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R E P O R T

of the

PANAMA FORTIFICATION BOARD.

(Par. 29, S. O. 265, W. D., 1909.)

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PANAMA FORTIFICATION BOARD.

Washington, D.C., August 12, 1910.

The Adjutant General,

Washington, D.C.

Sir:-

The board of officers appointed by paragraph 29, Special Orders, No. 265, War Department, 1909, as amended by paragraph 15, Special Orders, No. 300, War Department, 1909; paragraph 26, Special Orders, No. 20, War Department, 1910, paragraph 7, Special Orders, No. 32, War Department, 1910, and paragraph 23, Special Orders, No. 175, War Department, 1910, for the purpose of making a report upon the subject of the necessary defenses for the Panama Canal, has the honor to submit the following report:

The duties with which the Board is charged are set forth in letter to the Board from The Adjutant General of the Army dated November 13, 1909, (A. G. O. 1455096), a copy of which is included in Appendix I.

The Board has visited the Canal Zone, examined the ground about the termini of the canal and in the vicinity of its course, and conferred with the Isthmian Canal Commission as to the status and availability of the tracts of land in the Canal Zone deemed necessary by the Board for military (including naval) purposes. The Board, under date of April 23, 1910, submitted a preliminary report on such of its duties as pertain to seacoast defenses for the termini of the canal, and this preliminary report, together with a letter of the Secretary of War, a resolution of the Joint Board, and estimates of cost, were forwarded to Congress by the President by letter dated April 29, 1910. No appropriation, however, has yet been made for the initiation of work on the proposed defenses.

For the better prosecution of the work of the Board, committees were appointed on seacoast fortifications, on land defense, and on naval stations and anchorages. The reports of these committees, together with certain other related papers, transmitted herewith, contain the details of the defensive project recommended in the body of this report.

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The Board recommends that the following seacoast armament be emplaced for the defense of the canal against naval attack: Ten 14-inch rifles, twelve 6-inch rifles, twenty-eight 12-inch mortars. The locations and fields of fire of these batteries should be those shown in the accompanying report of the committee on seacoast fortifications.

For the defense of the locks, dams, bridges, tunnel, and seacoast fortifications against land attack by raiding parties, the Board recommends the construction of permanent field works of the character and in the positions set forth in the accompanying report of the committee on land defense. As the construction of such works will require time and cannot be delayed with safety until the imminence of war has been recognized, the Board is of the opinion that they should be completed by the date of completion of the canal. The exact locations of these field works and the preparation of working plans therefor must await further progress in the construction of the locks, and the completion of accurate surveys.

Comparatively strong natural positions exist at both the Atlantic and Pacific termini of the canal for defense against land operations of an enemy in force. These positions can be strengthened materially by the construction of roads and obstacles and by clearing the ground. On the completion of maps now in preparation it will be practicable to lay out lines of defense, and accurate surveys should then be made of the immediate vicinity of such lines, and plans prepared for fortifications, obstacles, roads and clearings. As, therefore, the completion of these plans, as well as those for the permanent field works and for the permanent camps discussed hereinafter, must be deferred for a considerable time, and as the work involved is of the same nature as that now being done by the National Land Defense Board for the land defense of seacoast fortifications in the United States, the Board recommends that the National Land Defense Board be furnished with a copy of the report of the committee on land defense and instructed to prepare complete land defense plans in accordance with the general plans and principles set forth therein.

The Board recommends that the permanent garrison to be maintained in the Canal Zone in time of peace be composed of twelve companies of coast artillery, four regiments of infantry, one battalion of field artillery and one squadron of cavalry. This force should be augmented in time of war by reinforcements from the United States when the conditions under which the war is being waged are such that an enemy may be expected to despatch a considerable force in transports to the Canal Zone. The strength of such reinforcements, referred to in the report of the committee on land defense as the Canal Zone Reserves, will vary with the conditions under which the war is being carried on. The Board believes that this subject should be considered in connection with the preparation of general plans for the national defense and therefore recommends that it be referred to the Army War College for study and report.

The Board recommends that posts be established as follows for the accommodation in time of peace of the permanent garrison: (a) At Point Toro, a post for four companies of coast artillery; (b) On Perico Island and ground to be filled in between that island and Flamenco Island, a post for eight companies of coast artillery; (c) On the high sloping ground east of the canal between Empire and Culebra, a post for four regiments of infantry, one battalion of field artillery, and one squadron of cavalry.

With the exception of a few buildings, such as power houses, cold storage plant, etc., which are of concrete, existing buildings on the Canal Zone are of wooden construction. The experience of members of the Canal Commission indicates that the life of wooden buildings on the Canal Zone is not more than five years, and that existing buildings of that character will be in such condition on the completion of the canal that they cannot be utilized for the accommodation of the permanent garrison, except possibly as temporary accommodations during a short period immediately following the completion of the canal. The Board recommends that all buildings to be erected as a part of the permanent posts be of concrete construction.

The proposed disposition in time of war of the permanent garrison is set forth in the report of the committee on land defense. As the camps to be oc-

cupied by these troops should be ready at the beginning of hostilities, the Board recommends that permanent camps be constructed in time of peace and simultaneously with the construction of the seacoast fortifications and permanent field works.

The camp sites recommended for occupancy by reinforcements sent to the Canal Zone in time of war are given in the accompanying report of the land defense committee.

The instructions of the Board require it to report upon such points outside of the Canal Zone as it might consider should be required by the United States in order to insure the defense of the canal, its attention in that connection being especially invited to the defensive and offensive value and possibilities of the Island of Taboga and the harbors of Porto Bello and in the Chiriqui Lagoon. The Board is of the opinion that, although the connection of these places to which may be added the Pearl Islands, with the defense of the Canal Zone is a strategic question for the later study of the War Colleges of the two services, there is no present necessity for the erection of works or the use, occupation or control of land or water at any of them. Such surveys and examinations should be made as may be needed by the War Colleges in preparing plans of operations, which plans may include arrangements to be made with the Government of Panama under Article II of the Treaty of February 25, 1904.

The instructions also require the board to report upon the possibilities of approach by water to the Gatun locks and dam by way of the Chagres River. In its study of the land defense the Board concluded that the Chagres River can be closed effectively against any craft that could enter it, by the movable artillery to be assigned as extra armament to the mobile army forces provided for the land defense of the canal.

Special attention is invited to the remarks in the report of the committee on naval stations and anchorages as to the necessity of the provision of a wireless station as an essential part of the defenses, a new delimitation of the waters under Panamanian jurisdiction in Limon Bay, and of the provision at both termini of the canal of suitable wharfs for naval vessels and army transports, and adequate landing facilities for small boats, and to

the remarks in the report of the committee on land defense as to consideration being given possible military uses in selecting locations for roads to be constructed in the Canal Zone and the Republic of Panama. The Board recommends that these matters be brought to the attention of the Canal Commission with a view to the initiation of such measures as will accomplish the desired ends.

The accompanying map shows the several tracts of land in the Canal Zone which the Board deems necessary for military (including naval) purposes. While the Board recommends the definite assignment of the areas as indicated for the ultimate use of the War and Navy Departments, it is of the opinion that the control and full and free use of the areas in question for the purposes of canal construction and maintenance should continue under the Canal administration until the work of construction is completed; and that thereafter such portions of these proposed reservations as may be absolutely necessary for the proper maintenance of the canal be definitely set aside for that purpose.

The following table gives the estimates of cost for the defenses recommended by the Board, for the necessary accessories for use therewith, for the construction of permanent posts, and for the preparation of camp sites; but does not include the cost of construction for naval purposes:

Surveys.....	\$ 62,000.
Purchase and reclamation of sites.....	1,200,000.
Emplacements, seacoast batteries,.....	6,027,000.
Guns and carriages, seacoast batteries,.....	2,324,000.
Ammunition, seacoast,.....	1,382,288.
Power plants, seacoast,.....	138,000.
Searchlights, seacoast,.....	244,800.
Fire control, seacoast,.....	370,755.
Field fortifications,.....	282,000.
Camps,.....	240,000.
Permanent posts, coast artillery,.....	1,834,000.
Permanent post, mobile army,.....	<u>5,442,000.</u>
Total,.....	\$19,546,843.

The Board is unable to make a close estimate of the total cost of construction of the naval stations, for the reason that the scope of the stations has not been definitely indicated to it by the Navy Department. In any event, the principal point to be settled in these stations is the location of the drydocks, and that cannot be settled without examinations and borings. While the above total does not, therefore, include the naval establishments on the

Isthmus, the Board records its opinion that naval establishments provided with such facilities as the Navy Department shall consider necessary are an essential part of the defense of the Canal, and should be provided equally with the projected land defenses.

It is conservatively estimated that the canal will be completed and in use by January 1, 1915, and it is quite possible that it may be completed before that date. As it will require several years to construct and emplace the proposed armament, if it is to be done in an orderly and economical manner, the initiation of work on these defenses should not be deferred beyond the close of the present fiscal year, if they are to be completed by the date of completion of the canal. The Board therefore recommends that an estimate be submitted to Congress this year for \$19,546,843.00, for the purposes indicated in the above table, with recommendation that the expenditure of this sum be authorized and that the sum of \$7,000,000 thereof be appropriated at the next session of Congress and made immediately available for expenditure toward the execution of these purposes with a view to their completion within three years; and it recommends that the further sum of \$2,000,000 be appropriated at the next Congress and made available immediately and until used, for expenditure toward the creation of the necessary naval establishments, including complete surveys; in all \$9,000,000 to be made immediately available.

The Board is of the opinion that, as a matter of economy and efficiency, the authority charged with the construction of the canal should also be charged with the military and naval works of construction for defense of the canal, the work to be done in accordance with plans to be approved by the Government.

(Sgd.) Leonard Wood,

Major General, Chief of Staff,
President of the Board.

William Crozier,

Brigadier General, Chief of Ordnance.

Arthur Murray,

Brigadier General, Chief of Coast Artillery.

W. W. Wotherspoon,

Brigadier General, U. S. Army.

W. H. Bixby,
Brigadier General, Chief of Engineers.

H. S. Knapp,
Captain, U. S. Navy.

W. J. Maxwell,
Commander, U. S. Navy.

W. G. Haan
Major, Coast Artillery Corps.

Stanley D. Embick,
Captain, Coast Artillery Corps, Recorder.

Appendix I.- Attached.

Appendix II.- Roll containing map. separate.

APPENDIX I.

R E P O R T

of

PANAMA FORTIFICATION BOARD.
(Par.29, S.O. 265, W.D., 1909.)

containing

- A - Instructions for Board.
- B - Report of Committee on Seacoast Fortifications.
- C - Report of Committee on Land Defenses.
- D - Report of Committee on Naval Stations and Anchorages.
- E - Tracings showing proposed locations and fields of
fire of seacoast armament.

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- A -

INSTRUCTIONS FOR BOARD

Convened by

Par. 29, S. O. 265, W. D., 1909.

The following is a copy of the letter of instructions
furnished the board for its information and guidance.

—oooOooo—

WAR DEPARTMENT
The Adjutant General's Office
Washington.

November 13, 1909.

Brigadier General William Crozier,
Chief of Ordnance,
Washington, D. C.

Sir;-

Referring to the letter to you from this office of this date on the subject of the joint Army and Navy Board appointed in orders from the War Department of this date for the purpose of making a report upon the subject of the necessary defenses for the Panama Canal, and directing the Army members and recorder of the Board to proceed to the Canal Zone, I have the honor to communicate to you the following instructions of the Secretary of War for the information and guidance of the board:

The board will make a preliminary report covering the following subjects:

First: The seacoast batteries and such field works as might be considered desirable and necessary (for the defense of the approaches) and entrances at both ends of the canal, and the locks, dams, bridges and tunnel within the Canal Zone including their location, character and armament.

If any permanent field works should be considered necessary or desirable for the defense of the said locks, dams, bridges and tunnel, their character and location should be definitely described.

Such auxiliary field works as the board might consider it advisable to have constructed whenever serious danger of hostilities, involving defense of the Canal should arise, should be fully described and located in the vicinity of the said locks, dams, bridges and tunnel.

Second; The character of the garrison considered essential for permanent station in the Canal Zone in time of peace, together with such reenforcements as might be considered necessary upon threat of hostilities, as well as the location and character of permanent facilities for the accommodation of the permanent garrison; also the location of camp sites for reenforcements in war.

In this connection, the board should be instructed to take into consideration the utilization of any suitable existing buildings which might become available upon completion of the Canal, for the temporary accommodation of the peace garrison recommended, until permanent accommodations therefor could be constructed.

The board will report upon such points outside of the Canal Zone as it might consider should under terms of the treaty with Panama, be acquired by the United States in order to insure the proper defense of the Canal, its attention being especially invited in this connection to the defensive and offensive value and possibilities of the Island of Tiboga, and the harbors of Porto Bello and in the Chiriqui Lagoon; also, the possibilities of approach by water to the Gatun locks and dam by way of the Chagres River.

The board will also report upon any other situation or consideration which, in its judgment, has any bearing whatever upon the defense of the Canal.

It is desired that this report should be so exhaustive and complete as not to necessitate the convening of any further boards on the questions involved.

Very respectfully,

HENRY P. McCAIN,

Adjutant General.

—oooOooo—

- B -

REPORT
OF
COMMITTEE
ON
SEACOAST FORTIFICATIONS.
(Par. 29, S.O., 265, W. D., 1909.)

REPORT OF COMMITTEE

--ON--

SEACOAST FORTIFICATIONS.

Washington, D. C., August 12, 1910.

The President,

Board of Officers convened by

Par. 29, S. O. 265, W. D., 1909.

Sir:

The committee on seacoast fortifications has the honor to submit the following report:

1. The committee recommends that the following seacoast armament be emplaced for the defense of the canal:

COLON TERMINUS.

Point Toro:

2 - 14-inch Rifles on disappearing carriages;
2 - 6-inch " " " "
8 - 12-inch Mortars.

Point Cano Principal:

2 - 14-inch Rifles on disappearing carriages;
4 - 6-inch " " " "
8 - 12-inch Mortars.

PANAMA TERMINUS.

Flamenco Island:

4 - 14-inch Rifles (two batteries) on disappearing carriages;
8 - 12-inch mortars.

Perico Island:

2 - 6-inch Rifles on disappearing carriages.

Naos Island:

4 - 6-inch Rifles on disappearing carriages.

Batele Point:

2 - 14-inch Rifles on disappearing carriages;
4 - 12-inch Mortars.

These batteries should be so oriented as to have the fields of fire shown on the accompanying tracings.

2. The committee recommends that the fire control system for the armament at the Colon terminus of the canal be of the horizontal base type and that for the armament at the Panama terminus of the canal be of the depression type. The armament at Point Toro should be organized as one battle and two fire commands, that at Point Cano Principal as one battle and two fire commands, that on Flamenco, Perico and Naos Islands as one battle and two fire commands, and that at Batele Point as one fire command.

3. The committee recommends that three 60-inch searchlights be provided for the armament at Point Toro, three for the armament at Point Cano Principal, four for the armament at Flamenco, Perico and Naos Islands, and two for the armament at Batele Point.

4. Eight companies of coast artillery will be required to provide one manning detail for the armament recommended at each terminus of the canal, or a total of sixteen companies for the armament at both termini. The committee assumes that it is unlikely that the United States will become engaged in a war in which both termini of the canal would be exposed to naval attack. On this assumption the committee recommends that the permanent coast artillery garrison to be maintained in the Canal Zone consist of twelve companies of coast artillery, of which eight companies would be used in time of war to furnish a complete manning detail for the seacoast armament at that terminus of the canal exposed to naval attack, two companies to furnish guards and caretakers for the seacoast armament at the other terminus of the canal, and two companies to man the heavy movable armament to be provided as a part of the project recommended by the Committee on Land Defense.

5. The committee recommends that the causeway now in course of construction to Naos Island be extended to connect Naos and Perico Islands, and that about forty acres of the shoal water area between Perico and Flamenco Islands be filled in to afford in connection with Perico Island a site for a permanent coast artillery post. The committee further

recommends that a permanent coast artillery post for eight companies of coast artillery be constructed on this site, and that a permanent post for four companies of coast artillery be constructed at Point Toro, all buildings to be of concrete construction.

6. It is recommended that at Point Toro and on the land to be filled in between Perico and Flamenco Islands central power plants be provided in connection with the construction on those sites of the permanent coast artillery posts, that battery plants be provided for all the armament, and that additional reserve units be provided at Point Cano Principal and Batele Point.

(Sgd) William Crozier

Brigadier General, Chief of Ordnance.

Arthur Murray,

Brigadier General, Chief of Coast Artillery

W. H. Bixby,

Brigadier General, Chief of Engineers.

H. S. Knapp,

Captain, U. S. Navy.

W. G. Haan,

Major, Coast Artillery Corps.

- C -

R E P O R T

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C O M M I T T E E

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L A N D D E F E N S E .

(par. 29, S.O. 265, W. D., 1909.)

REPORT OF COMMITTEE ON LAND DEFENSE.

(Par. 29, S. O. 265, W. D., 1909.)

Washington, D. C., August 12, 1910.

The President,

Board of Officers convened by

Par. 29, S. O. 265, W. D., 1909.

Sir:

The Committee on land defense has the honor to submit the following project for the land defense of the canal:

PART I.

1. This project is based upon the following general assumptions:

(a) That the sea power of the United States is such that the enemy will be unable to interrupt over-sea communication between the United States and the Canal Zone in both the Atlantic and Pacific Oceans at the same time.

(b) That, having control of over-sea communication in one ocean or the other, the permanent garrison can be reinforced by troops from the United States before the enemy can attack at the Canal Zone with any force other than such as can be landed from his warships.

(c) That the coast fortifications will be adequate to prevent the enemy from successfully attacking them directly from the sea or remaining with his ships in the water covered by the coast forts.

(d) That the permanent garrison for the Canal Zone shall be composed of;

a. Sufficient coast artillery troops proper to furnish a complete manning detail for all the forts at one end of the canal, plus two companies for the heavy movable armament, and two companies for the forts at the other end of the canal.

b. Sufficient mobile troops to control all local hostile attempts, and furnish an adequate defense against all probable raids attempted by parties landed from the enemy's warships that may be in the vicinity at or shortly after the outbreak of war.

2. The land raids attempted by the enemy may be upon the coast forts, naval establishments, locks or other vulnerable part of the canal. These

raids may vary in strength from a few men landed with the object of stealthily making their way through the forest and by the use of high explosives attacking the forts or locks, etc., to raids by the largest force that can be landed from any probable fleet of the enemy. In addition to such raids there may be a systematic movement by land with troops sent across the ocean in transports for this purpose.

3. We have then to provide a defense for two probable forms of attack; first, that by raids, and second, that by larger bodies of troops.

4. Raids may be expected immediately after the outbreak of hostilities and provision must be made by a permanent garrison for this defense.

5. To make a systematic movement by a large force on the Isthmus the enemy will have to send across the ocean in transports the necessary force. This will take considerable time, and, as has been assumed in (b), paragraph 1, the United States should be able to reinforce its permanent garrison on the Isthmus to meet such an attack before the enemy could be prepared to make it.

6. The mobile troops of the permanent garrison must be sufficient in strength and properly organized to successfully meet all raids of the enemy that might probably be undertaken with parties landed from his warships.

7. Following the general organization that has been adopted for coast defense in the United States, the following is considered the best organization for the mobile troops of the permanent garrison: (a) Coast Artillery Supports and (b) Coast Guard, the functions and control of each being, briefly, as follows:

(a) Coast Artillery Supports: These are mobile troops which are in time of war under the exclusive control of the artillery district commander. Their duties are to prevent the coast forts from being captured from the land side by comparatively small raids, such as might be made by troops quickly landed near the forts from the enemy's warships.

(b) Coast Guard: These are mobile troops under the control of the Coast Guard commander. Their duties are twofold:

(Land Defense)

First, to reinforce the Coast Artillery Supports in case of a determined attack on any fort, and
Second, to prevent the naval establishments, locks or other vulnerable parts of the canal from being destroyed or seriously injured by parties that might be landed from the enemy's warships.

8. In any war in which it is probable that an attempt will be made by the enemy to send a considerable force of troops in transports to take possession of the Canal Zone it will be necessary to considerably reinforce our permanent garrison as indicated under assumption (b), paragraph 1. In this project such reinforcing troops are designated Canal Zone Reserve.

9. The necessary personnel, extra armament, auxiliary fortifications, location of camps for time of war and barracks for time of peace are here taken up in a general way for:

- (a) The Coast Artillery Supports.
- (b) The Coast Guard.
- (c) The Canal Reserve.

PART II.

COAST ARTILLERY SUPPORTS.

10. Lines of Defense.- At each coast fort the line of defense will be made as short as possible consistent with affording a proper defense. This generally requires that the line be drawn in close to the coast batteries, but it must be so located that as long as it is held the coast forts are immune from the direct fire of the raiding party. This inner line of defense being thus near the coast batteries can in case of emergency be quickly reinforced by a portion of the coast artillery troops proper. Coast Artillery Supports and coast artillery troops proper constituting together the personnel for the coast fort form a compact force under the exclusive control of the district commander.

11. Auxiliary Fortifications.- The defenses of this line have for their main object the stopping of the advance of the raiding party rather than the resistance of projectiles. These auxiliary fortifications should

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therefore have wherever practicable a passive resistance in themselves-- stockades twelve feet high or concrete walls of similar height with proper flank defenses in the form of block houses, bastions or similar arrangements; the salients strengthened by small infantry redoubts and the entire line completely protected by wire entanglements or other obstacles; all timber, brush and other obstructions should be removed from the front of the line to such an extent as to give a clear field of fire in front of the line for a distance of about three hundred yards.

12. Artillery Positions for the Movable Armament.-- As a general rule it will not be necessary to select and prepare in advance positions for the field guns assigned to the Coast Artillery Supports; gun pits can be readily prepared where needed by the troops themselves.

13. Camps.-- Carefully prepared camps for the Coast Artillery Supports are essential for the health and hence the efficiency of these troops. As soon as the lines of defense and auxiliary fortifications are definitely located and working plans prepared therefor, the camps should also be definitely located and complete working plans for their preparation made. These plans should include:

- a. Definite locations.
- b. Proper grading of ground.
- c. Complete drainage.
- d. Complete sewerage, toilets, etc.
- e. Complete water supply.
- f. Complete lists of material for tent floors, tent frames, wire screening, special kitchen and mess room screening, and all other accessories suggested by the experience of the Sanitary Department of the Canal Zone.

14. The importance of having the auxiliary fortifications and camps for the Coast Artillery Supports ready at the very beginning of hostilities prompts the Committee to recommend that steps be taken to have these completed as far as practicable simultaneously with the construction of

(Land Defense)

the coast forts. Having the war camps and auxiliary fortifications completed in time of peace will give opportunity for these troops of the mobile garrison assigned as Coast Artillery Supports to be exercised to great advantage in their war positions, but above all it will insure the safety of the coast batteries at what will probably be for them the most critical and most dangerous period of the entire war. The auxiliary fortifications can in time of peace be fully completed; the camp sites can be graded, drained, sewerred, permanent toilets established, and a complete water supply installed; all material for floors, frames, wire screenings, tentage, etc., can be stored in suitable storehouses built for that purpose.

15. The exact location of the lines of defense for the Coast Artillery Supports can^{not} be fully determined until after the batteries and fire control stations are definitely located and accurate charts prepared showing such locations. The same remarks apply to the auxiliary fortifications and camps; but from its examination on the ground the Committee has been enabled to come to definite conclusions as to the strength and special armament of the Coast Artillery Supports for each point where coast batteries have been recommended. This information is given in the following paragraph. After the exact locations for the coast batteries have been approved, special surveys will have to be made for land defenses covering not only the Coast Artillery Supports but the larger defenses by the Coast Guard and Canal Reserve.

16. Personnel and extra armament are recommended for the Coast Artillery Supports at the various points where coast forts are recommended, as follows:

Point Toro.

- 1 Battalion of infantry, war strength,
- 4 3.2" field guns,
- 2 Limbers,
- 2 Double sets of wheel harness,
- 4 Machine guns.

Point Cano Principal.

1 Battalion of infantry, war strength,
4 3.2" field guns,
2 Limbers,
2 Double sets of wheel harness,
4 Machine guns.

Flamenco, Perico and Naos Islands.

1 Battalion of infantry, war strength,
4 3.2" field guns,
2 Limbers,
2 Double sets of wheel harness,
4 Machine guns.

Batele Point.

1 Battalion of infantry, war strength,
4 3.2" field guns,
2 Limbers,
2 Double sets of wheel harness,
4 Machine guns.

The aggregate of personnel thus called for is:

4 Battalions of infantry, war strength,
16 3.2" field guns,
8 limbers,
8 double sets of wheel harness,
16 Machine guns.

17. The assumption has been made by the Committee that the United States would retain control in one ocean. The forts on that ocean could only be attacked from the land side by parties that had crossed the Isthmus for that purpose. The probability of such an attack is small and if undertaken would probably be by small parties attempting by stealth to approach the batteries with the hope of finding them unprotected and destroy them by means of high explosives. The Committee believes that one battalion is sufficient for pro-

protecting the forts on the side opposite to where the enemy controls the sea. The full extra armament is, however, needed at each fort. It is, therefore, recommended that the total force and extra armament for Coast Artillery Supports be as follows:

- 3 Battalions of infantry, war strength,
- 16 3.2" field guns,
- 8 Limbers,
- 8 Double sets of wheel harness,
- 16 Machine guns.

PART III.

COAST GUARD.

18. As has already been stated, the duties of the Coast Guard are twofold: First, to reinforce the Coast Artillery Supports in case of a determined attack on any fort, and second, to prevent the locks or other vulnerable parts of the canal from being destroyed or seriously injured by parties that might be landed from the enemy's warships.

19. Defense of the locks and other vulnerable parts of the canal against comparatively small raids.-- In order to prevent the locks or other vulnerable parts of the canal--such as spillway, navy yards, important railroad bridges or tunnel--from being injured by small parties which might be landed from the enemy's warships in the vicinity and stealthily make their way to such points through the forest, a suitable guard must be provided for each place which can be approached by such parties of the enemy. This immediate defense is entirely similar, in the case of the locks and other vulnerable parts of the canal, to the defense of the forts by the Coast Artillery Supports.

20. The reasons given in paragraphs 10, 11, 13 and 14 of this report apply in all respects to the cases of the locks, dams and spillways

(Land Defense)

in regard to the inner lines of defense being as short as practicable; the auxiliary fortifications to have passive resistance; the camps to be prepared in the best possible condition; and the auxiliary fortifications and camps to be completed as far as practicable as soon as the locks are completed, and not wait until hostilities are begun to construct them. The work on the locks is not yet far enough advanced to permit complete working plans to be prepared for the auxiliary fortifications and camps. Later, as in the case of the Coast Artillery Supports (see paragraph 15), special surveys will have to be made, defensive works designed to fit the sites, camp sites accurately located, and working plans prepared; but, as in regard to the Coast Artillery Supports, the Committee from its examination of the ground has been enabled to reach definite conclusions as to the strength and special armament for the force making the immediate defense of the locks, dams, spillway, railroad bridges, tunnel and other vulnerable parts of the canal. The force recommended is given in the following paragraph.

21. The plans are based on the assumption that the enemy has control of only one ocean. Let us assume first that he has control of the Atlantic and may attack from that side. Under such circumstances the minimum force recommended for the immediate protection of the various points is as follows:

Gatun Locks, Dam, Spillway and Accessories.

2 Battalions of infantry, war strength, with eight machine guns.

1 Battery of field artillery.

Railroad Terminus at Colon, Bridges, Tunnel Miraflores,
and Pedro Miguel Lock.

1 Battalion of infantry, war strength.

2 Troops of cavalry.

For the immediate protection of the naval establishment at Colon it is assumed that sufficient marines will be available; hence no assignment from the Army is recommended for this purpose.

If, now, the assumption is made that the enemy has control of the Pacific, the location of the forces, which should be of the same strength

and compositions as under the first assumption, would be reversed. Two battalions of infantry and one battery of field artillery would be located at Pedro Miguel and Miraflores locks and one battalion of infantry and two troops of cavalry look after the railroad and other vulnerable parts. The total force recommended for the immediate protection of the locks, dams, spillway, bridges, tunnel and other vulnerable points against small raids is, therefore, as follows:

- 1 Regiment of infantry, war strength, with eight extra machine guns.
- 1 Battery of field artillery.
- 2 Troops of cavalry.

22. For the purpose of reinforcing the immediate defense by the Coast Artillery Supports at the forts, or the immediate defense at the locks or other vulnerable parts of the canal, in case of an attack by a large raiding party, a sufficient force must be immediately available to successfully resist such an attack.

23. The estimates of naval officers are to the effect that a force of from 2500 to 3000 men might be detached temporarily from a naval fleet for making a raid on the Isthmus.

24. The minimum supporting force considered adequate to meet such an attack is as follows:

- 2 Regiments of infantry,
- 2 Battalions of field artillery,
- 2 Troops of cavalry.

25. Before the outbreak of war this force must be concentrated at points from which it can be quickly thrown to the assistance of either the Coast Artillery Supports or the force in immediate charge of the locks, naval station, and other parts of the canal. The points selected for such concentration are as follows:

- a. In case the enemy has control in the Atlantic, the concentration should be made at the Gatun Locks.
- b. In case the enemy has control of the Pacific, the concentration should be made at ^{the} Miraflores Locks.

26. From the foregoing it will be seen that the total force for the Permanent Mobile Garrison including:

- a. the Coast Artillery Supports,
- b. the troops in immediate charge of the locks and other vulnerable parts of the canal,
- c. the supporting force required to be immediately available;

is as follows:

- 4 Regiments of infantry,
- 1 Battalion of field artillery,
- 1 squadron of cavalry.

27. For the purpose of instruction and economy, it is considered best that the mobile troops of the permanent garrison, including the Coast Artillery Supports and Coast Guard, be concentrated into a single post. The site recommended by the Committee for this post is on the sloping high ground east of the canal between Empire and Culebra. Here can be obtained a suitable water supply uncontaminated. There are suitable sites for buildings for the size of the command required. The government has possession of a sufficiently large tract of land which can be made into a suitable drill and maneuver ground, and the general sanitary conditions are superior to those of any other available sites.

PART IV.

CANAL RESERVE.

28. If the conditions under which war is being waged be such that the enemy would probably send a considerable force in transports across the ocean to attack at the Isthmus, it may be assumed without further discussion that such enemy would deliberately violate the neutrality of the Republic of Panama; and consequently our plans should not take into consideration the dividing line between the Canal Zone and the Republic of Panama, but the best defensive positions should be selected, and, if thought advisable, prepared for defense.

29. The distance that any probable enemy would have to transport

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his troops to attack on the Pacific side is so great that necessarily the force that would finally make the attack would be limited far more than would a force attempting an attack from the Atlantic side. The Canal Zone Reserve for an attack from the Atlantic side should consequently be larger than for an attack from the Pacific side.

30. The conditions on both the Atlantic and Pacific Oceans are such, that a large force can be landed on either side of the Canal Zone. The conditions, after a landing has been made, for maneuvering against the Canal Zone, are, however, extremely unfavorable. On the Atlantic side the tremendous rain-fall during nine months of the year and the consequent tropical jungle makes it very difficult for a large force to maneuver away from the landing point after it has actually landed. On the Pacific side the rain-fall is less and the jungle is not so heavy; in fact, it can be penetrated anywhere in most any direction by foot troops with but little work in preparing trails.

31. While the jungle on the Atlantic side is much heavier than on the Pacific side, it is in no places impenetrable, except in the actual swamps where the ground is, even in the dry season, too soft; but these are not many and a force can go around them. Moreover, both on the Atlantic and the Pacific sides, and clear across the Isthmus, are networks of trails, and in general it may be assumed that, with the possible exception of some of the steepest mountains, there is no impassible land to determined foot troops in the vicinity of the Canal Zone.

32. There are, generally speaking, fair strategic lines for defense on both the Atlantic and Pacific termini of the canal, near the boundary line between the Republic of Panama and the Canal Zone.

33. The best positions for the concentration camps for the Canal Reserves are:

(a) On the Pacific side, near Miraflores.

(b) On the Atlantic side, near Gatun.

Complete working plans for such camps should be prepared and such material as may be needed to make these camps as sanitary as possible should be secured in time of peace and kept near the camp sites in suit-

able storehouses under the care of the permanent garrison.

34. Personal visits by the members of the Land Defense Committee have been made to all these places, and it is believed that, without constructing works in time of peace or without constructing practically any actual trenches, the strong strategic positions that can be selected can be strengthened materially by roads and obstacles and by clearing; but the maps that are available are so very inaccurate, and the forests are too heavy for casual visits of this kind to determine the exact location of such lines. As soon, however, as the exact locations of the coast fortifications have been determined and the working plans for the auxiliary fortifications in the immediate vicinities of the forts, locks, etc., have been prepared, it will be practicable from the present knowledge of the situation and from triangulation maps that are now under construction, to locate generally the strategic lines that should be prepared for defense against a large and systematic attack. After such strategic lines have been located it will be necessary to send engineer troops in charge of engineer officers to make accurate surveys of the immediate vicinity of such lines and to design the best possible fortifications, roads, clearings and obstacles. This is entirely in accordance with similar work now in progress within the United States under the general supervision of the National Land Defense Board.

NOTE: No particular mention has been made thus far in regard to the construction of necessary roads. It seems to have been a policy fairly well adopted already, both by the Canal Zone government and the Panama government, to undertake the construction of roads on a considerable scale. It would be well for at least the Canal Zone government to keep in mind that the canal is being constructed probably as much for strategical as for commercial purposes, and that such auxiliary work as road construction, etc., should be undertaken with a view to improving military communications as much as possible. Perhaps by keeping this in mind negotiations for the joint construction of roads in the Republic of Panama and the Canal Zone might lead to the location of roads in the most favorable positions for military communications.

35. In view of the fact that the NATIONAL LAND DEFENSE BOARD has now in charge the preparation of plans for the land defense of all coast fortifications in the United States and has worked out a satisfactory system of doing that work and since the only difference in land defense plans for the Canal Zone from those in the United States proper is due to its isolated

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location, it is recommended that an extract of that part of this report relating to land defense be referred to the National Land Defense Board with instructions to prepare complete land defense plans in accordance with the principles herein stated.

36. The following table gives the estimates of cost for the construction of the auxiliary fortifications and preparation of permanent camp sites for the Coast Artillery Supports:

Place.	Auxiliary Fortifications.	Camps.
Point Toro	\$47,000.00	\$45,000.00
Point Cano	35,000.00	50,000.00
Flamenco, Naos and Perico Islands	10,000.00	30,000.00
Batele Point	<u>60,000.00</u>	<u>40,000.00</u>
Totals	152,000.00	165,000.00

The corresponding estimates for the immediate or inner defense of the locks, dams and spillways are:

Place.	Auxiliary Fortifications.	Camps.
Gatun Lock and spillway	\$75,000.00	\$40,000.00
Pedro Miguel lock	15,000.00	5,000.00
Miraflores locks, etc.	<u>=40,000.00</u>	<u>30,000.00</u>
Totals	130,000.00	75,000.00

The total estimates for auxiliary fortifications and camp sites to be constructed simultaneously with the completion of the coast fortifications and locks are therefore as follows:

Auxiliary fortifications	\$282,000.00
Camps	<u>240,000.00</u>
Total	\$522,000.00

The foregoing amounts are based upon estimates made by Engineer Offi-

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cers at the request of the National Land Defense Board for similar work
in the United States.

ARTHUR MURRAY,

Brigadier General, Chief of Coast Artillery.

W. W. WOTHERSPOON,

Brigadier General, U. S. Army.

W. H. BIXBY,

Brigadier General, Chief of Engineers.

W. G. HAAN,

Major, Coast Artillery Corps.

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N A V A L S T A T I O N S A N D A N C H O R A G E S .

(Par. 29, S. O. 265, W. D., 1909.)

REPORT OF COMMITTEE ON NAVAL STATIONS AND ANCHORAGES.

Washington, D. C., August 12, 1910.

The President, Board of Officers,

Convened per Par. 29, S. O. 265, W. D., 1909.

Sir:-

The Committee on Naval Stations and Anchorages has the honor to submit the following report:

1. A tentative choice of sites for a naval station near Gatun, a station near Corozal, and a magazine in Lake Gatun was submitted by the Committee to the Board on March 23, 1910, and was included in the Board's letter of March 24, 1910, to the Canal Commission asking for an expression of the Commission's views regarding all the sites selected by it for the purposes within the scope of its instructions. In view of the reply of the Chairman of the Canal Commission, the Committee recommends that the Board request that these sites for naval purposes be reserved for the needs of the Navy Department.

2. The Committee notes that at the northern end of the reservation near Gatun the map furnished the members after their return from the Isthmus does not include the area between the old French canal, the northern branch of the Mindi River and the Panama Railroad. If the railway line is relocated further to the east, thereby widening the proposed naval reservation, this is not important; but if the railway line is not relocated the Committee does regard the inclusion of the area described above as important.

3. The Navy Department has not defined the scope of the naval stations on the Isthmus; and when that is known an accurate knowledge of the terrain, above and below ground, will be required before a definite plan can be laid down for the stations. Lacking this definite knowledge the Committee is not able to submit an estimate of the cost of the naval establishments. To meet the cost of the surveys, and to enable the Navy Department to put its work immediately in hand when the results of the surveys enable it to lay down definite plans, the Committee recommends that the Board ask for an appropriation of \$2,000,000 to be made available immediately and to continue available

until expended.

4. In connection with the subject of anchorages, the Committee invites attention to the area in Limon Bay marked "Republic of Panama" or "Colon Harbor" on Commission maps. The western part of that area is the most desirable place for a naval anchorage; south of ^{it} there is insufficient water. The General Board of the Navy, in its indication of the desirable naval anchorage made several months ago, was under a misapprehension of the status of the area so marked, supposing it to be the part of Colon Harbor reserved by the Commission for canal purposes, and it was not until the arrival of the Naval Members of the Board upon the Isthmus that they understood that the marked area is under Panamanian jurisdiction. In order to get official information of record the question was asked of the Chairman of the Commission, to which he made answer as follows in his letter of March 16th:

The anchorage areas in Limon Bay, marked "Republic of Panama" or "Colon Harbor" on commission maps, are the areas fixed for the harbor of Colon under the provisional delimitation of boundaries agreed upon by General Geo. W. Davis, Governor of the Canal Zone, and Tomas Arias, Secretary of State, Republic of Panama, on June 15th, 1904, following out the terms and provisions of Article II of the Treaty. The areas in question are, therefore, not in the Canal Zone but are Panamanian territory. Any change in the boundaries, or location, of Colon Harbor requires only agreement between the proper officers of the United States and Panama Governments. A change in the Treaty is not necessary.

5. The present conditions are unsatisfactory from both the naval and army point of view. The western part of the reserved Panamanian anchorage area extends, at its southern edge, to include practically all the water suitable for war vessels of modern draft, leaving only the space north of the Panamanian anchorage and between it and the breakwater for a naval anchorage. This is a very undesirable condition. From the army point of view, the approach to its positions on Toro Point by water is entirely covered by the Panamanian anchorage, which appears to the Committee an intolerable condition. There seems also every reason to think that it will be undesirable to have the canal prism actually pass through foreign jurisdiction. Thus, from all points of view, a change in the anchorage in Limon Bay under Panamanian jurisdiction is desirable. As this will require diplomatic action, the Committee recommends that the Board invite the attention of the War and Navy Departments to the conditions

with a view to the institution of measures to bring the change about, so that the jurisdiction over waters most desirable for a naval anchorage may vest in the United States. In the opinion of the Committee Panamanian jurisdiction should not extend over any of the waters included in or west of the waters of the Canal Prism, for reasons that have been outlined above. The General Board of the Navy has expressed the opinion that "no anchorage separate from the commercial harbor is necessary on the Panama side."

6. The Committee notes in the latest survey of Limon Bay published by the Coast and Geodetic Survey of December, 1909, that a shoal patch marked "Dumping Ground" exists in the otherwise good anchorage ground west of the Canal Prism and included in what is now called Colon Harbor. The Committee does not believe that the Canal Commission will overlook this shoal, but in view of the importance of having unobstructed anchorage waters in this area, it invites attention to the shoal in order that there may be no possibility of its existence being lost to sight.

7. When the canal defense shall have been finished commodious landing stages near the anchorages off Cristobal and Ancon will be needed for the use of both services. The only landings at present at the Atlantic end are at Colon, in foreign jurisdiction, and dangerous, if not impossible, in northers. There should be good landing stages at Cristobal of sufficient size to accommodate ships' boats and the ferries that must be established for communication with the proposed seacoast defenses. Suitable landing stages are even more necessary on the Pacific side owing to the great range of the tide. It has further been pointed out by naval officers who have had occasion to visit the Isthmus in command of ships that it is most desirable that some wharf should be provided at which the vessels engaged on duty in Central American waters can lie during their visits to the Isthmus. Such a wharf will be necessary not only for naval vessels but for Army transports when once the Canal shall be garrisoned. The Committee recommends that the Board invite attention to this matter in its report with a recommendation that an agreement be reached between the two services and the Commission after the subject has had proper consideration.

8. With regard to that part of the instructions of the Secretary of War for the information and guidance of the Board referring to "the offensive and defensive value and possibilities of the Island of Taboga, and the harbors of Porto Bello and in the Chiriqui Lagoon," to which may be added the Pearl Islands in Panama Bay, it is evident that no actual work is contemplated in any of these places, and that their connection with the defense of the Canal Zone is a strategic question which the Committee believes that the Board may well recommend be referred to the War Colleges of the respective services for study, with a further recommendation that any necessary surveys and examinations be made from time to time as the progress of the studies may indicate to be necessary or desirable.

9. Under date of February 21, 1906, the Chief Engineer of the Isthmian Canal Commission assigned an area 300 feet square at the summit of Lirio Cerro, south of Culebra, to the Navy Department as a site for a naval experimental wireless station. Recent developments have shown the importance of a high powered wireless station at this point, which will require a somewhat larger area for its establishment. The committee recommends that an area not exceeding ten acres with necessary right of way for approaches be set aside at the summit of Lirio Cerro under the same conditions as to present and final control as recommended by the Board in the case of the other sites desired for defensive purposes, and that the establishment of the wireless station at this point be regarded as part of the defense of the canal, and that the cost of establishment of this station be defrayed from the appropriation recommended for naval purposes.

(Sgd) William Crozier,
Brigadier General, Chief of Ordnance.

W. W. Wotherspoon,
Brigadier General, U. S. Army.

H. S. Knapp,
Captain, U. S. Navy.

W. J. Maxwell,
Commander, U. S. Navy.

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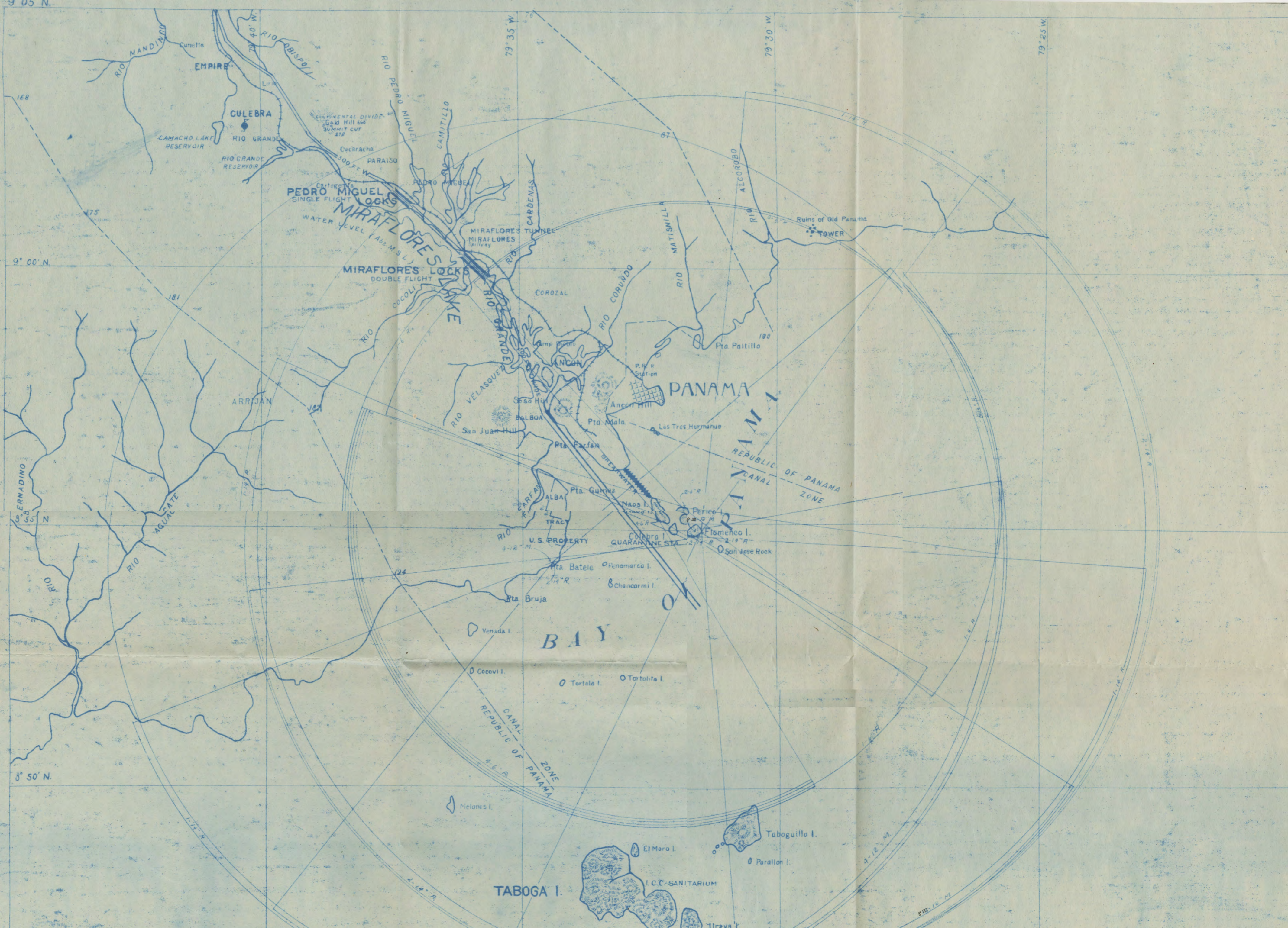
T R A C I N G S

SHOWING PROPOSED

LOCATIONS AND FIELDS OF FIRE

of

SEACOAST ARMAMENT.



PROJECT FOR SEACOAST DEFENSES, PANAMA

TERMINUS OF CANAL

SCALE - 1 to 80,000

