



WATER-RIGHT DOCKET

Cape Hatteras National Seashore

Docket No: 1

HEADQUARTERS-COQUINA BEACH

Supporting Hydro Data

01-29-1958: letter to division of mineral resources from superintendent regarding wishes to make application for a well driller's cert

05039

Cape Hatteras National Seashore
Manteo, North Carolina

January 29, 1958

Dr. J. L. Stuckey, State Geologist
North Carolina Department of
Conservation and Development
Division of Mineral Resources
Education Building
Raleigh, North Carolina

Dear Dr. Stuckey:

The National Park Service, in behalf of the Cape Hatteras National Seashore Recreational Area located with headquarters at Manteo, North Carolina, wishes to make application for a well driller's Certificate of Registration.

The well drilling work involves a series of test wells to locate a source of potable water. In some cases we may utilize a few of these test wells as supply wells to furnish water to recreational areas. We hope that funds will permit the study to be carried on each of the three islands comprising the National Seashore. We assume that one permit will cover the area and will be issued to the National Park Service and will cover the various members of our staff who are in charge of the well drilling. The work on each of the three islands will be performed by different crews.

Sincerely yours,

ROBERT F. GIBBS

Robert F. Gibbs
Superintendent

Copy to: Regional Director, Region One

ENash:ac



UNITED STATES
DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY
P. O. Box 2857
Raleigh, North Carolina

June 13, 1958

Mr. Robert F. Gibbs, Superintendent
Cape Hatteras National Seashore Recreational Area
Manteo, North Carolina

Dear Mr. Gibbs:

This office cooperated with Mr. Philip M. Brown, Ground Water Branch, U. S. Geological Survey, in developing a well field for a water supply for the National Park Service installation on Bodie Island. The dynamic conditions that exist between salt water and fresh water areas on Bodie Island make it necessary that further studies be conducted in order to preserve the adequacy of a fresh water supply. This letter is being written at the request of Mr. Nash and from recommendations from Mr. Brown's report. I have knowledge of the contents of the formal report that is being transmitted to the National Park Service in the near future pertaining to the ground water studies on Bodie Island.

With knowledge of the positions of the wells that are to be used for water supply and the wells that are to be used for the monitoring of the area to check on the vertical and lateral infiltration of salt water, the following proposals should be adopted: Mr. Brown's report states that a well is to be located in the middle of the producing well field and driven to a depth that will yield salt water. The location of this well is such that any upward seepage of salt water due to lowering of fresh water head should yield water of an increasing salt water concentration; therefore, a continuous record will be needed in order to determine the increasing salt concentration in this aquifer. Mr. Brown's report states that a well will be driven between the producing well field and the point most likely to yield salt water when the fresh water head is decreased in the production field. This well will be located between the production

IN REPLY REFER TO:

Cape Hatteras National Seashore JUN 19 1958	
Superintendent	☒
Asst. Sup.	☐
Adm. Assistant	☐
Chief Ranger	☐
Engineer	☒
Naturalist	☐
Historian	☐
Land Arch.	☐
Entomologist	☐
Land Acq. Office	☐
Project Supervisor	☐
Fort Raleigh	☐
Hatteras	☐
Ocrake	☐
File	☐

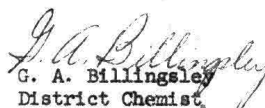
field and Pamlico Sound. It will be driven to the same depth as the wells that produce water for the recreation area. The monitoring of the salt concentration in this well should point up any lateral infiltration of salt water into the area. Therefore, the following proposal is made:

1. A continuous recording line-operated conductivity unit utilizing two pens for the recording of conductivities in the salt well and the fresh well. This will necessitate the placing of electrodes with their proper respective cell constants to record simultaneous conductivity from both wells.
2. These units should be laboratory checked with respect to sensitivity and accuracy of results before placing into operation.
3. A periodic servicing of the electrodes and the conductivity unit should be made and also samples of water should be collected and tested by laboratory equipment and procedures in order to determine deviations from true results which probably will take place in the instrument due to corrosion, scale or possibly slime formation on the electrodes, also, the recorder charts will need to be changed on a periodic basis.
4. This study should be conducted for a long enough period of time to take into consideration extreme conditions in order to insure an adequate supply of fresh water. As drought conditions are not predictable, it is impossible to state exactly how long this study should be conducted. I would guess that a minimum of two years should be considered. At the end of the first year the data obtained from the recorders together with information on the amount of water withdrawn from the well field, the amount of recharge into the field from atmospheric precipitation and possibly utilization of well levels should be analyzed and evaluated and assembled into a preliminary interpretative report concerning the investigation that took place during the first year. In this way, it would be possible to more accurately determine the necessary duration of the study.
5. Cost of this study for the first year will be greater than subsequent years because of equipment necessary to conduct such an investigation. The recorder, laboratory calibration, and installation of continuous

conductivity recorder and electrodes will cost \$2,000. Periodic inspections by qualified personnel should be made at least once a month. This service together with the analyses of the first year's data would cost approximately \$1,000.

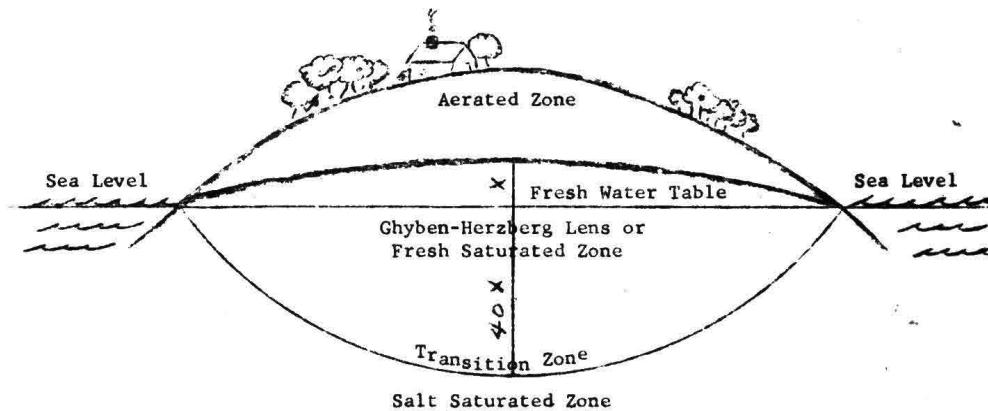
If you have any questions pertaining to this letter or to the problem that exists in your area, please do not hesitate to call on us.

Very truly yours,


G. A. Billingsley
District Chemist

cc: Mr. P. M. Brown

**G. BEN-HERZBERG THEORY OF LENS OF FRESH WATER,
SUPPORTED ON DENSER SALT WATER IN A RAIN ISLAND**



Distribution of Ground Water or Pervious Sandy Islands

Theory.--A symmetrical, uniformly pervious, but rainy island will involve the interaction of fresh water and salt water which is heavier by one-fortieth, so that a given depth of salt water will cause one-fortieth more pressure than the same depth of fresh water.

Description.--Where rainfall occurs, the run in (seepage into ground) will move downward by gravity until it reaches the salt water table. If abundant the water will spread laterally and some will escape at the edge of the island as shore line springs. But some will pile up and press down on the salt water and will displace some of the salt water until an equilibrium is reached. Thus, fresh water will saturate a body of sandy materials shaped like a bi-convex lens, known as Ghyben-Herzberg Lens. The lower surface of the lens, or "transition zone" will bulge downward about forty times as far below sea level as the upper surface, or water table bulges above the sea level. From the ground surface downward, as suggested by diagram, we would find first an aerated zone, then a fresh water table, a fresh saturated zone, a transition zone, and finally, a salt saturated zone.

Explanation.--The amount or depth of fresh water in the lens below sea level will be forty times the height of the fresh water above sea level. As rains swell the amount of fresh water falling on the island, the depth of the fresh water lens will become correspondingly deeper. As dry spells or pumping of the fresh water occurs, the salt water zone will move upward at a fast rate. This rate will be forty feet for every one foot drop of the fresh water table above the sea level mark. This phenomena of ground water distribution explains why excessive or uncontrolled pumping of fresh water areas on sandy islands can quickly result in the destruction of the fresh water supply. As the diagram shows, size of land mass or area in which the fresh water lens is recharged or supplied with rain water is a factor in the size and capacity of the fresh water zone.

U. S. Geological Survey, Ground Water Branch,
 Raleigh, N. C.

Sample - Description and Drilling - Mine Log

2: tea

Elevation of holes:

County and hole number: **Deer County, Hole #23** **T-3**

Depth to water table:

Location: **Cape Hatteras National Seashore**

Formations encountered:

Total footage: 78' 18.41

Number of samples: 13 Soil
1 Water

Left on eye: **Clyde Ward**

[illegible]

[illegible]

[illegible]

Fig. 2 as given above.

[illegible]

[illegible]

U. S. Geological Survey, Ground Water Branch,
 Raleigh, N. C.

Sample - Description and Drilling - Time Log

Date: **3/5/58**

Elevation of hole:

County and hole number: **Dare County, Hole #2** **T-14**
Soundside Dune

Depth to water table:

Location: **Cape Hatteras National Seashore**

Formations entered:

Total footage: **66'**

Number of samples: **13 Soil**
4 Water

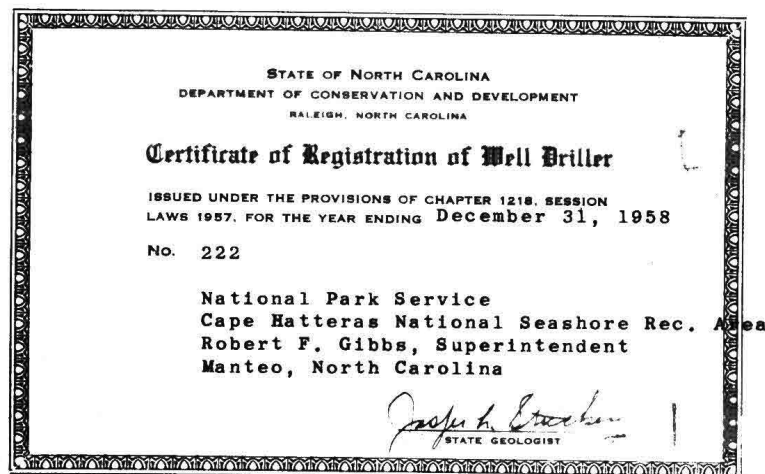
Done by: **Clyde Ward**

[illegible]

[illegible]

Good flow fresh water
down to 11'

[illegible]



Other Supporting Information

Form 10-174
(June 1962)UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

FACE SHEET FOR COMPLETION REPORT

Park Cape Hatteras National Seashore Recreational Area, Manteo, N. C.		Region Southeast	Work Order No. B-33 CAHA
Location in Park Bodie Island - from Coquina Beach to Oregon Inlet		State(s) North Carolina	Fund Symbol 14X1035
☒ Contract and/or ☐ Day Labor		County or Counties	Year Programmed 1962 Storm Damage
		Date	PCP No. - -
Work Order Title Reconstruct water system - Oregon Inlet			Master Plan No. - -
			Master Plan Corrected By - -
			As Built Drawings By - -
			Date Started 4-27-62
			Date Completed 6- 4-62

DESCRIPTION OF FIXED ASSETS
(For completion by employee in charge of project)TOTAL COSTS
(For completion by FFO)100.8 Utilities, Water System

14,186.12

Reconstruct Bodie Island water system after storm
damage (originally constructed under B-5)

TOTAL

\$ 14,186.12

DISTRIBUTION		THE FIXED ASSET DESCRIBED ABOVE HAS BEEN COMPLETED IN ACCORDANCE WITH APPROVED DRAWINGS, SPECIFICATIONS, AND AUTHORIZED CHANGES		
No.	To	Submitted By:	Title	Date
1	WASO (Orig)	By: <i>Willdon B. Craddock</i>	Project Supervisor	12-14-62
1	EODC	By: <i>Willdon B. Craddock</i>		
1	SERO	Approved By: <i>H. Reese Smith</i>	Title: Superintendent	Date: 12-14-62
1	Cape Hatteras	By: <i>H. Reese Smith</i>		
1	FFO	COSTS VERIFIED BY: <i>J. Baer</i>	Title: Regional Accountant	Date: 1-24-63
		BY: <i>J. Baer</i>		

11360

NARRATIVE REPORT

Contract No. 14-10-0131-897

Prime Contractor: Stetson & Daniels, Wanchese, North Carolina

Account No. 0330-B-33

PCP No.: None

Base Contract:

Bids opened

Number bids received

Low bidder

Date of contract

Notice to proceed

Designated commencement date

Actual commencement date

Designated completion date

Actual completion date

Stop order date

Resume work order date

Final inspection date

Final acceptance date

"Release of Claims" received date

Final estimate submitted

Purchase order

negotiated with
original contractor.

Stetson & Daniels

April 24, 1962

April 25, 1962

April 25, 1962

April 27, 1962

May 24, 1962

June 4, 1962

None

None

June 4, 1962

June 4, 1962

June 13, 1962

June 14, 1962

Sub-contractors: None

Change Orders: No. 1 - May 22, 1962

Change Order No. 1: Due to relocation of comfort station and parking area at storm damaged Oregon Inlet, an additional 39 lin. ft. of 6" a/c water line @ \$2.68 per lin. ft., and 650 lin. ft. of 2" plastic water line @ \$1.50 per lin. ft. for a total increase of \$1,079.52, was required.

Monthly payments: Final estimate - June 14, 1962 = \$9,880.02

Actual quantities and payments:

6" class 150 water line - 1,739 lin. ft. - \$2.68 - \$4,660.52

2" schedule 40 pvc

plastic water line - 2,650 lin. ft. - 1.50 - 3,975.00

6" x 6" x 2" tee - 1 each - 35.00 - 35.00

6" x 2" x 2" tee - 1 each - 35.00 - 35.00

6" gate valve w/c.i.box - 1 each - 108.00 - 108.00

2" " " " " " - 6 each - 61.00 - 366.00

Water hydrants - 5 each - 55.00 - 275.00

6" galv. conduit - 1 each - 175.00 - 175.00

Concrete markers - 15 each 16.70 - 250.50

Actual location, size and quantity of contract work:

100.8 Utilities, Water System

1,739 lin. ft. of 6" a.c. water line connecting to existing 6" a. c. water line at Oregon Inlet and running south to a point approximately 519 ft. south of Oregon Inlet Campground entrance road.

2,650 lin. ft. of 2" schedule 40 pvs plastic water line.
1,019 lin. ft. connecting to south end of 6" a/c water line and following an easterly direction to water hydrant approximately 100 ft. northeast of comfort station No. 2 with two spur lines branching off from main line which runs center of steel parking area - one to northeast end of parking area, the other to southwest end of parking area.

1,631 lin. ft. connecting to south end of 6" a/c water line and following a southerly direction for approximately 516 feet, then in a westerly direction for approximately 200 feet, passing under new North Carolina State Highway Commission bridge approach, then back to a southerly direction for approximately 800 feet to comfort station No. 3 at Oregon Inlet Marina site. One artery from main line to Oregon Inlet Fishing Center concessionaire 115 lin. ft. running in a westerly direction approximately 485 feet north of comfort station No. 3.

Form 10-174
(Rev. 8-56)UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

COMPLETION REPORT OF CONSTRUCTION PROJECT

REGION One	AREA Cape Hatteras National Seashore	COUNTY Dare	STATE North Carolina
PROJECT OR JOB TITLE Water Resources Study - Bodie Island			PCP NO. None
LOCATION IN AREA Headquarters-Coquina Beach		MASTER PLAN NO. RA-CH 3042F	BUILDING NO. None
WORKING DRAWING NO. AND TITLE RA-CH 3042X - Water Resources Study Area - Bodie Island			
APPROPRIATION TITLE AND SYMBOL 1481033 - MRP 0140 (147.2)			WORK ORDER NO. None
CONTRACT NO. Force Account Project		DATE WORK STARTED May, 1957	DATE WORK COMPLETED June 30, 1958
NAME OF CONTRACTOR Continuing Project - Report for Bodie Island		ADDRESS	

COST ANALYSIS

CONSTRUCTION ITEMS	QTY.	UNIT COST IN PLACE	TOTAL COST IN PLACE
24 wells @ 298.805	24	298.805	7,171.33
U. S. Geological Survey Participation			1,000.00
TOTAL			8,171.33

SUMMARY OF EXPENDITURES

PERSONAL SERVICES 2,314.30	EQUIPMENT 1,665.07	MATERIALS AND SUPPLIES 2,647.68	
OTHER 361.58	Facilitating Services 182.70 U.S.G.S. Participation 1,000.00		
CHANGE ORDERS			
ORIGINAL CONTRACT AMOUNT	FIRST	SECOND	THIRD
FINAL CONTRACT AMOUNT	FOURTH	FIFTH	SIXTH

THIS PROJECT OR JOB HAS BEEN COMPLETED IN ACCORDANCE WITH
APPROVED DRAWINGS, SPECIFICATIONS, AUTHORIZED CHANGES

SUBMITTED BY (Name and title) Edward Nash, Park Engineer	DATE October 31, 1958
APPROVED BY (Name and title) Robert F. Gibbs, Superintendent	DATE October 31, 1958

(ATTACH NARRATIVE STATEMENT, PHOTOGRAPHS, AND "AS BUILT" DRAWINGS TO THIS FORM)

COST SUMMARY

<u>Labor & Personal Services</u>	<u>COSTS</u>	<u>PROGRAMED</u>
1957 F.Y. (none)	2,314.30	2,000.00
1958 F.Y.	2,314.30	<u>5,230.00</u>
	Total	7,230.00
<u>Equipment</u>		<u>EXPENDITURES</u>
1957 F.Y. (for construction rig)	647.87	1,933.25
1958 F.Y. Rental & Operation	778.80	5,238.08
Amortz & Depreciation	238.40	U.S.G.S. <u>1,000.00</u>
		Total 8,171.33
<u>Materials</u>		<u>COST SUMMATION</u>
1957 F. Y.	1,205.38	19 exploratory wells
1958 F. Y.	1,442.30	) <u>5 test wells</u>
		24 wells @ \$298.805 or
<u>Other Direct Expenses</u>		\$7,171.33. Approximate
1958 F. Y.	331.58	cost per well \$300.00.
<u>Facilitating Services</u>		
1957 F. Y.	80.00	
1958 F. Y.	<u>102.70</u>	
Total	7,171.33	
U. S. Geological Survey +Participa- tion - Supervision, analyzing data and report	<u>1,000.00</u>	
Total Expenditures Water Resources Study (por) Bodie Island	\$8,171.33	

Water Resources Study
Bodie Island
Narrative Report

1957 Fiscal Year: Project was initiated latter part of fiscal year with instructions to purchase supplies and fabricate a well rig. A surplus military jeep was procured, materials purchased, and arrangements made to make a well rig with a local welding company. Supervision of this work was under a retired local well driller.

1958 Fiscal Year: During the 1958 Fiscal Year, \$5,230.00 was programmed to carry out the Water Resources Study on Bodie Island. Active work started on November 20, 1957 under the direction of Mr. Phillip Brown of the U. S. Geological Survey, Raleigh, N. C. Mr. Clyde Ward, Bodie Island Maintananceman, was assigned to do the field work, and instructions on well rig operation were given by Mr. White, a retired well driller.

As with any home-fabricated equipment, there was considerable modification of method used before a standard operating procedure came into use. However, in time a satisfactory well drilling operation envolved and the drilling plans and program altered to fit the productive capacity of our well rig.

Nineteen (19) exploratory wells were jettied; six (6) along the ocean front at intervals of 1,000 feet for a distance of 6,200 lineal feet; six (6) crosswise of the island at similar intervals, and seven (7) wells at a selected sound-side dune arc. The purpose of the exploratory wells was to find depth of fresh water lense, depth to salt water, sand, gravel, shell, and clay formations, and areas of best water. The purpose of the Water Resource Study was threefold: to locate the best available pumping site, the depth to which optimum pumping conditions existed, and the amount of water available for pumping without salt water contamination. From the data furnished by the exploratory wells, a pumping test site was selected and five (5) wells were jettied in place, 1 production well, (39' including 8' screen), 1 saline well (66') and 3 observation wells (39'). The test was successfully run and all data supplied by the study was analyzed by the staff members of the U. S. Geological Survey, Ground Water Branch and a report prepared. The report covered all the data necessary for the design of a water system on Bodie Island (Headquarters-Coquina Beach Area) that is, well location site, depth of optimum water supply and well capacity. A summary of testing results showed the area might safely yield 200 gpm, with separate wells of 25 gpm capacity spaced at 100 foot intervals in relation to test wells, that the well depth should not exceed 42' mean sea level, and that, although the water is soft with a good taste quality, chlorination may be necessary to remove a slight hydrogen sulphide odor. Hydrogen sulphide was 3.4 ppm.

The Water Resource Study was completed on or about June 1, 1958 on Bodie Island, the testing site cleaned, and all wells capped. All remaining supplies and the well rig were sent to the Hatteras Maintenance District at Buxton on Hatteras Island for a similar study at the Cape Point Area proposed for Fiscal Year 1959.

Water Resources Study, Bodie Island

Cape Matteras National Seashore

Well Rig in operation - photo shows jet hose attached to driving hammer which is attached to 1/2" water jet line extending into casing for depth of casing. Water pouring out of casing is jet water carrying sediment. This sediment shows the stratified layers met as the casing is jetting downward. Soil samples were taken every five feet. Water samples were taken every five feet as the casing was pulled. Depth of casing was set by driving to salt water of non-potable concentration (2,000 ppm or over).



7503

P. O. BOX 2000

W. H. HALEY, BRISTOL COMPANY

Recd

Cape Hatteras
N.C.
SEP 11 1964

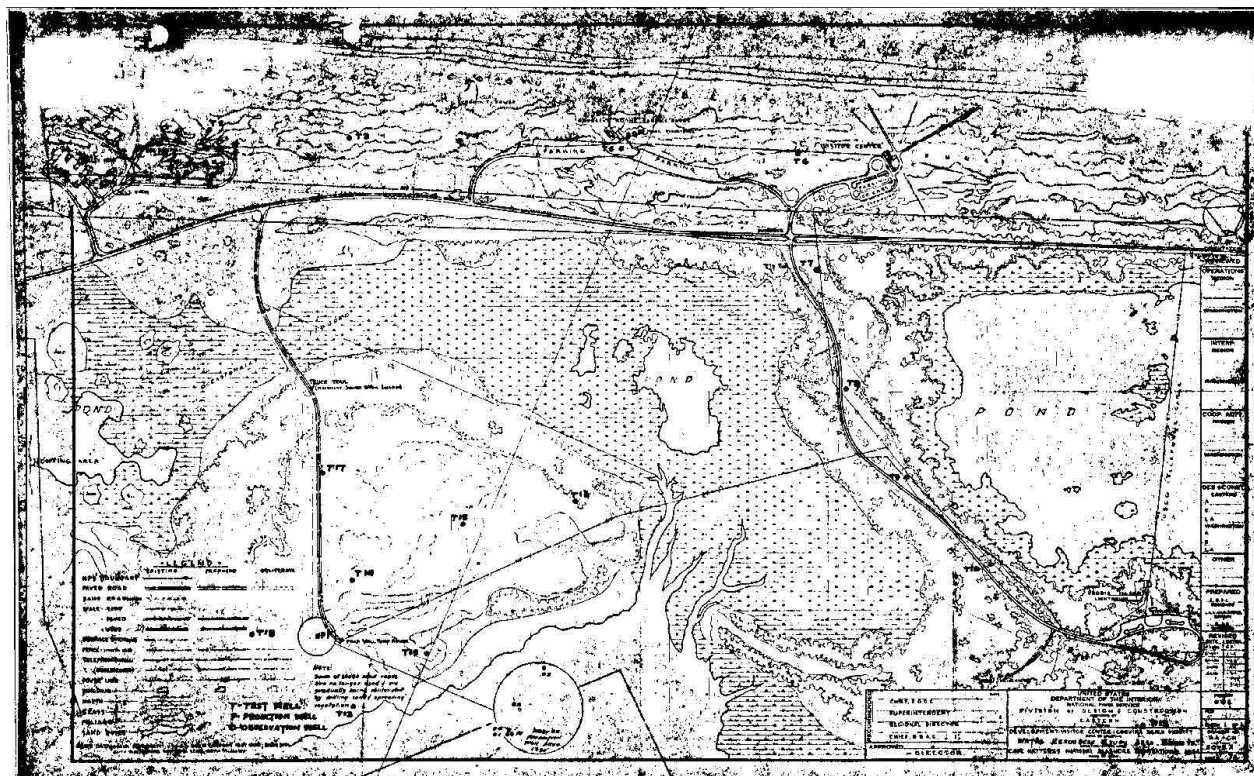
Subsistent
Pine Barren
Adm. Assistant
Chief Engineer

Director
National
Historical
Landscape
Program
Chief
Archaeologist
Chief
Historian
Chief
Interpreter
Chief
Preservation
Officer
Chief
Resource
Manager
Chief
Technical
Services
Officer
Chief
Training
Officer
Chief
Public
Affairs
Officer
Chief
Facilities
Officer
Chief
Security
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Maintenance
Officer
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Inventory
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Chief
Records
Officer
Chief
Communications
Officer
Chief
Transportation
Officer
Chief
Food
Services
Officer
Chief
Catering
Officer
Chief
Bartending
Officer
Chief
Housekeeping
Officer
Chief
Janitorial
Officer
Chief
Security
Officer
Chief
Maintenance
Officer
Chief
Inventory
Officer
Chief
Records
Officer
Chief
Communications
Officer
Chief
Transportation
Officer
Chief
Food
Services
Officer
Chief
Catering
Officer
Chief
Bartending
Officer
Chief
Housekeeping
Officer
Chief
Janitorial
Officer

Your letter of September 3, in regard to the drilling of test wells in Dare and Hyde Counties, has been received.

Registration merely amounts to writing a card or letter to the Mineral Resources Division stating that the undersigned well driller is planning on drilling wells in the State of North Carolina.

W. H. Riley
Executive Secretary



Docket Information

Number of Documents in Docket 36

Documents Dated from 1/13/1958 to 12/14/1962

Docket Compiled: 2/1/2011