



WATER-RIGHT DOCKET

Great Smoky Mountains National Park

Docket No: 29

SPRING. TOWSTRING QUARTERS

Preliminary Docket Information

00-00-0000: water right/source docket information

SEE GREAT SMOKY MOUNTAIN DOCKET NO. 1 FOR MAP
AND PRELIMINARY MAP SHOWING LOCATIONS OF
WATER SOURCES WITHIN THE PARK.

WATER RIGHTS DOCKET
Towstring
Great Smoky Mountains National Park

Supporting Hydro Data

20.

TOWSTRING

Situation: This area is located approximately 2 miles north of Oconaluftee and involves a single ranger residence and the park's horse operation. The present spring supply is too marginal to supply the residence and the number of horses stabled there.

Proposed: If possible, a deep well of a minimum capacity of 15 g.p.m. is desired.

Progress to Date: Contract awarded April 14, 1967. Drilled well to 148' with a yield of 18 g.p.m. artesian discharge and 29 g.p.m. pumping capability.

(09/28/67)

WATER SUPPLY

Tow String Creek Well

The well site is located near the left bank of Tow String Creek, in the northeastern corner of the yard at National Park Service ranger's residence, and about 2 miles north of the Oconaluftee Maintenance area. Altitude of the general area is roughly 2,140 feet (from topographic map).

Drilling began on June 12, 1967 using a 6-inch tri-cone bit. At a depth of about 15 feet, saturated unconsolidated material caused the well to cave-in. The hole was reamed larger, and 15 feet of 8-inch pit-casing was set in the well. Drilling then continued to 32 feet, and the well was cased to this depth with 6-inch casing. (this was later driven four more feet to insure a tight seal). No other problems were encountered, and the well was completed on June 14. Below is a hydrogeologic log of the well, drilled in alluvium and plutonic rock of the basement complex.

0-14 ft., Soil cover and alluvium ranging from sand and pebbles to boulders. No water.

14-24 ft., Still in alluvium with many scattered boulders. Water encountered at 15 feet. Estimated yield was 3-4 gpm.

24-30 ft., Soft, highly weathered bedrock (resembles brown sand). Water was orange in color and discharge was estimated at 5 gpm.

30-32 ft., Solid bedrock of biotite-quartz gneiss. Yield was still about 5 gpm. Well temporarily cased to this depth (the casing was later driven to 36 feet).

- 32-36 ft., Fine-grained biotite-quartz gneiss with no water. The casing sealed off the fractures that supplied the above mentioned 5 gpm.
- 36-44 ft., Biotite-quartz gneiss with some cubic crystals of pyrite (FeS). No weathering or decomposition of either is evident. No water.
- 44-80 ft., Same type rock, hard and unweathered, with pyrite crystals up to 1/8-inch in size. No water.
- 80-108 ft., Same type rock and some water at 108 feet. Estimated yield was 3 gpm.
- 108-130 ft., Still in the same fine-grained gneiss, but action of the bit and drill cuttings indicate some fracturing. Yield increased to about 5 gpm.
- 130-143 ft., Same as above.
- 143-144 ft., At 143 feet the bit dropped through a highly-weathered fracture zone about a foot thick. The yield measured about 90 gpm.
- 144-148 ft., Unweathered fine-grained gneiss. No noticeable change in yield. Drilling terminated at 148 feet.

A noteworthy quality of this well is its ability to discharge water at a steady rate above ground level. The source of this artesian condition is probably an inclined system of interconnected fractures sloping downward from the surrounding hillsides that possibly could originate along a sloping fault plane as there are complex fault systems in the general area (the Greenbrier fault is within 1,000 feet west of the well site). Measurements of discharge made on June 15, 16, 27, and 28 indicate a steady flow of 15-18 gpm over the rim of the casing, which is about 2 feet above ground level.

On June 27, a 6-inch, 5-horsepower, submersible pump was set in the well at 126 feet for the pump test. Water level was at the top of the casing or approximately 2 feet above ground level. For the first half-hour of the test, the pump was operated at a maximum discharge of 90 gpm and the water level declined to 108 feet. Afterwards, the discharge was varied so as to stabilize the water level. (see fig. 1). Following a period of fluctuation, the water level was held steady for $3\frac{1}{2}$ hours at a depth of 123 feet with a discharge of approximately 29 gpm. The specific capacity of the well is 0.23 gpm per foot of drawdown after 6 hours of pumping.

The chemical analysis of a water sample taken at the end of the 6-hour pump test shows a specific conductance of 97 and a pH value of 7.9 (see table 1). The water is of excellent quality and should require no treatment for domestic use.

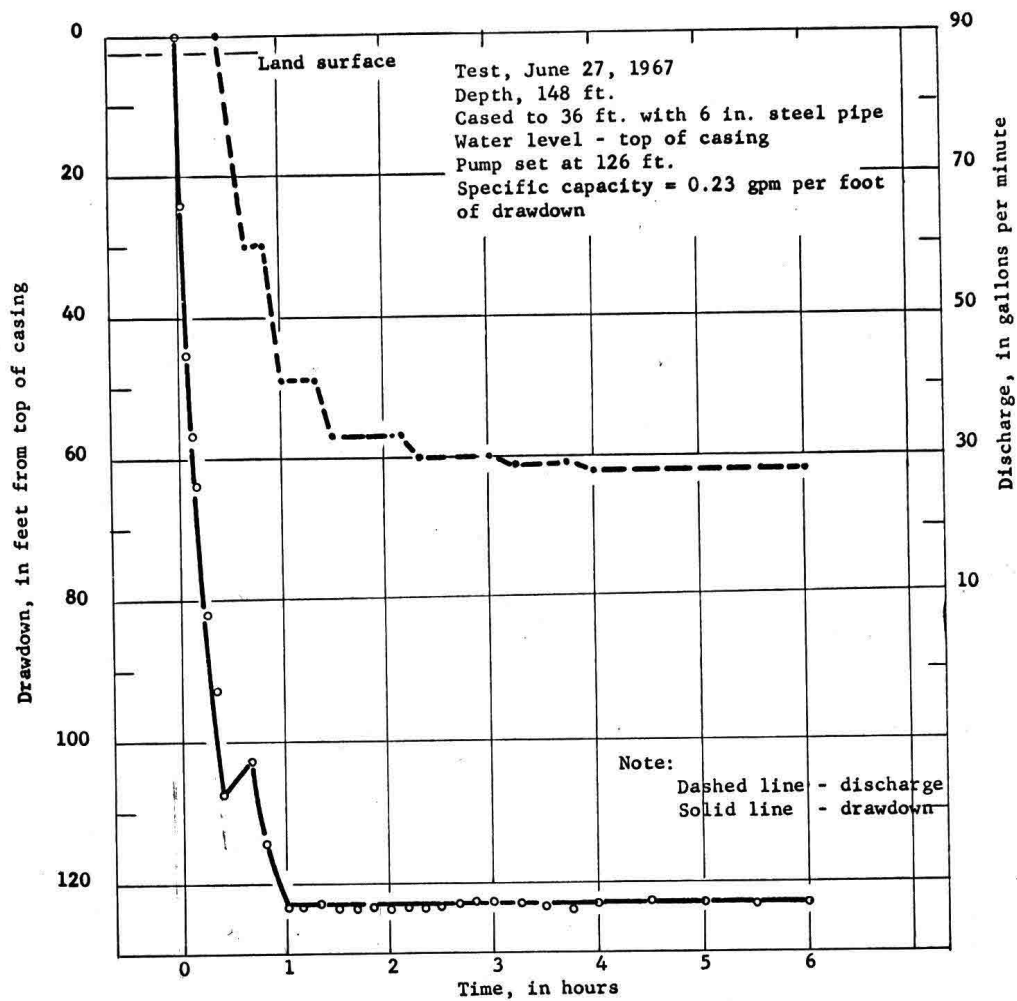


Figure 1. Discharge and drawdown of well at Tow String Creek.

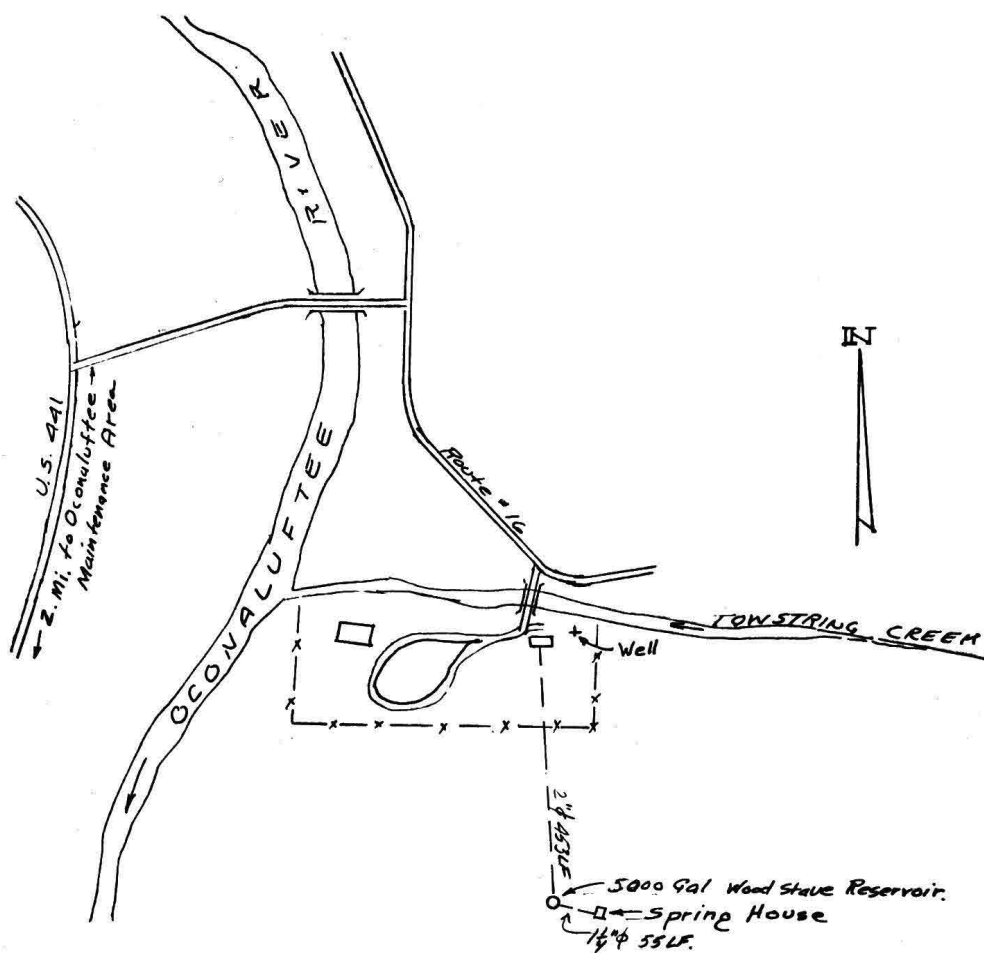
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
WATER ANALYSIS

W.R. Lab. No. NC 48654

Location <u>Tow String</u> <u>Swain County</u>			
Source _____			
Pt. of collection: <u>Orifice</u>			
Date of collection <u>6/27/67</u>			
Gage height(ft.) _____		Discharge(sec.ft.) _____ Temp.(°F) <u>53</u>	
(Parts per million)			
Silica (SiO ₂).....	17	Carbonate (CO ₃).....	
Aluminum (Al).....	.0	Bicarbonate (HCO ₃).....	47
Iron (Fe).....	.05	Sulfate (SO ₄).....	7.2
Manganese (Mn).....	.01	Chloride (Cl).....	1.0
Calcium (Ca).....	14	Fluoride (F).....	.4
Magnesium (Mg).....	.3	Nitrate (NO ₃).....	.1
Sodium (Na).....	4.4	Phosphate (PO ₄).....	.00
Potassium (K).....	1.3		
Lithium (Li).....			
(Parts per million)			
Dissolved solids:		ABS.....	
Sum.....	69	Color.....	1
Residue upon evapo- ration @ 180°C.....	70		
Hardness as CaCO ₃	37		
Noncarbonate.....	0		
pH.....	7.9	Specific conductance (micromhos at 25°C).....	97

Table 1. Chemical quality of water from the Tow String Creek Well.

Unpublished records subject to revision



TOWSTRING
RANGER STATION

NAME OF SYSTEM: Towstring, Quarters #274LOCATION: Park Route 16LOCATION: STATE: North Carolina COUNTY: SwainA. Source of SupplyLocation - Reference to Permanent LandmarkCoordinates

1. A small spring

450 feet southeast of Quarters #274

Lat. N 35°32'17"
Long. W 83°17'45.7"

This gravity flow system is supplied by a small boxed-in spring located on a hillside at an elevation 40 feet higher than the house. From the spring intake, the water flows through 55 feet of 1½" galvanized pipe to a 5,000 gallon wood stave storage tank (approximately 40 feet elevation above residence). The estimated quantity of water available from the spring is ½ - 1 gallon per minute. No treatment for the water is provided; the amount used is not metered.

2. A deep well

40 feet northeast of northeast corner of residence

Lat. N 35°32'22"
Long. W 83°17'17.6"

A test well was drilled to a depth of 148 feet. The well yields 18 gallons per minute artesian discharge and has a pumping capability of 29 gallons per minute.

B. Consumption:

Annual consumption for this system is estimated at 135,000 gallons. This system serves a single employee residence and the park horse corral operation.

C. Distribution Mains and Laterals:

<u>Size</u>	<u>Type</u>	<u>Length</u>
1½"	Galvanized Iron	55 Lineal Feet
2"	Galvanized Iron	<u>500 Lineal Feet</u>
TOTAL		555 Lineal Feet

D. Problems:

This system, though it only supplies one residence and the park horse operation, is too marginal during dry periods for acceptable operation.

E. Additional Information:

The deep well will be put into operation in 1970 F.Y. The system will include a submersible, 1 H.P., Fairbanks-Morse pump, complete with controls and pump housing.

(Towstring - Addendum No. 1)



5,000 GALLON WOOD STAVE RESERVOIR



A CONCRETE BOX ENCLOSURE OVER SPRING INTAKE

Other Supporting Information

PROPOSED SITES FOR WATER RESOURCES INVESTIGATION

1. Park Headquarters
2. Green Mountain (Foothills Parkway)
3. Newfound Gap
4. Cades Cove
5. Deep Creek
6. Smokemont
7. Abrams Creek
8. Twin Creeks
9. Collins Creek
10. Metcalf Bottoms
11. Cataloochee
12. Elkmont
13. Cosby
14. Chimneys
15. Rocky Mountain (Foothills Parkway)
16. Webb Mountain (Foothills Parkway)
17. Little Greenbrier
18. Greenbrier
19. Sinks
20. Towstring
21. Indian Camp Creek
22. Tremont Ranger Station
23. Round Bottom Campground
24. Balsam Mountain Campground
25. Main Oconaluftee Residential Area
26. Old Oconaluftee Residence Area (Ravensford)
27. Big Creek Ranger Station
28. Cataloochee Ranger Station
29. Cataloochee Maintenance Area
30. Twentymile Ranger Station
31. Cherokee Orchard
32. Sugarlands

(09/28/67)

735-7-17-65-

L54 SER(OLW)

SEP 14 1965

Handwritten:
Reed
EWC 9/17
WRR

Memorandum

To: Superintendent, Great Smoky Mountains

From: Acting Assistant Regional Director, Operations,
Southeast Region

Subject: Water Resources Investigations, Great Smoky Mountains
National Park

We will be glad to assist you in developing a detailed water resources study at Great Smoky Mountains National Park during the 1966 fiscal year as requested in your memorandum of August 23. The results produced from such a study should provide us with the basis for a full and most effective development of all water resources located within the Park boundaries. It is evident that new sources of water are needed to meet the demands of future and existing Park facilities.

We believe the investigative work should include the following:
(1) The first and most pressing problem involves the need to expand several water supply systems in order to provide more water to take care of a greater number of Park visitors and increased Park uses. This requires an evaluation of the probable capacity of the present sources of supply and the locating of possible new sources of water supply of acceptable quality for increased demands of the future and (2) The second phase of the project (extending over a period of several years) would be to conduct surface and ground water studies throughout the Park in order to obtain a general knowledge of all water resources. With such information at hand, the Park staff will be able to plan efficiently for new or expanded developments.

An over-ceiling item was included in the 1966 F.Y. Regional Water Resources Program in the amount of \$26,000 to initiate a study of domestic water supply needs and test well drilling work at the Park. Mr. E. W. Reed, Chief, Water Resources, has recently advised that at present the Washington Office reserve contains sufficient funds to finance this study.

We agree a meeting and field reconnaissance should be held at the Park between representatives of the U. S. Geological Survey, the Regional Office and the Park staff to properly formulate a logical approach to this water resources project. In early October, we will take the necessary action to firm up a satisfactory date for the meeting with all those concerned.

(SIGNED)

W. Mikell

cc: ~~Director~~, w/c of inc.
Chief, EODC (2), w/c of inc.



UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

Great Smoky Mountains National Park
Gatlinburg, Tennessee 37738

August 23, 1965

Y REFER TO:
L54

SOUTHEAST REGION	
AUG 26 1965	
Regional Director	
Asst. Reg. Dir. (A)	26
Asst. Reg. Dir. (CA)	
Asst. to Reg. Dir. (PA)	
Asst. to Reg. Dir. (D)	
Resource Studies Asst.	

X *Land & Water*
Main

Memorandum

To: Regional Director, Southeast Region
From: Superintendent, Great Smoky Mountains *lost Lake*
Subject: Water Resources Investigations, Great Smoky Mountains National Park

Over the past couple of years, continued increases in demands on the numerous surface water supplies have gradually developed into a problem that needs immediate attention. While it is recognized that in the past we have shown little or no interest in water resources investigations, it now appears that well supplies may not only be a desirability but a necessity. During periods of prolonged drouth such as we are now experiencing in the Park, the surface supplies diminish to the point of nearly drying up, and supplemental supplies of low quality water are heavily treated and pumped into the supply lines.

During USPHS Engineer Henderson's recent trip to the Park, we had occasion to closely observe several of our major supplies. For example, we found that the Ash Hopper Branch gravity supply that ordinarily supplies headquarters was providing 19 gallons per minute (actual meter readings) over a period of a week. The consumption at this time was metered at 35,000 to 37,000 gallons per day and so, needless to say, we had to pump a supplemental supply out of a branch of Fighting Creek which runs through the residential area. We actually were only able to obtain a maximum of 15 gallons per minute from this supply. Incidentally, this creek pumping station is only a couple of hundred feet from the first domestic user and less than 1,000 feet from our major development area which definitely does not allow the desired chlorine retention time for safe water treatment. Also, when you realize that our actual usage exceeded an average of 25 gallons per minute and all available water in the system amounted to 34 gallons per minute, it is easy to see there is little margin for any emergency whether it be a leak in the line, any type of fire drawdown or allowance for any consideration of lawn sprinkling. If either of these supplies decrease further, we do have several alternatives in order to retain a minimum supply on hand.

By metering, we have determined that we are wasting 13,000 gallons per day through our Visitor Center dehumidifier system. This is quite a luxury and one that needs some study as to the possibility of re-circulation of this water. If our present supply should decrease any further, we would of course have to shut down the dehumidifier system which would have rather detrimental effects on artifacts storage as well as causing the Visitor Center to be rather uncomfortable.

Further checks on other major supplies in the Park showed similar conditions but none as critical as that that exists in the Headquarters area. If at all possible, and if it can be worked into your Water Resources Investigation program as an emergency measure, we would like to suggest the programming of an exploratory well for this fall. While we have little information on the characteristics of wells in this area, Mr. Henderson felt that a well programmed for 100-foot depth with rotary drill method (possible heavy river boulder sub-surface) should provide a plentiful supply for the area. On this basis, it appears that funds in the construction amount of \$2,500 would be needed to drill, case and test the well.

In an August 19 telephone conversation between Hydraulic Engineer Vick of your office and Chief of Maintenance Rowe, Mr. Vick had mentioned that he had put an over-ceiling item in his 1966 F.Y. Water Resources budget in the amount of \$24,000 to initiate a study of Park domestic water supply needs. We support this program whole-heartedly and hope that a necessary field inspection involving personnel from the USGS, the Regional Office, and the Park can be set up for the month of November. / /

As suggested to Mr. Vick in the abovementioned telephone call, the following listing is a tentative priority list of well investigations which we would like to see programmed:

1. Headquarters -- As soon as possible.
2. Green Mountain Picnic Area, Foothills Parkway -- 1967 F.Y.
3. Cades Cove -- 1967 F.Y.
4. Cataloochee -- 1967 F.Y.
5. Rocky Mountain -- 1967 F.Y.
6. Chilhowee, Foothills Parkway -- 1968 F.Y.

7. Cades Cove -- 1968 F.Y.
8. Deep Creek -- 1968 F.Y.
9. Smokemont -- 1968 F.Y.
10. Chimneys -- 1969 F.Y.
11. Elkmont -- 1969 F.Y.
12. Cosby -- 1969 F.Y.
13. Webb Mountain, Foothills Parkway -- 1969 F.Y.


George W. Fry

MAY 1962 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : Gerald Rowe, Chief of Maintenance
Great Smoky Mountains National Park
Gatlinburg, Tennessee 37738

DATE: September 7, 1967

FROM : W. M. McMaster, USGS, WRD
Knoxville, Tennessee

SUBJECT: Summary of work plans for study of water resources of Great Smoky Mountains
National Park, North Carolina and Tennessee Districts

As I promised you on August 11, I am sending you our plans for the study of water resources of Great Smoky Mountains National Park that have been modified as a result of a meeting between North Carolina and Tennessee U. S. Geological Survey personnel July 6-7, 1967.

W. M. McMaster
W. M. McMaster
Hydrologist

cc: Edward J. Kennedy, Chief, Tenn. District
Ralph C. Heath, Chief, N. C. District



Buy U.S. Savings Bonds Regularly on the Payroll Savings Plan

Summary of work plans for study of water resources of Great Smoky Mountains
National Park, North Carolina and Tennessee Districts

Sept. 7, 1967

At a meeting in Knoxville during July 6-7, 1967, North Carolina and Tennessee personnel discussed modification of plans in the study of water resources of the Great Smoky Mountains National Park. Those who attended the meeting were: Ralph C. Heath, North Carolina District Chief; Edward J. Kennedy, Tennessee District Chief; D. R. Rima, Assistant District Chief for Tennessee; Nat Thomas, G. C. Goddard, and E. T. Hubbard of North Carolina; and W. M. McMaster of Tennessee.

At the meeting it was agreed that the effort in both districts should be combined under leadership of one individual; McMaster was delegated project leadership. McMaster will be responsible for ground water interpretive aspects of the study and Hubbard will be responsible for surface water interpretive aspects.

The final product will be a hydrologic atlas of the Smokies area, published by the Geological Survey, that will consist of the 1:125,000 base map upon which will be delineated ground water and surface water information. Ground water occurrence and availability will be shown as a series of patterns, each defining a range between a minimum, a maximum, and an average of expected well yields within the area covered by the pattern. These areas are expected to be established by topographic criteria, geologic location, estimated soil thickness, and background information provided by test wells drilled during the course of the study. If a test well appears capable of yielding the desired quantity of water for water supply at the drilling site, a pumping test will be run.

Surface water information will be indicated by isopleths of minimum flow in cubic feet per second per square mile at the 2-year 7-day recurrence interval, based on a series of low-flow measurements made during the course of the study, at a total of about 100 sites throughout the Park distributed so as to define variations in flow with location and altitude. It is hoped that these sites can be measured a total of 8-9 times following periods of about 7 days of no rainfall.

Ground water and surface water chemical quality will be described, based on results of analysis of water from test wells and samples collected from streams. A series of coliform analyses of stream water is planned to define possible areas of contamination.

An explanatory text and supplementary illustrations will be included. The atlas is expected to provide the NPS engineer a basis for planning future developments of any kind in the Park for which knowledge of water resources is required.

Consideration will be given to popular-type brochure for distribution to Park visitors, describing and illustrating the occurrence of water in the area and its role in shaping the mountains.

Test drilling and reporting will continue to be handled by the District in which the site is located.

Plans are to complete the text of the final report by May 1969 for transmission through final review prior to publication. However, if insufficient opportunities to collect low-flow measurements occurs during the remaining time through November 1968, it is hoped that supplementary funds will be available from NPS to make additional measurements during the following year.

Docket Information

Number of Documents in Docket 21

Documents Dated from 8/23/1965 to 9/28/1967

Docket Compiled: 3/30/2011