowest level. The material of the bottom adjacent to the site, in depths up to 8 fathoms, as shown on the Coast Survey Chart, is generally hard, and it is reasonable to suppose that the material of the shoal consists of sand at least to an equal depth. From the nature of the shoal, and a consideration of the general geology of the region, it is extremely unlikely that any better foundation material than sand will be encountered at any feasible depth, and the only question is, whether the sand stratum which

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now overlies the shoal is of sufficient thickness to support the load without undue settlement, which would occur should a layer of soft material underlie the sand stratum at too short a distance. Experience at Fort Monroe has demonstrated that a sand stratum about 20 feet thick overlying about 15 feet of thickness of exceedingly soft material will support, without settlement, all the forces due to the dead loads and shock of firing caused by the most powerful 12-inch batteries in the service. The question of foundations is so important that no final designs for either breakwater or sea-wall should be determined until the whole area involved has been systematically explored by adequate borings.

24. With regard to the foundations of the batteries, I am of the opinion that piles will serve no very useful purpose. If the fill of the island be made of clean sand, deposited by hydraulic dredges, it will become so compacted and confined by the sea-wall that future settlement will be but little. If, as seems most likely, no hard stratum at a reasonable depth underlies the shoal, piles driven into the undisturbed material of the shoal will not increase the bearing power of the foundation. In my judgment, a continuous re-inforced concrete slab underlying the concrete portions of the battery will afford the best foundation possible. To allow for some settlement in the fill, it is proposed to place the floor of the magazines at reference (11.0), or one foot higher than the level of the fill. In view of the instructions contained in Department letter of July 2, 1907, an estimate for a pile foundation is included. The piles should be of re-inforced concrete, about 2 feet in diameter at the butt, and long enough to penetrate the original material of the

shoal about 2 feet, and spaced 5 feet apart on centers, in both directions, for the heavy guns, and 6 feet on centers for the rapid-fire guns.

THE FILL.

25. As it appears undesirable to disturb the material of the shoal upon which the island and breakwater will be founded, material for the fill should be obtained from some other convenient shoal, of which there are a number to the north, and placed behind the sea-wall with a rehandling machine.

ESTIMATES.

26. The site of the proposed island is over 16 miles from Fort Monroe, and 6 miles from either Cape Henry or Cape Charles. It is manifest that the execution of any extensive engineering project at a point so far removed from any practicable working base, and the necessity for an extensive floating plant, will increase the unit cost of the different classes of work, as well as the contingencies. Fishermans Island is the nearest point where a floating plant can find shelter in rough weather, and it might be possible to secure the use of this island from Marine Hospital service, to which it belongs, for use as a base of operations. In determining the tonnage of stone needed for the breakwater, it has been assumed that 33-1/3% of the volume of the substructure will be voids, and 16-2/3% of the superstructure will be voids.

ESTIMATE OF COST OF BREAKWATER.

176,544 short tons of medium stone for substructure, @ $2.00,	$353,088
96,508 short tons of large facing stone, @ $4.00,	386,032
Carried forward,	$739,120

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Brought forward,	$ 739,120
17,435 cubic yards concrete superstructure, @ $9.00,	156,915
	$ 896,035
Contingencies, 25%,	224,009
Total,	$1,120,044

ESTIMATE OF COST OF SEA-WALL.

34,648 cubic yards concrete, @ $15.00,	$519,720
4,000 tons rip-rap, @ $2.00,	8,000
	$527,720
Contingencies, 25%,	131,930
Total,	$659,650

ESTIMATE OF COST OF SAND FILL.

875,000 cubic yards, @ 30¢,	$262,500
Paving 5,000 square yards, @ $2.00,	10,000
	$272,500
Contingencies, 25%,	68,125
Total,	$340,625

ESTIMATE OF COST OF 14-INCH BATTERY.

Grillage, 5,926 cubic yards re-inforced concrete, @ $10,	$ 59,260.00
Concrete above grillage, 11,385 cubic yards, @ $10,	113,850.00
Four ammunition hoists, with motors, @ $5,000 each,	20,000.00
Stairs and hand-rails,	3,000.00
Hold-down bolts,	1,500.00
Trolleys and chain blocks,	5,000.00
Steel and grating doors,	2,000.00
Electric wiring,	5,000.00
Sand fill, 20,000 cubic yards, @ 50¢,	10,000.00
Clay, 625 cubic yards, @ $1.50,	937.50
Soil, 625 cubic yards, @ $1.50,	937.50
Sod, 50,000 square feet, @ 4¢,	2,000.00
	$223,485.00
Contingencies, 25%,	55,871.00
	$279,356.00
If pile foundation is used, add	
1,280 re-inforced concrete piles, @ $60.00 each,	76,800.00
Total,	$356,156.00

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ESTIMATE OF COST OF 10-INCH BATTERY.

Grillage, 3,583 cubic yards re-inforced concrete, @ $10,	$ 35,830
Concrete above grillage, 8,560 cubic yards, @ $10,	85,600
Four ammunition hoists, with motors, @ $2,500 each,	10,000
Stairs and hand-rails,	2,500
Trolleys and chain blocks,	4,000
Hold-down bolts,	1,000
Steel and grating doors,	2,000
Electric wiring,	3,000
Sand fill, 15,000 cubic yards, @ 50¢,	7,500
Clay, 500 cubic yards, @ $1.50,	750
Soil, 500 cubic yards, @ $1.50,	750
Sod, 40,000 square feet, @ 4¢,	1,600
	$154,530
Contingencies, 25%,	38,632
	$193,162
If pile foundation is used, add	
774 re-inforced concrete piles, @ $60.00,	46,440
Total,	$239,602

ESTIMATE OF COST OF 6-INCH BATTERY.

Grillage, 2,313 cubic yards re-inforced concrete, @ $10,	$ 23,130
Concrete above grillage, 5,450 cubic yards, @ $10,	54,500
Electric wiring,	2,500
Hold-down bolts,	1,000
Steel and grating doors,	2,000
Sand fill, 10,000 cubic yards, @ 50¢,	5,000
250 cubic yards clay, @ $1.50,	375
250 cubic yards soil, @ $1.50,	375
20,000 square feet sod, @ 4¢,	800
	$ 89,680
Contingencies, 25%,	22,420
	$112,100
If pile foundation is used, add	
580 re-inforced concrete piles, spaced 6 feet centers, @ $60,	34,800
Total,	$146,900

ESTIMATE OF COST OF 15-POUNDER BATTERY.

Grillage, 777 cubic yards re-inforced concrete, @ $10,	$ 7,770
Concrete above grillage, 1,650 cubic yards, @ $10,	16,500
Carried forward,	$24,270

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Brought forward,		$24,270
Steel doors and hold-down bolts,		1,000
Electric wiring,		1,000
Sand fill, 5,000 cubic yards, @ 50¢,		2,500
250 cubic yards soil and clay, @ $1.50,		375
10,000 square feet sod, @ 4¢,		400
		$29,545
Contingencies, 25%,		7,386
		$36,931
If pile foundation is used, add 195 re-inforced concrete piles, spaced 6 feet centers, @ $60,		11,700
Total,		$48,631

ESTIMATE OF COST OF CONSTRUCTING INTERVENING CASEMATES.

8,133 cubic yards concrete, @ $10,		$ 81,330
48,000 cubic yards sand fill, @ 50¢,		24,000
2,000 cubic yards clay and soil, @ $1.50,		3,000
80,000 square feet sod, @ 4¢,		3,200
		$111,530
Contingencies, 25%,		27,882
Total,		$139,412

ESTIMATE OF COST OF CENTRAL ELECTRIC PLANT.

Three 80 K. W. generators, direct-coupled to 125 H. P. engine, @ $5,000,	$15,000
Four 150 H. P. boilers, @ $4,000,	16,000
Outside conduits for mains,	10,000
Total,	$41,000

ESTIMATE OF COST OF RANGE STATIONS AND SEARCHLIGHTS.

Three 60-inch searchlights, @ $10,000,	$30,000
Three range-finding stations, @ $5,000,	15,000
Total,	$45,000

ESTIMATE OF COST OF WATER SUPPLY.

Five re-inforced concrete cisterns, each 20,000-gallons capacity, @ $2,000,	$10,000

61757/33

ESTIMATE OF COST OF CONSTRUCTING WHARF.

Metal pile wharf, 200 feet by 80 feet, ---------- $30,000

RECAPITULATION.

Cost of breakwater, ----------	$1,120,044
Cost of sea-wall, ----------	659,650
Cost of sand fill of island, ----------	340,625
Cost of 14-inch battery, ----------	356,156
Cost of 10-inch battery, ----------	239,602
Cost of 6-inch battery, ----------	146,900
Cost of 15-pounder battery, ----------	48,631
Cost of intermediate casemates, ----------	139,412
Cost of electric plant, ----------	41,000
Cost of range stations and searchlights, ----------	45,000
Cost of water supply, ----------	10,000
Cost of wharf, ----------	30,000
Total cost of Engineering work, ----------	$3,177,020

27. If pile foundations be omitted from the batteries, the sum of $169,740 should be deducted from the above estimate of cost of Engineering work, reducing the total to $3,007,280.

28. In conclusion, the plans and estimates as presented herein should be viewed as preliminary only. The magnitude and character of the work are such that plans and estimates should not be accepted as final until they have been more thoroughly elaborated and carefully reviewed by competent authority.

Respectfully submitted,

Joseph O. Kuhn

Major, Corps of Engineers,

U. S. Army.

10/27 H. R.

3 tracings in sep.pkge.

Through:
Lieut.-Colonel Dan C. Kingman,
Corps of Engineers, U. S. Army,
Division Engineer, Southeast Division.

CHESAPEAKE BAY
E.D.SAFE CASE 18 NO. 1

OFFICE OF CHIEF OF ENGINEERS,
OCT 31 1907
61757
33

WAR DEPARTMENT.

Norfolk, Va.
Oct. 23, 1907.

KUHN,

MAJOR JOSEPH E.

In compliance with Dept. letter of Jul.2'07 (54140-360), submits the within report relative to an estimate for the construction of an artificial island at the entrance to Chesapeake Bay, including Engineer work involved in the defenses at this point.

3 Inclos, E.S.
(tracings)

FORWARDED BY DIVISION ENGINEER.

REC'D BACK, OFFICE CHIEF OF ENGRS. JUL 6 1908
Inclos.

REC'D. BACK, OFFICE CHIEF OF ENGRS. MAY 2 1908
incs. 34-36 & 2 addl incs
accg.

OFFICE SAVANNAH, GA. OCT 25 1907

1st indorsement,
OFFICE OF DIVISION ENGINEER,
SOUTHEAST DIVISION,
Savannah, Ga.

October 29, 1907.

1. Respectfully forwarded to the Chief of Engineers, U. S. Army, with the following remarks:

2. The general plan and arrangement seems to me to be good and the estimates of cost seem to be ample. There are some criticisms that I should be disposed to make, viz:

(a) That the proposed artificial island is too small. The general shape of the island is pentagonal and the batteries and casemates occupy four of the five sides. This exposes the casemates and secondary batteries to reverse fire when the heavy guns are engaged. I am inclined to think that it might be necessary to erect a parados, perhaps in the form of a mound, to mask these secondary batteries. This would occupy considerable space and, therefore, a larger island would be required.

(b) The proposed seawall would produce a very neat finish, but I have some doubt of the practability of using a system of interlocking piling to form coffers. I think that the experience of contractors has generally been that these piles are so bent and sprung that you cannot use many of them the second time. I should be disposed to recommend that the area be enclosed by a rubble mound of large stone, coming up a foot or two above low water, and that this wall be covered on the island side with a very thick layer of small stone to fill the voids; that upon this gravel or shale or cinders be placed, and afterwards the sand banked up against it, and that the concrete wall simply be carried on the top of this structure from low water up to the desired height.

(c) I should recommend that the toe of the slope of the batteries be 100 rather than 50 ft. back from the crest of the seawall.

(d) I am inclined to think that the breakwater is too near the island to afford a useful space for harbor purposes. I should recommend that it be placed 1,000 feet cut from the island that it be built entirely of rubble stone; that its crest be held only 2 or 3 feet above extreme high water; that the upper portion of the structure be built of very large pieces of stone, placed so as to get a good bed and bond. If there is any material difference in the cost of large stone and small stone, then the core or heart of the breakwater should be made of the cheaper material, and the stone exposed to the full force of the waves should be of ten tons weight and upward.

(e) I should recommend that the seaward slope be at least as flat as 1 on 4, and the harbor slope 1 on 3.

3. Finally, I am of the opinion that a careful consideration of the engineering features, so

as to make use of that class of material and that method of construction which local conditions render the cheapest and most advantageous, will materially reduce the cost of the whole work.

Francis Bingman

Lieut. Col., Corps of Engineers,
Div. Engr., S. E. Div.

3 Enclos. in sep. roll.

2d *indorsement.*

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
WASHINGTON.

November 1, 1907.

1. Respectfully referred to The Board of Engineers, for consideration and report.

2. Attention is invited to pages 6,7,10,11,13, and 23, report of the Taft Board, and to the accompanying memorandum and extract from supplemental report of the Taft Board of February 23,1907, on the same subject.

A. Mackenzie

Brig. Gen., Chief of Engineers.
U. S. Army.

61757/33

Inclos. 34-36 in sep. roll.
Extract from 54140/360,& 1 addnl. inclo, accompg.

3d Indorsement
The Board of Engineers,
Army Building,
New York City, April 30, 1908.

Respectfully returned to the Chief of Engineers, inviting attention to the Board's report of this date on the within subject.

W W Ladmood

Colonel, Corps of Engineers,
Senior Member of Board.

Chesapeake Bay 1/1
Inclos.2,3 accompg.
Inclos.4-6 in sep.roll.

RECD. OFFICE CHIEF OF ENGRS MAY 2 1908

61757/33

See 54,140/71 and 54,140/232 for additional reports - Chesapeake Bay.

COPY

Subject:—

THE BOARD OF ENGINEERS.
ARMY BUILDING.

Rec'd Off. Chief of Engrs. June 29/08

Chesapeake Bay 1/6a

THE BOARD OF ENGINEERS,
RECEIVED DEC 11 1907

New York City November 12, 1907.

Brig. Gen. A. Mackenzie,
Chief of Engineers,
Washington, D.C.

General:

1. By 2nd indorsement of November 1, 1907, the report of Major Kuhn relative to an estimate for the construction of an artificial island at the entrance to Chesapeake Bay (61757/33) was referred to The Board of Engineers for report, and attention was invited to an accompanying extract from the supplemental report of the Taft Board of February 23, 1907.

2. In that extract occur the following recommendations of The First Committee of the Board, which recommendations were approved by the Secretary of War:

1. That the artificial island to be constructed on the Middle Ground between Capes Henry and Charles have a sheltered harbor sufficient in size to hold torpedo boats, submarines, and supply boats for garrison needs.

3. That the General Board of the Navy be requested to indicate the amount of water space needed for the naval boats to be accommodated in the artificial harbor.

3. In order that The Board of Engineers may fully comply with the instructions contained in the indorsement above referred to, I have the honor to request that action may be taken as set forth in recommendation 3 above quoted, and the result communicated to the Board.

Very respectfully,
Your obedient servant,

Wm. L. Marshall

Colonel, Corps of Engineers,
Senior Member Present.

Chesapeake Bay 1/6a

E.W. 61757/38

CHESAPEAKE BAY
OFFICE OF CHIEF OF ENGINEERS, DEC 1907
61757 NOV 1907 1305094
38 hls
WAR DEPARTMENT.

DEPARTMENT.

1657
47

New York City,
Nov. 12, 1907.

JOHN G. D. [redacted],
SR. MEMBER PRESENT,
THE BD. OF ENGRS.

Referring to E.D.ind.of Nov.1,1907, tes certain recommendations from ract from the supplemental report of Taft Bd.of Feb.23,1907,which were roved by S. of W. Requests that ion be taken as set forth in recom- dation 3 as quoted, & the result municated to The Bd.of Engrs.

9665 NAVY DEPT. SECRETARY'S OFFICE, Rec'd NOV 19 1907
4

03 GENERAL BOARD, Navy Department. RECEIVED NOV 23 1907

RECD. BACK, OFFICE CHIEF OF ENGRS. DEC 7 1907
RECD. BACK, OFFICE CHIEF OF ENGRS. MAY 2 1908
REC'D BACK, OFFICE CHIEF OF ENGRS. JUL 6 1908
Received A.G.O., NOV 16 1907

1st *Indorsement.*
WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
WASHINGTON.

November 14, 1907.

Respectfully forwarded to The Adjutant General, with recommendation that inquiry be made of the Navy Department as to what action has been taken by the Navy General Board in the matter of indicating the amount of water space needed for naval boats in the artificial harbor to be constructed in connection with the artificial island at the entrance of Chesapeake Bay.

A. Mackenzie
Brig. Gen., Chief of Engineers,
U. S. Army.

61757/38

2nd Indorsement. CLERK.
NOV 16 1907
WAR DEPT.

To the
Secretary of War.

A.G.O., Nov. 16, 1907.

Cor. 3:50 Nov. 16/07

3rd Indorsement.
War Department,
November 16, 1907.

Respectfully referred to the Honorable the Secretary of the Navy, with request for the information desired by the engineer authorities.

Robert Shaw Oliver
Acting Secretary of War.
Noted O.C. of E.

9665 NAVY DEPT. SECRETARY'S OFFICE, Rec'd NOV 19 1907
4

REPRODUCE

1657
47

No. 9665-4 D-Tn

4th ENDORSEMENT.

NAVY DEPARTMENT,

November 20, 1907.

SUBJECT:

JOHN G.D.KNIGHT, BOARD OF ENGINEERS, ARMY BLDG., NEW YORK:

Referring to Engr. Department indorsement of Nov. 1, 1907, notes certain recommendations from extract from the supplemental report of the Taft Board Feb. 23, 1907, which were approved by the Secretary of War. Requests that action be taken set forth in recommendation 3 quoted, and the result communicated to the Board of Engrs.

Respectfully referred to the General Board via the Bureau of Navigation for report and recommendation. The records of the Secretary's Office fail to show receipt of the previous indorsement of the War Department on the subject within mentioned.

By direction of the Secretary of the Navy:

Chief Clerk.

61757/38

GENERAL BOARD,
Navy Department.
RECEIVED NOV 22 1907
ENDORSEMENT.

5th
1657-47

S-D

November 22, 1907.

In re estimate for the construction of an artificial island at the entrance to Chesapeake Bay, etc., recommendations connected therewith, etc.

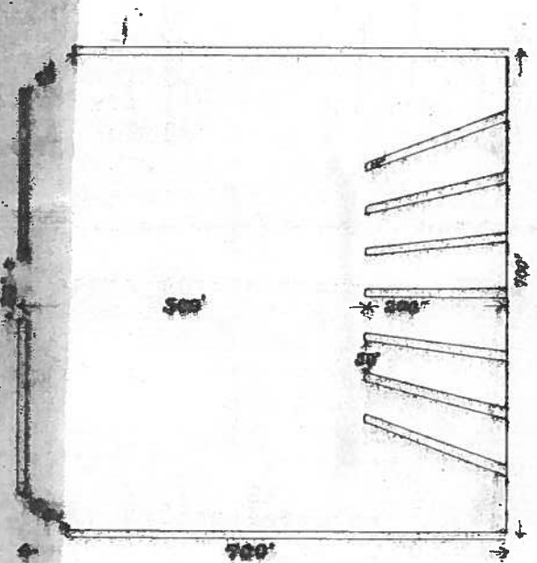
Respectfully forwarded to the General Board.

Chief of Bureau.

61757/38

G.B.No.403.

6. The sketch below shows the suggested arrangement of torpedo piers and the openings in the breakwater:



Admiral of the Navy,
President General Board.

61757/38

E.D. 61757/38

No.403. JJB

6th ENDORSEMENT.

GENERAL BOARD,
NAVY DEPARTMENT,
WASHINGTON, D.C.

Nav. 1657/47

December 2, 1907.

SUBJECT:

In re estimate for the construction of an artificial island at the entrance to Chesapeake Bay, etc., recommendations connected therewith, etc.
(November 29, 1907)

Respectfully returned to the Navy Department.

2. It is believed that if the proposed sheltered harbor on the Middle Ground between Capes Henry and Charles were given an area of about 500,000 square feet (approximately 700 feet square) it would be ample for all probable naval use and include space for supply boats for garrison needs.

3. Such a harbor should have three entrances, one at each corner of the westerly side and one in the middle of that side, the latter providing for the essential navigational requirement that the axis of the entrance shall approximately coincide with

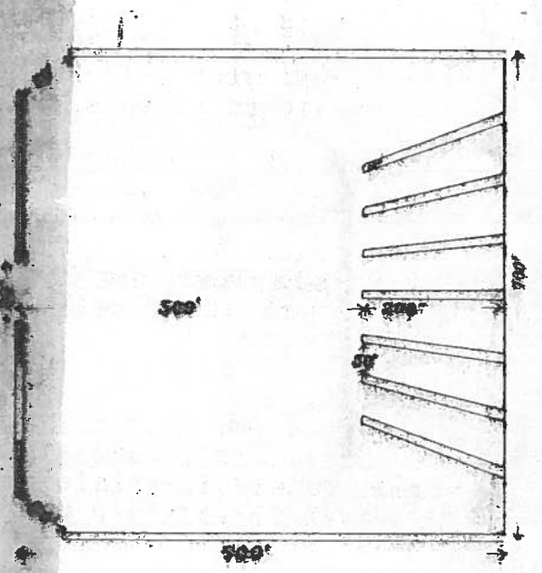
that of the principal tidal current. On the easterly side there should be provided piers for 12 torpedo boats and submarines and berths for two parent ships (large tugs) adjacent to the end piers.

4. The piers should be built on radial lines from the center of the middle entrance. They should be 50 feet apart in the clear at the ends thus permitting a submarine to be berthed on each side. They should have a minimum deck width of 10 feet. The middle pier should be 200 feet in length The ends of the piers should be on a straight line parallel with the side of the breakwater against which they abut. They should be provided with bollards for securing boats. Depth of water between piers should be at least 16 feet. Beyond the end of the piers and thence outside the breakwater in the vicinity of the entrances a minimum depth of 20 feet.

5. By berthing torpedo craft at piers, the sides of the breakwaters would, it is believed, afford all necessary berthing space for supply and other vessels belonging to the Army.

61757/38

6. The sketch below shows the suggested arrangement of torpedo piers and the openings in the breakwater:



George Dewey

Admiral of the Navy,
President General Board.

61757/38

9665 NAVY DEPT. SECRETARY'S OFFICE, Rec'd DEC 4 1907

No. 165-W-4

7th ENDORSEMENT. S-D

Enclosures.

SUBJECT:

December 3, 1907.

General Board: In re estimate for the construction of an artificial island at the entrance to Chesapeake Bay, etc., recommendations connected therewith, etc.

Respectfully returned to the Department, inviting attention to the 6th endorsement.

W H Brumby

Chief of Bureau.

61757/38

No. 9665-4 D-Tn

8th ENDORSEMENT.

61757/38

NAVY DEPARTMENT,

December 4, 1907.

SUBJECT:

COL. JOHN G.D.KNIGHT, BOARD OF ENGINEERS, ARMY BLDG.,NEW YORK:

Referring to Engr. Department endorsement of Nov. 1, 1907, quctes certain recommendations from extract from the supplemental report of the Taft Board of Feb. 23, 1907, which were approved by the Secretary of War.

Requests that action be taken as set forth in recommendation 3 as quoted, and the result communicated to the Board of Engrs.

Respectfully returned to The Honorable the Secretary of War inviting attention to the 6th endorsement hereon (No. 403) of the General Board, which contain the information within indicated by the Senior Member, Board of Army Engineers relative to the amount of water space needed for naval boats to be accommodated in the artificial harbor to be constructed in connection with the proposed artificial island on the Middle Ground between Capes Henry and Charles.

T. Newton

Sent Back A.G.O., DEC 5 1907 Secretary.

9th Indorsement.
To the C. of E.
A.G.O., Dec.6, 1907.

RECD. OFFICE CHIEF OF ENGRS DEC 7 1907

10th indorsement.

WAR DEPARTMENT,

OFFICE OF THE CHIEF OF ENGINEERS,

WASHINGTON.

December 9, 1907.

1. Respectfully returned to The Board of Engineers.

2. If in the consideration of this matter The Board of Engineers desires the attendance of Major Kuhn, he will, upon an application being made, be ordered to report to the Board.

David L Stone

Acting Chief of Engineers.

61757/38

11th Indorsement.

The Board of Engineers,
Army Building,
New York City, April 30, 1908.

Respectfully returned to the Chief of Engineers, inviting attention of the report of the Board of this date on this subject. A copy of this paper and its indorsements have been retained for the Board's files.

D W Thornbrough
Colonel Corps of Engineers
Senior Member of Board.

Chesapeake Bay

1/6

RECD. OFFICE CHIEF OF ENGRS MAY 2 1908

Subject:—

THE BOARD OF ENGINEERS.
ARMY BUILDING.

New York City April 30, 1908.

61757/43

Brig. Gen. A. Mackenzie,
Chief of Engineers,
Washington, D.C.

General:

1. In accordance with instructions contained in your indorsement of November 1, 1907 (61757/33), The Board of Engineers has carefully considered the project of Major Joseph E. Kuhn, Corps of Engineers, for the construction of an Artificial Island in Chesapeake Bay, its protective breakwater and sea wall, and his arrangement of the Armament fixed by the Taft Board thereon, and has the honor to recommend the following modifications to said project:

These modifications are shown in considerable detail on the tracings submitted with this report.

CHANGES.

2. (a)- The pentagonal shape of the Island is retained but its area is enlarged by extension to the westward to give space for the necessary barracks and quarters for the garrison and other post buildings.

(b)-The breakwater and sea wall traces are recommended to be broken straight lines, eliminating curves for structural reasons.

(c)-Both breakwater and sea wall to be constructed of rip rap stone foundations, with superstructure thereon, and having the interstices as well filled as practicable with smaller stone; for the breakwater such small stone varying from 300 lbs. to 20 lbs.

weight, and for the sea wall, especially on the land side, the stone to be graded down to gravel in order to retain the sand filling.

(d)-The Breakwater to be in cross section as shown on Major Kuhn's larger section, throughout.

(e)-The Sea Wall to be of the section shown on the tracing herewith; the rip rap foundation to be levelled at low water to 16 ft.wide at top with a superstructure of masonry laid in cement, or of concrete 8 ft.in height resting on a footing course of concrete approximately 2 ft.in thickness and 7 ft.wide. The back of the sea wall to be made reasonably tight by small stones, spalls, gravel and clay. The slopes of the rip rap walls are shown on the drawings.

(f)-A continuous parados is provided in rear of the guns, and the space between the arms of the parados to the extent of something over 4 acres is filled with earth or sand to within 5 ft. of the crest of the parados, and paved to furnish a catchment area for rain water. It is estimated that in round numbers one million gallons of water may be annually collected from each acre of this catchment area.

(g)-Under this catchment area and parados covered cisterns are placed with capacity of approximately one million and a quarter gallons,-sufficient to supply 10 gallons per day to 1200 men for 100 days. Rainfall may keep the cisterns full or nearly so under such rate of consumption.

(h)-There is also indicated under the parados and thoroughly protected against gun fire, a continuous bomb proof chamber

which may be subdivided as required, sufficient to shelter the garrison. Capacious flumes are provided to the bomb proof gallery which may serve both as ventilators and passage ways for chimneys or iron smokestacks for heating, lighting and culinary purposes. The Island is arranged to stand continuous bombardment for a long time and furnish bomb proof shelters for men and munitions of war.

(i)- The back slope of the parados from its crest to the paved catchment surface is paved with concrete about 2 ft. thick to cause the bursting of such shells as may strike it before they penetrate far into the parados.

(k)- An area sufficiently large for the permanent store houses that require free ventilation and light is provided between the protecting arms of the parados and the catchment mound, sheltered from all gun fire against the front and flanks of the Island.

(l)- A roadway is provided between the emplacements and parados for wagons or railroad for communications, and this roadway and the emplacements are covered against enfilade fire by bonnet traverses at each salient angle of the fortified line.

(m)- There is provided a harbor for torpedo boats and other small naval vessels, substantially as requested by the General Board of the Navy. To this end, the distance between the breakwater and sea wall on three sides of the pentagonal island has been reduced from 400 ft. proposed by Major Kuhn to 300 ft., and on the fourth exposed side increased to 700 ft. as requested by the General Board of the Navy. The minimum natural depth in this harbor and at the entrances is now 16 ft. at mean low water. This may be

increased to any desired extent in dredging material for the construction of the Island. The main entrances to this harbor are 150 ft.wide,at the ends of a detached breakwater sheltering the harbor.

(n)- The location of the post wharf has been changed so as to partially shelter the torpedo piers, and its dimensions increased to 200 x 300 ft.,giving 1.4 acres for storage purposes and warehouses thereon.

ARMAMENT.

3. The numbers and calibers of the guns to be emplaced has been determined by the Taft Board. The arrangement and fields of fire of all the armament except two 6-inch rifles,as given in Major Kuhn's project, have been accepted by The Board of Engineers. Two 6-inch rifles have been moved from the right flank of the broken line of the defenses to the left flank, the better to cover the minor channels between the island and Cape Charles and to provide,in connection with the other guns,an all around fire for the Island such that all positions of attack within range shall be covered by one or more guns of 6-inch or greater caliber without firing over the area provided for post buildings or over all the berths of naval vessels.

4. The Board of Engineers has not provided in this project for pile foundations as it is believed that the wide foundations provided by the sea wall and from 26 to 30 ft.of sand fill over the natural bottom will furnish suitable supports for the emplacements, but a careful examination by borings should be made before

75-1/43

adopting this opinion of the Board. Piles may possibly be indicated by such examinations.

ESTIMATE OF COST.

BREAKWATER.	
185770 tons of medium stone at $2.00	$ 371,540
115760 tons of large facing stone at $4.00	463,040
24200 cu.yds.of concrete at $7.00	217,800
	1,052,380
Contingencies 25%	263,095
	$1,315,475
SEA WALL.	
103960 tons of medium stone at $2.00	$ 207,920
43320 tons of large facing stone at $4.00	173,280
2270 cu.yds.of concrete footing at $7.00	20,430
5180 cu.yds.of stone in cement at $20.00	103,600
	505,230
Contingencies 25%	126,308
	$ 631,538
SAND FILL.	
1,220,300 cu.yds.at 30¢	$ 366,090
Contingencies 25%	91,522
	$ 457,612
GUN EMPLACEMENTS.	
Two 14"rifles,disappearing mount,	$ 300,000
Two 10"rifles, " "	160,000
Four 6"rifles " "	120,000
Four 3"R.F.guns,pedestal mount	30,000
	$ 610,000
INTERVENING CASEMATES (Major Kuhn's)	$ 139,412
PARADOS & TRAVERSES.	
117,500 cu.yds.sand at 50¢	$ 58,750
7,500 cu.yds.soil and clay at $1.50	11,250
13,600 cu.yds.concrete for bombproof & passages at $10.00	136,000
238,000 sq.ft.sod at 4¢	9,520
	215,520
Contingencies 25%	53,880
	$ 269,400
EMBANKMENT IN REAR OF PARADOS.	
103,240 cu.yds.sand at 50¢	$ 51,620
700 cu.yds.soil and clay at $1.50	1,050
	52,670
Contingencies 25%	13,168
	$ 65,838

57/43

WATER SUPPLY.

Seven reinforced concrete cisterns:	
4550 cu.yds.reinforced concrete at $20.00	$ 91,000
12690 sq.yds.concrete pavement at $2.00	25,380
	116,380
Contingencies 25%	29,095
	$ 145,475

WHARF.

Reinforced concrete piles, length of front 500 ft. at $60.00	30,000
Contingencies 25%	7,500
	$ 37,500

CENTRAL ELECTRIC PLANT (Major Kuhn's) $ 41,000

RANGE STATIONS & SEARCHLIGHTS.

Three 60" searchlights at $17,000	$ 51,000
Three range finding stations at $5000	15,000
	$ 66,000

COST OF GUNS & MOUNTS.

Two 14" disappearing at $132,000 (This item from Taft Bd. report p.29)	$ 264,000
Two 10" " at $57,877	115,754
Four 6" " at $19,705	78,820
Four 3" pedestal at $6,350	25,400
	$ 483,974

SUMMARY.

BREAKWATER	$1,315,475
SEA WALL	631,538
SAND FILL	457,612
GUN EMPLACEMENTS	610,000
INTERVENING CASEMATES	139,412
PARADOS & TRAVERSES	269,400
EMBANKMENT IN REAR OF PARADOS	65,838
WATER SUPPLY	145,475
WHARF	37,500
CENTRAL ELECTRIC PLANT	41,000
RANGE STATIONS & SEARCHLIGHTS	66,000
COST OF GUNS & MOUNTS	483,974
Total cost	$4,263,224

This estimate does not cover the cost of construction of the Torpedo piers.

1751/43

Respectfully submitted:

W. W. Goodwood

Colonel, Corps of Engineers.

Wm. G. D. Knight

Colonel, Corps of Engineers.

[illegible]

Colonel, Corps of Engineers.

E. W. Bebbitt

Lieut. Colonel, Ordnance Department.

Chesapeake Bay 1/13
Inclos: 2 tracings,
Sheet 1, showing site & fields of fire of batteries on artificial island;
Sheet 2, plan and sections of artificial island.

[illegible] 1st 4th Endorsement. Hq

OFFICE OF THE CHIEF OF ORDNANCE
Washington, Aug. 14, 1908.

1. Respectfully forwarded to the Quartermaster General, U.S.A. The plan of the Board of Engineers is satisfactory to this office.

2. The estimate given on page 7 within of the cost of guns and mounts should be changed to read as follows:

COST OF GUNS AND MOUNTS.

Two 14" disappearing at $132,000 (This item from Taft Board report, p. 29), ... $264,000
Two 10" disappearing, (rifles on hand) at $46,000, ... 92,000
Four 6" disappearing at $32,000, ... 128,000
Four 3" barbette at $8,000, ... 32,000.
Total $516,000.

Jno. T. Thompson
Major, Ord. Dept., U.S.A.,
Acting Chief of Ordnance.

Encls. 1 and 2 accompg.

E.N. 6, 1751/43

(1402112)

WAR DEPARTMENT,

THE ADJUTANT GENERAL'S OFFICE,

WASHINGTON, July 15, 1908.

Respectfully referred to the Chief of Coast Artillery, the Chief of Ordnance and the Quartermaster General, for remark.

The early return of these papers is desired.

By order of the
Secretary of War:

2 inclosures

Adjutant General.

3d INDORSEMENT.
WAR DEPARTMENT,
OFFICE OF THE CHIEF OF COAST ARTILLERY,
WASHINGTON, JUL
5648/42-B

1. Respectfully transmitted to the CHIEF OF ORDNANCE.

2. The project of the Board of Engineers is satisfactory to the Chief of Coast Artillery, except as to the number of range finding stations. The project should call for seven of these stations instead of three, as given in the enclosed report.

Arthur Murray

Brigadier General,
Chief of Coast Artillery.

2 Encls. E.D. 61757/43

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1. Respo
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The plan
Engineers i
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2. The
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COST OF
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p. 29),
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$8,000,

Major, C
Actin

ncls. 1 a

E.D.

WAR DEPARTMENT,
Q. M. G. O. FORM No. 194-c
1699—Nov. 26-06—13,000.

5th *Indorsement.*

WAR DEPARTMENT,

OFFICE OF THE QUARTERMASTER GENERAL,

WASHINGTON.

Aug. 20, 1908.

1. Respectfully returned to The Adjutant General of the Army.

2. The proposed area for buildings, roads, etc., appears to be about 7 acres. About 2 acres additional are taken up by water storage tanks and about 2 acres additional used as a catchment area to supply rain water to tanks. A wharf with 1.4 acres is proposed for a post wharf.

3. WHARF. It is thought that the post wharf is very poorly protected and that it will be difficult, if not impossible, for boats to make a landing in rough weather. The wharf should be a small wharf without buildings and built on piles in the usual wharf construction with either reinforced concrete or iron piles.

4. BREAKWATERS. The detached breakwater on the south side should be lengthened to properly protect the wharves and the two entrances should be made by

E.D. 61757/43

filled and salt water pumps.

Spenial attention is called to the need of making a tentative lay-out for the required buildings before the final approval of plans.

Jno. W. Pullman
Asst. Quartermaster General,
U. S. Army.
Acting Quartermaster General.

248058
BTC
Resv.Kin.
Enc.-2 tracgs.

Rec'd Back A.G.O., AUG 21 1908

6th Indorsement.

To the
C. of E.

2 Inclosures.
A. G. O., August 22, 1908.

RECD. OFFICE CHIEF OF ENGRS AUG 22 1908

E.D. 61757/43

61757/43

7th *indorsement.*
WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
WASHINGTON.

September 1, 1908.

1. Respectfully returned to the Chief of Coast Artillery with request for further remarks.

2. In the view of the Chief of Engineers permanent occupation on the usual generous scale by the full garrison is not to be provided for, but the area is large enough for 1200 men with reasonably free accommodations, much greater than in large cities, for instance. There is as much open area on the island as is required under Field Service Regulations for camping two full battalions. There is also a strip 50 feet wide around the entire island where men may be encamped comfortably. Bombproofs are also provided which are habitable for a short time by 1200 men. It is not believed that more than eight companies or two battalions will be actually required on the island at any one time in war or peace. The bombproofs shown on the accompanying tracing are sufficient in time of war.

3. In the remarks of the Quartermaster General as to wharf and breakwater the Chief of Engineers does not concur. The Wharf has three sides. On one side boats can lie in ordinary weather; at the head they can lie in any weather except storms, and on the other side there is complete shelter. A pile wharf such as suggested by the Quartermaster's Department, would not have any side that provides a perfect lee and would require a costly tight breakwater for its protection.

8th INDORSEMENT.
WAR DEPARTMENT,
OFFICE OF CHIEF OF COAST ARTILLERY,
WASHINGTON. Sept.5,1908.

1. Respectfully returned to the CHIEF OF ENGINEERS.

2. It is contemplated that the proposed island will be occupied by a garrison only in time of war. The garrison probably will not exceed eight companies. In time of peace the island will be occupied only by a detachment of caretakers. In view of this the area reserved in the project of the Board of Engineers for sheltering the garrison is considered ample. It is pointed out in this connection that Fort Sumter, S.C., the area of which on exterior lines, is only 2.4 acres, and the area of the interior or parade, only about 1.25 acres, was occupied throughout the Civil War, during about two years of which it was invested constantly, by a garrison of 550 men.

3. The plans of the wharf, breakwater, and cisterns proposed by the Board of Engineers, appear satisfactory to the Chief of Coast Artillery.

4. The recommendation of the Quartermaster General that the plans include the installation of a distilling plant is concurred in.

Arthur Murray
Brigadier General,
Chief of Coast Artillery.

RECEIVED CHIEF OF ENGRS SEP 8 1908

9th *indorsement.*
WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
WASHINGTON.

September 10, 1908.

Respectfully submitted to The Adjutant General, with recommendation that the within plans and estimates be approved by the Secretary of War, and adopted as the official interpretation of the project of the National Coast Defense Board for the defenses of the Middle Ground at the entrance of Chesapeake Bay.

W. Gillespie

61757/43
Encls. 44 & 45 accompg.

Brig. Gen., Chief of Engineers
U. S. Army.

Rec'd Back A.G.O. SEP 11 1908
Left with Secty Genl Staff

OFFICE CHIEF OF STAFF
REC'D. SEP 12 1908
To the Second Section

Sept. 12/08

OFFICE CHIEF OF ENGINEERS RECEIVED SEP 14 1908 SECOND SECTION 8,1,7,11,G,1,5

TO THE CHAIRMAN
ARMY WAR COLLEGE COMMITTEE

Rec'd Back A.G.O. SEP 14 1908

4

with 1 add Sec's memo
Chief of Staff.

10th Indorsement.

(1402112)

WAR DEPARTMENT,

THE ADJUTANT GENERAL'S OFFICE,

WASHINGTON, Oct. 15, 1908.

Respectfully returned to the Chief of Coast Artillery, the Chief of Ordnance, the Quartermaster General and the Chief of Engineers, inviting attention to the approval of the Secretary of War noted on the inclosed memorandum of the Acting Chief of Staff.

The return of these papers is desired.

By order of the
Secretary of War:

E.D. 61757/43

Henry P. McCain
Adjutant General.

3 Inclosures.

REC'D C. C. A. OCT 15 1908

REC'D BACK OCT 16 1908 C. C. A. 3 encls.

11th Indt.

To C. of O. noted.

O. C. C. A. Oct. 16. 08.

3 encls.

REC'D O.C.O. OCT 17 1908

[A.G.O. 72]

35396-47 Hq

12th Endorsement.

To the Q.M.G., noted.

W.C.

O.C.O., Oct.19,1908.
Encls. 1,2 & 3 accompg.

Rec'd back OCT 22 1908 Q. M. G. O.

13th Indorsement.

Q.M.G.O., Oct. 26, 1908.
To A.G.O. noted.

3 Inc.

RECD. OFFICE CHIEF OF ENGRS OCT 27 1908

E.D. 61757/43

14th *indorsement.*

WAR DEPARTMENT,

OFFICE OF THE CHIEF OF ENGINEERS,

WASHINGTON.

November 14, 1908.

1. Respectfully returned to The Adjutant General, noted.

2. As these drawings and papers contain in detail the plans which the Engineer Department will have to carry out, and the approval thereof by the Secretary of War, it is requested that the papers be returned to the Chief of Engineers when they are finally ready for file.

Frederick V. Abbot
Acting Chief of Engineers.

Inclosures 45, 46 and 47 ~~accompanying~~

61757
43

WAR DEPARTMENT,

15th Indorsement. (1402112)

THE ADJUTANT GENERAL'S OFFICE.

WASHINGTON, November 16,1908.

Respectfully referred to the Commanding General, Department of the East, inviting attention to the preceding indorsements hereon.

The prompt return of these papers is desired.

By order of the
Secretary of War:

Henry P. McCain
Adjutant General.

3 inclosures.

16th Indorsement.

HEADQRS.DEPARTMENT OF THE EAST
Governors Isld,N.Y.Nov.24,1908.

Respectfully returned to the Commanding Officer, The Artillery District of Chesapeake Bay to note and return.

By command of
Major General Wood:

Adjutant General.

3 Encls.

17th Endorsement,

Headquarters, Artillery District of Chesapeake Bay,
Fort Monroe,Virginia,
December 10,1908.

Respectfully returned to the Adjutant General, Department of the East, Governor's Island, N. Y.,contents noted.

Colonel, Coast Artillery Corps, Commanding District.

H.D.E. DEC 14 1908 REC'D BACK

18th Indorsement

HEADQRS DEPARTMENT OF THE EAST,
Governors Island, N. Y.
December 14,1908.

Respectfully returned to The Adjutant General of the Army.

Major General,U.S.A.,
Commanding.

3 incls.
thg.

1230

Rec'd Back A.G.O., DEC 15 1908

19th Indorsement.

Through C.of C.A., C.of O. and Q.M.G. to C.of E.
A.G.O., Dec. 15, 1908.
3 Inclosures.

REC'D C. C. A. DEC 16 [illegible]

REC'D BACK DEC 15 1908 C. C. A. 3 encls

20th Ind.

To the C. of O., noted.

O.C.A. 12/19/08.
3 Encls

REC'D C. of O. DEC 21 1908

35396-47 J Jq

21st Endorsement

To the Q.M.G.

O.C.O., December 24, 1908

Enc. 3 herewith
Encs.1 and 2 separately

REC'D BACK DEC 26 1908 M.G.O.

22nd indorsement.

December 29, 1908.

To C. of E.
Q.M.G.O. 3 Inclosures.

REC'D OFFICE CHIEF OF ENGRS. DEC 29 1908

E.D. 61757/43