



WATER-RIGHT DOCKET

Shenandoah National Park

Docket No: 6

DICKY RIDGE WATER SYSTEM

Preliminary Docket Information

00-00-0000: docket #6 - dicky ridge water system index

SHENANDOAH NATIONAL PARK

Docket #6

Dickey Ridge Water System

I N D E X

PART I - INVESTIGATION

1. Geologic Map - Dickey Ridge Area.
2. Preliminary Report, Dickey Ridge Area, prepared by Virginia Division of Mineral Resources, Charlottesville, Virginia, May 24, 1963.
3. Geologic Log (Well No. 2) - August 1, 1963.
4. Water Well Completion Report (Well No. 2).
5. Geologic Log (Well No. 1) - July 23, 1963.
6. Water Well Completion Report (Well No. 1).
7. Final Report, Dickey Ridge Area, prepared by Virginia Division of Mineral Resources, Charlottesville, Virginia, September 5, 1963.

8 Final Rpt #2 Jan 27, 1967

PART II - WATER RIGHT

*Correspondence
Statement of Real Property - Original
Spring Supply*

COMMONWEALTH OF VIRGINIA DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT DIVISION OF MINERAL RESOURCES JAMES L. CALVER, COMMISSIONER		VDMR 1346 WWCR 66
MAILING ADDRESS: Box 3667, University Sta. Charlottesville, Virginia	WATER WELL COMPLETION REPORT	OFFICE ADDRESS: McCormick Road Charlottesville, Virginia

OWNER: <u>Shenandoah National Park</u>	Mailing Address: _____
TENANT: <u>Dickey Ridge # 5</u>	Mailing Address: _____
DRILLER: <u>H. L. Singhas, Pres.</u> <u>Valley Drilling Corp.</u>	Mailing Address: <u>Middleburg, Virginia</u>

WELL LOCATION: County <u>Warren</u>	Approx. <u>5</u> ~~miles~~ <u>miles</u> <u>south</u> (direction)
<u>Front Royal</u> and <u>1/2</u> ~~miles~~ <u>miles</u> <u>east</u> (direction) of <u>Skyline Drive</u>	

(GIVE DIRECTION AND DISTANCE IN FEET OR MILES FROM TWO REFERENCE POINTS - ROADS, TOWNS, RIVERS, ETC. - ON COUNTY HIGHWAY OR OTHER MAP.)

DATE STARTED: <u>July 13, 1965</u>	DATE COMPLETED: <u>August 24, 1965</u>
------------------------------------	--

TYPE OF DRILL RIG USED: <u>Air Rotary</u>	TOTAL DEPTH <u>650</u> feet
---	-----------------------------

WATER LEVEL: Stands <u>200</u> feet below surface OR	
has <u>NATURAL</u> flow of _____ gallons per minute.	

YIELD TEST: Method <u>Submersible pump</u> Drawdown _____ feet Rate <u>60</u> gal. per min. Duration <u>26</u> hrs., _____ min.	HOLE SIZE: <u>10</u> inches from <u>0</u> to <u>51</u> feet <u>6 3/8</u> inches from <u>51</u> to <u>650</u> feet _____ inches from _____ to _____ feet
--	---

WATER ZONES: from <u>600</u> to <u>605</u> feet from <u>625</u> to <u>630</u> feet from _____ to _____ feet	SCREEN SIZE: _____ inches from _____ to _____ feet _____ inches from _____ to _____ feet _____ inches from _____ to _____ feet
---	--

CASE SIZE: <u>6 1/2</u> inches from <u>0</u> to <u>52</u> feet _____ inches from _____ to _____ feet _____ inches from _____ to _____ feet	
--	--

WATER: Color <u>Clear</u> Taste <u>Good</u> Odor <u>None</u> Temp. <u>56</u> °F	
--	--

WELL TO SUPPLY: (check one) Home _____ Farm _____ Town _____ School _____ Industry _____ Other <u>X</u>	GROUTING: Method <u>Poured</u> Material <u>concrete</u> Depth <u>52</u> feet
---	---

WATER ANALYSIS AVAILABLE: Yes <u>X</u> No _____ DRILL CUTTINGS SAVED: Yes <u>X</u> No _____	PUMP: Type <u>10 HP Submersible</u> Capacity <u>50</u> gal per min. Depth of intake <u>630</u> feet
--	---

(DRILL CUTTINGS SHOULD BE COLLECTED AT 10 FOOT INTERVALS. THESE SAMPLES MAY BE SHIPPED TO THIS OFFICE EXPRESS COLLECT. SAMPLE BAGS ARE FURNISHED FREE OF CHARGE UPON REQUEST.)

REMARKS: _____

(LOG OF WELL) OVER

LOG

FURNISHED BY: Valley Drilling Corp.

DATE: September 1, 1965

DEPTH (feet)		TYPE OF ROCK OR SOIL PENETRATED (gravel, clay, etc., hardness, color, etc.)	REMARKS (water, caving, shot, screen, sample, etc.)
FROM	TO		
0	23	Dirt and loose boulders	solid rock at 23'
23	600	Solid blue rock	
600	605	Small stratus of Catoclin green stone encountered, first stream of water encountered here.	
605	625	Solid blue rock	water bearing, large vein
625	630	Stratus of Catoclin green stone	
630	650	Solid blue rock	

(Use additional forms if necessary)

(LOG OF WELL) OVER

LOG

FURNISHED BY: Dickey Ridge #4DATE: 7/22/64

DEPTH (feet)		TYPE OF ROCK OR SOIL PENETRATED (gravel, clay, etc., hardness, color, etc.)	REMARKS (water, caving, shot, screen, sample, etc.)
FROM	TO		
0	125	Pink and green	
125	160	Green	
160	165	Pink and green	
165	185	Green hard	
185	300	Pink and green	

(Use additional forms if necessary)

COMMONWEALTH OF VIRGINIA
 DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT
 DIVISION OF MINERAL RESOURCES
 JAMES L. CALVER, COMMISSIONER
 WATER WELL COMPLETION REPORT

VDMR 1138
 WWCR 62
 OFFICE ADDRESS:
 McCormick Road
 Charlottesville, Virginia

MAILING ADDRESS:
 Box 3667, University Sta.
 Charlottesville, Virginia

OWNER: National Park Service Mailing Address: Luray, Virginia

TENANT: Dickey Ridge #3 Mailing Address: 619 Brandon Avenue, SW

DRILLER: Frank W. Martin Drilling Company Mailing Address: Roanoke, Virginia

WELL LOCATION: County _____ Approx. _____ feet _____ miles _____ (direction) of _____

_____ and _____ feet _____ miles _____ (direction) of _____

(GIVE DIRECTION AND DISTANCE IN FEET OR MILES FROM TWO REFERENCE POINTS - ROADS, TOWNS, RIVERS, ETC. - ON COUNTY HIGHWAY OR OTHER MAP.)

DATE STARTED: 7/13/64 DATE COMPLETED: 7/16/64

TYPE OF DRILL RIG USED: Air Rotary TOTAL DEPTH 200 feet

WATER LEVEL: Stands 1-1/2 feet below surface OR

has NATURAL flow of _____ gallons per minute.

YIELD TEST: Method Pump

Drawdown 155 feet

Rate 2 gal. per min.

Duration 24 hrs., _____ min

WATER ZONES: from 0 to 20 feet

from _____ to _____ feet

from _____ to _____ feet

WATER: Color Clear Taste _____

Odor _____ Temp. 56 °F

WELL TO SUPPLY: (check one) Home _____

Farm _____ Town _____ School _____

Industry _____ Other X

WATER ANALYSIS AVAILABLE: Yes _____ No _____

DRILL CUTTINGS SAVED: Yes X No _____

(DRILL CUTTINGS SHOULD BE COLLECTED AT 10 FOOT INTERVALS. THESE SAMPLES MAY BE SHIPPED TO THIS OFFICE EXPRESS COLLECT. SAMPLE BAGS ARE FURNISHED FREE OF CHARGE UPON REQUEST)

REMARKS: _____

(LOG OF WELL) OVER

HOLE SIZE: 10 inches from 0 to 20 feet

6+ inches from 20 to 200 feet

_____ inches from _____ to _____ feet

SCREEN SIZE: _____ inches from _____ to _____ feet

_____ inches from _____ to _____ feet

_____ inches from _____ to _____ feet

CASE SIZE: 6-1/4 inches from 0 to 20 feet

_____ inches from _____ to _____ feet

_____ inches from _____ to _____ feet

GROUTING: Method None

Material _____ Depth _____ feet

PUMP: Type Submersible

Capacity 10 gal. per min

Depth of intake _____ feet

LOG

FURNISHED BY: Dickey Ridge #3DATE: 7/22/64

DEPTH (feet)		TYPE OF ROCK OR SOIL PENETRATED (gravel, clay, etc., hardness, color, etc.)	REMARKS (water, caving, shot, screen, sample, etc.)
FROM	TO		
0	5	Mud and broken rock	
5	15	Brown and green	
15	20	Green and hard	
20	25	Green	
25	40	Pink and green	
40	50	Green	
45	65	Pink and green	
65	120	Green	
120	130	Pink and green	
130	180	Green	
180	185	Pink and green	
185	200	Green	

(Use additional forms if necessary)

Land History

Form 10-550
(Nov. 1958)

U. S. DEPARTMENT OF THE INTERIOR - NATIONAL PARK SERVICE

FIXED PROPERTY RECORD

DESCRIPTION OF PROPERTY (Include reference to the location within the Park, how the asset was acquired, name of contractor, etc.)

Location: Dickey Ridge - North District

Two Springs
 Collection Trenches and Boxes
 20,000 Gallon Concrete Reservoir
 22,400 Linear Feet of Pipe
 Five Stone Masonry Drinking Fountains
 One Fire Hydrant

Gravity System (Chlorinated)

Constructed by CCC, WPA in 1939

Line	DATE	REFERENCE		QUANTITY			COST		
		Journal Voucher	Other	Unit	No. of Units	Accumulated Total	Direct Costs	Indirect Costs	Accumulated Costs
1	8/27/59	37-10		System	1				29,500.00
2	3/31/62	15				1	613.00		30,113.00
3									
4									
5									

G.L. Acct. No.	General Classification	Sub-Classification	Region	State	Park or Office
100.8	Utility	Water System	One	7a.	SNP

Other Supporting Information

Form 10-174
(June 1962)UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICEWork Order No.
211725

FACE SHEET FOR COMPLETION REPORT

Park Shenandoah National Park	Region Southeast	Fund Symbol 14X1035
Location in Park Dickey Ridge - North District	State(s) Virginia	Year Programmed 1968
☒ Contract and/or ☒ Day Labor	County or Counties = Warren County	PCP No. U-153-1
		Master Plan No. NP-SHE/MP
Work Order Title Water System Improvements Dickey Ridge		Master Plan Corrected By
		As Built Drawings By Robert R. Wiley (PSC-DC)
		Date Started September 1967
		Date Completed June 1968 <i>WAS</i>

DESCRIPTION OF FIXED ASSETS
(For completion by employee in charge of project)TOTAL COSTS
(For completion by FFO)230 - Utility System

1. Water System: This project consisted of constructing one 100,000-gallon reservoir, chlorinator building, well pump installation, 5,890 feet of 2" and 6" waterlines, loops to old system, and site renovation.

\$68,968.37

XXX PS&S ADDED

11,034.94

TOTAL

\$ 80,003.31

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	Robert R. Wiley	Project Supervisor 12/23/68
1	D&C PSC	Approved By: R. Taylor Hoskins	Title: Date:
1	SERO		Superintendent 12/23/68
1	SERO FO		
1	SHEN		
COSTS VERIFIED		Title: Date:	
BY T. J. Baer <i>TJB</i>		Regional Accountant JAN 30 1969	

GSA DC 65-14218

11360

Rec'd w/ memo to Supt. from HSC. 4-28-69.

Form 10-411
(July 1965)UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DISTRIBUTION OF COPIES

NO.	TO
6	SERO

PROJECT CONSTRUCTION PROPOSAL

1. STATEMENT OF MANAGEMENT'S REQUIREMENTS, PROPOSED WORK, AND ITS RELATIONSHIP TO OTHER FACETS OF THE PARK PROGRAM. (Provide detail data for "Management Information" on Form 10-411a, Supplemental Sheet and attach.)

An adequate water supply system for the Dickey Ridge Area is required. The existing system was constructed in 1939 by the C.C.C. and has a spring-fed source which is approximately four miles distant. Due to its age, and the type of construction materials used, the present system cannot be maintained properly and the spring serving it is not considered to be reliable under prolonged drought conditions.

A production well was drilled in July 1965 under the Water Resources Program and the purpose of this proposal is to reimburse the Water Resources Account for this work, provide a storage reservoir, and connect the well into the system.

2. ADVANCE REQUIREMENTS DATA

LAND STATUS Government-owned NPS	MASTER PLAN NO. NP-She 2119B	APPROVAL DATE 4-8-64
PCP NUMBERS OF PREVIOUSLY COMPLETE PORTIONS None	INTERRELATED & DEPENDENT PROJECT PCP NUMBERS None	
INTERPRETIVE PROSPECTUS APPROVAL DATA None		DATE N/A

WATER RIGHT NEEDS & STATUS

None

RESEARCH NEEDS & STATUS

None

OTHER

None

3. RECOMMENDED BY SUPERINTENDENT (Signature & Date)

R. Taylor Hoskins May 19, 1967

4. APPROVED BY REGIONAL DIRECTOR (Signature & Date)

ACTWA
Charles S. Marshall 6/7/67

5. LOCATION WITHIN AREA OR TERMINI

Dickey Ridge (Snead Property)

6. BLDG. OR RT. # AND SEC.

Building 7-15
23-17. REGION
SE

8. PARK

Shenandoah National Park

9. PROJECT

Improvement to Water System, Dickey Ridge

Warren
(County)
Virginia
(State)

10. PCP INDEX NO.

U-1531

CLASS ☐ (A) - Estimate based on working Drawings	P. S. & S. by
CLASS ☒ (B) - Estimate based on preliminary plans	BPR ☐ NPS ☒
CLASS ☐ (C) - Estimate based on similar facilities in other parks	

ESTIMATE	ITEM	QUANTITY	COST
1.	Drill 650' deep production well, case, and pump test-----	Lump Sum	\$ 5,000
2.	Construct housing unit, approximately 8 feet by 8 feet, furnish and install pumps, to deliver approximately 20 gpm, including automatic control system-----	Lump Sum	5,000
3.	Install 2" water line from well to reservoir---	2,000 feet	6,000.
4.	Install 6" water line from reservoir to Dickey Ridge Development-----	3,000 feet	18,000
5.	Construct one 100,000-gallon ground level concrete reservoir-----	Lump Sum	20,440
6.	Water Line 2" galv. Bldg. connection	200' @ \$4	800
7.	Fire Hydrants	2 @ \$600	1,200
8.	Misc. valves, fittings, connections	Lump Sum	560
RESEARCH ESTIMATE APPROVED: _____		ESTIMATE TOTALS	
(Asst. Director, Resource Studies) _____		RESEARCH.....	
(Date) 6/26/67		Construction.....78% 54,440 57,000	
		Plans, Surveys, and Supervision.....12% 8,380 11,400	
		Contingencies 10% 6,980 7,600	
CONSTRUCTION ESTIMATE APPROVED: _____		CONSTRUCTION SUB TOTAL 69,800 76,000	
H. R. Se Smith _____		INTERPRETIVE SUB TOTAL (100%)	
(Design Office Chief)		C 'D TOTAL 69,800 76,000	
INTERPRETIVE ESTIMATE APPROVED: _____			
(Asst. Regional Director, Op. ons) _____			
(Date)			

GSA DC 66-2827

Form 10-411a
(July 1965)UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

Page 1 of 1 pages

SUPPLEMENTAL INFORMATION FOR PROJECT CONSTRUCTION PROPOSAL

PARK	FACILITY	P.C.P. NO.
Shenandoah National Park	Improvement to Water System, Dickey Ridge	U-153-2

1. MANAGEMENT INFORMATION

2. TECHNICAL INFORMATION

In the Final Report No. 2 for the Dickey Ridge Area, prepared by the Virginia Division of Mineral Resources, January 27, 1967, described Test Hole Number 5 which is approximately 10 feet from Test Hole Number 1. This well is 650 feet in depth with a water bearing zone at 650 feet. Capacity of the well is estimated at greater than 35 gpm.

Single-phase overhead electrical service lines will be extended to the well site by the power company at no cost to the government.

There is a possibility of some rock excavation being encountered in excavating for the water line.

Form 10-174A
(June 1962)UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICEOrder Number
211725

COMPOSITION OF COST FOR COMPLETION REPORT

Fund Symbol
14X1035Park
Shenandoah National ParkRegion
SEYear Programmed
1968 Lump SumLocation in Park
Dickey Ridge - North DistrictWork Order Title
Dickey Ridge, Improvement to Water System

COMPOSITION OF COST

COSTS CHARGED TO FUNDS ALLOTTED TO FIELD FINANCE OFFICE

(1) Personal Services.....	\$ 576.36	
(2) Travel.....		
(3) Contract Work	68,071.50	
(4) Supplies and Materials.....	237.88	
(5) Other Direct Expenses.....		
(6) Operation of Equipment.....	82.63	
(7) Depreciation of Equipment.....		
(8) Purchase of Construction Equipment.....		
(9) Purchase of Other Accountable Equipment		
(10) Other Costs:		
(11) TOTAL COST CHARGED TO FFO FUNDS	xxxxxxxxxx	\$ 68,968.37

OTHER COSTS:

(12) PS&S, AP, and/or Facilitating Services @ 16 %.....	\$ 11,034.94	
(13) Inventory and Other Non-Fund Costs		11,034.94
(14) GROSS WORK ORDER COSTS	xxxxxxxxxx	\$ 80,003.31

LESS:

(15) Residual Value of Construction Equipment on Line 8.....	\$	
(16) Other Credits		
(17) NET COST OF FIXED ASSETS	xxxxxxxxxx	\$ 80,003.31

Identify other costs and other credits by line item entry, on an attached schedule, or explain in narrative.

11061

NARRATIVE TO ACCOMPANY PROJECT COMPLETION REPORTWORK ORDER NO. 211725Water System Improvements - Dickey RidgeShenandoah National ParkContract No.: 14-10-1-134-8Prime Contractor: Sarco Corporation
169 Pleasant Hill Road
Harrisonburg, Virginia 22801Sub-Contractors: The Crom Corporation
212 S. E. First Street
Gainesville, Florida 32601Basic Contract Information:

Bid Invitation No.....	D&C-6-E-68
No. of Bids Received	Four (4)
Date of Bid Opening.....	August 17, 1967
Low Base Bid Accepted	\$68,794.00
Total Bid Accepted	\$68,794.00
Date of Award of Contract	August 24, 1967
Preconstruction Conference	August 30, 1967
Notice to Proceed	August 30, 1967
Date Notice to Proceed Acknowledged...	September 2, 1967
Designated Starting Date	September 3, 1967
Starting Date	September 2, 1967
Number of Days in Contract	One Hundred & Twenty (120)
Contract Completion Date	December 31, 1967
Extended Completion Date	May 2, 1968
Actual Completion Date	May 2, 1968
Date of Final Inspection	May 3, 1968
Notice of Acceptance	September 20, 1968
Final Payment Base Bid	\$68,071.50
Contract Amount Base Bid	\$68,794.00
Total Contract Amount	\$68,071.50
Underrun	\$ 722.50
Release of Claims	September 20, 1968

Change Orders:

- No. 1 - Dated December 22, 1967: Wage rate for a Back Hoe Operator.
A rate of 2.65 per hour was given.
- No. 2 - Dated December 22, 1967: No change in Contract amount. Contract time was extended 13 calendar days, from December 31, 1967 to January 13, 1968.

Written Orders:

Each time the Contractor used explosives he was required to request permission. These requests are filed in the Superintendent's office.

Permission was given the Contractor to work on Saturdays and Holidays.

Suppliers:

Pipe (2" and 6") - Bethlehem Steel
 Pump - Reda
 100,000 Gallon Prestressed Reservoir - Crom Corporation, Gainesville, Florida
 Automatic Control - Autocon System

Stop Work and Resume Work:

- No. 1 - Stop Work dated December 28, 1967 - Due to existing winter weather conditions.
- No. 2 - Resume Work Order - March 25, 1968
- No. 3 - Partial resume Work Order - March 25, 1968
- No. 4 - Resume Work Order - April 19, 1968

Estimates:

No. 1 - September 29, 1967	-	\$16,416.00
No. 2 - November 13, 1967	-	\$15,606.00
No. 3 - December 8, 1967	-	\$11,545.65
No. 4 - January 15, 1968	-	\$ 9,167.85
No. 5 - May 24, 1968	-	\$11,931.95
No. 6 - September 20, 1968	-	<u>\$ 3,404.05</u>
Total		\$68,071.50

Synopsis

This Contract consisted of developing an existing well into a supply system for the Dickey Ridge Visitor Center and seasonal housing area.

Four bids were received for this project with the low bidder being \$3,000.00 above the engineer's estimate. The Contract was set up into two stages so that if the amount exceeded the original proposal, that is to pipe water from the well to a reservoir to the existing service, the second proposal would provide service to the Visitor Center with fire protection.

Superintendent Hoskins was designated as Contracting Officer and Robert Wiley as Project Supervisor.

The preconstruction conference was held on August 30, 1968, at the Park Headquarter's Building. Several items were brought out at this time. One of our main objectives was to have the existing road to a FAA installation remain passable at all times due to its responsibility in maintaining air traffic control for the Washington, D. C., area. This was done by the Contractor.

The Crom Corporation, a subcontractor who constructed the reservoir, did a very good job as usual. Many of our parks and recreation areas now have this type of reservoir and find that they are very pleased with the results.

Throughout the project it was felt that the Contractor did not have sufficient manpower on the project but the finished product was well worth while. The clean up and finished grading was done very well.

One problem is still at hand and the Contractor is trying to fix this problem now. It seems that the pump controls cut out after several hours of operating.. Both the control supplier and the Contractor are resolving this problem.

One item that was overlooked during the planning stages was the fact that seeding, mulching, and fertilizing should have been included so that the area around the Visitor Center and along the Drive would have been done by the Contractor.

As-Built Quantities and Cost:

Item No.	Contract Quantity	Description	Quantity To Date	Unit Price	Amount To Date
1	1200 L.F.	Schedule 40, 2" Galv. water pipe in place	1307	3.50	4,574.50
2	2090 L.F.	6" Cast iron water pipe in place	2090	6.00	12,540.00
3	L.S.	Submersible well pump w/under-ground discharge unit and 2" schedule 80 riser pipe in place	L.S.	3,000.00	3,000.00
4	L.S.	Chlorinator building with appurtenances in place	L.S.	4,500.00	4,500.00
5	L.S.	100,000 Gallon prestressed concrete reservoir in place	L.S.	24,400.00	24,400.00
6	1720 L.F.	Control wire (2 #12) in place	1700	.20	340.00
7	3 Each	2" Gate valves w/valve box in place	8	70.00	560.00
8	3 Each	6" Gate valves w/valve box in place	3	180.00	540.00
9	1 Each	Air relief valve w/box in place	1	80.00	80.00
10	8 Each	Utility line markers in place	10	10.00	100.00
11	2600 L.F.	6" Cast iron water pipe in place	2391	7.00	16,737.00
12	2 Each	6" Fire hydrants in place	2	350.00	700.00

Work Order
No. 211725

Synopsis

Day Labor Portion

During the construction period of this contract several small items were found which were not covered by the contract and it was felt to be in the best interest of the Government to do these with Park forces.

After construction, the disturbed areas around the Dickey Ridge Visitor Center and along the Skyline Drive were topsoiled, seeded, and mulched.

The spring which feeds the old system was tied into the new system by Park forces as a means of secondary supply.

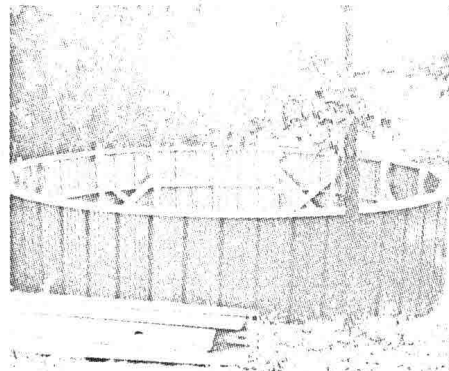
The new reservoir had an open-type overflow which was above ground level. This was plugged and cast iron pipe was utilized as an overflow to carry all excess water from reservoir area.

For better control of system, Park forces made a connection from the new to the old system; thereby, forming a loop system.

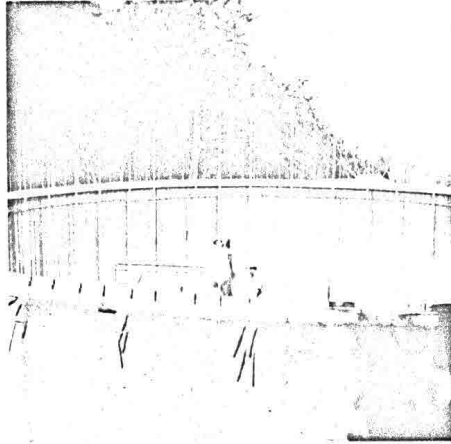
The above additions are shown on the as-built drawings for the system.



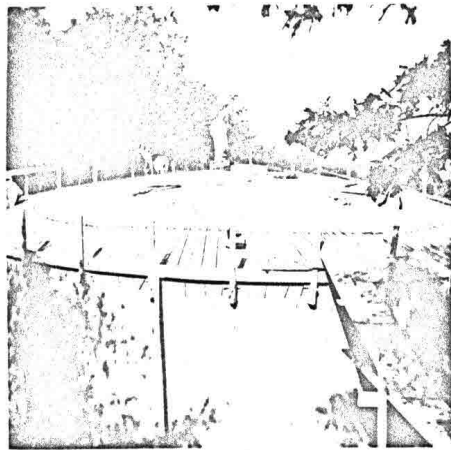
Excavating for 100,000 Gallon Reservoir



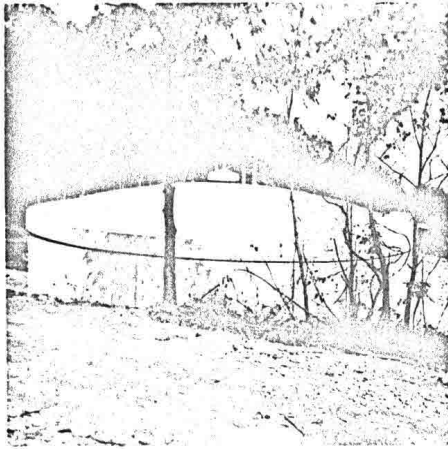
Erection of Diaphragm for 100,000 Gallon Reservoir



Erection of Steel and Grout on Diaphragm



Forming for top of 100,000 Gallon Reservoir



Finished 100,000 Gallon Reservoir



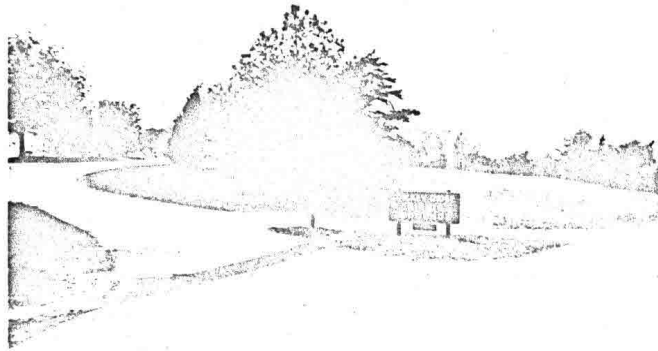
Chlorinator Building and Well Site



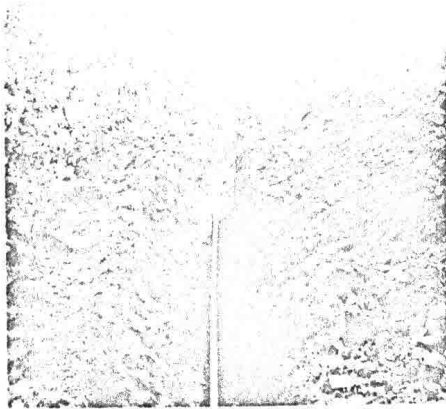
Finished Grading in Front of Visitor Center



Finished Grading around Fire hydrant



Road Crossings and Finished Grading Along Skyling Drive



EXCAVATION OF DITCH FROM CALCULATOR BLDG.



NATIONAL CENTER FOR
URBAN AND INDUSTRIAL HEALTH

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
National Capital Region
1100 Ohio Drive, S.W.
Washington, D. C. 20242

SEP 20 1967

REF ID: A5031

SEP 22 1967

Mr. Jackson E. Price	3.2
Regional Director	
Southeast Regional Office	
National Park Service	
Federal Building, Box 10008	
400 North Eighth Street	
Richmond, Virginia 23240	

[Signature]

Mr. Jackson E. Price
Regional Director
Southeast Regional Office
National Park Service
Federal Building, Box 10008
400 North Eighth Street
Richmond, Virginia 23240

Dear Mr. Price:

Mr. Dyksterhouse in our Charlottesville Regional Office has forwarded to us for our comments well log reports for several wells in Shenandoah National Park.

These reports and water use needs were discussed with Superintendent Hoskins. Our comments are listed below:

Corners Deadening Area - A new well was drilled in this area. A pump test indicated a yield of 28 gallons per minute. Examination of the chemical analysis indicates a satisfactory water.

Since this area is in a proposed wilderness area, there are no plans for developing facilities in this area at this time.

Dickey Ridge Area - This area contains a large visitor center, 30 site picnic area, and five houses. These facilities will require a considerable amount of water.

Test hole no. 3 - was drilled near the Fox Hollow weir. A pump test showed a final discharge of only two gallons per minute. This volume would not be adequate.

Test hole no. 4 - was drilled 600 feet north-northeast of test hole no. 3. This was a dry hole.

Test hole no. 5 - was drilled 10 feet from test hold no. 1 to a depth of 650 feet. The pump test indicated a flow of 35 gallons per minute for 28 hours, however, the recovery rate was only 2.5 gallons per minute. A study of the draw down curve indicates that this well

should not be pumped at a rate higher than 10 gallons per minute. The chemical analysis indicates that this is not a hard water and has a low iron content. The use of a large storage tank (100,000 gallons) with long pumping periods at a low rate should provide a adequate amount of high quality water.

Rockfish Gap - The area contains an entrance station with four employees. A small rest room and drinking fountain are located in this area.

Rockfish Gap well no. 1 was drilled about 200 yards north of the entrance station to a depth of 535 feet. The 6 inch diameter casing was grouted to 30.4 feet. A pump test for 19 hours produced 2 to 4 gallons per minute. Three gallons per minute was stabilized for five hours.

A chemical analysis of the water indicates a soft water with a nearly natural pH. The iron content is high enough to stain white fixtures and produce a metallic taste but should be palatable enough for drinking purposes.

With a suitable storage tank this well should produce a sufficient quantity of palatable water for this area.

Simmons Gap - This area will contain a submaintenance station with about 30 men, a trailer and one resident home.

A well was drilled to 205 foot depth. A 6 inch casing was grouted to a depth of 43 feet. After test pumping 25 gallons per minute for 21-2/3 hours, the water level remained at 113 feet.

A chemical analysis of this water indicates a soft water, with about 50 ppm alkalinity. Iron is very low. This water is suitably balanced and should be non-corrosive, good for laundry and general use and have a pleasing taste. This well should provide a satisfactory quantity of good tasting water.

Elkwallow Area - This area has a 50 site picnic area, a gift shop, and two comfort stations.

A well was drilled to a depth of 363 feet. The well was cased with 6 inch diameter pipe and grouted to depth of 41 feet. A pump test at

10 gallons per minute was run for 11 hours with the water level remaining at 298 feet. This well should produce 10 gallons per minute for an extended period of time.

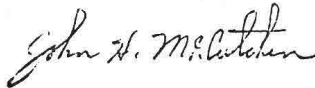
A chemical test indicated that this is a soft water, non-corrosive well, but does contain enough iron to stain fixtures and produce some metallic taste.

With a suitable storage tank, this well should produce a sufficient quantity of water but will not be as high quality as the Simmons Gap well.

If the presence of iron in some of the well water causes a problem at some later date, iron removal filters, or high chlorine dosages may be necessary to eliminate this problem.

If you have any further questions regarding these well supplies, feel free to call on us.

Sincerely yours,

A handwritten signature in cursive script, reading "John H. McCutchen".

John H. McCutchen
Sanitary Engineer Consultant

**FINAL REPORT NO. 2
Dickey Ridge Area
Shenandoah National Park**

**National Park
Service Contract
No. 14-10-1-134-2**

History

In Preliminary reports No. 1 and No. 2 submitted during 1963, the opinion was expressed that hydrogeologic conditions were not favorable in the Dickey Ridge Area near Skyline Drive. This was substantiated by the four test holes drilled. The need for a new water source was still required and a more extensive field investigation was conducted to determine the ground-water potential of areas more distant from the Visitors Center and Skyline Drive.

Accordingly, in Preliminary Report No. 3, dated December 23, 1964, three sites were recommended near the base of Dickey Ridge, just west of the Park boundary for the location of Test Hole No. 5. Although these sites were favorable geologically, the piping distance, inadequate electric power, and necessity to acquire drilling options did not seem in the best interests of the National Park Service.

To determine a solution National Park Service and Virginia Division of Mineral Resources personnel met on February 12, 1965 at the Shenandoah National Park Headquarters. As no favorable drilling site could be recommended within a reasonable distance from the Visitors Center, it was decided to convert Test Hole No. 1 into an exploration hole by deepening it to a depth of 1000 feet. This could not be done because of the condition of the hole, so Test Hole No. 5 was drilled about 10 feet from Test Hole No. 1. Drilling was terminated at 650 feet after the driller reported obtaining an estimated yield of 60 gallons per minute from a fracture at 630 feet.

Test-Hole Drilling and Evaluation

Test holes No. 1 and No. 2 are described in the Dickey Ridge Final Report, dated September 5, 1963. Test Hole No. 3 was completed by the Frank W. Martin Drilling Company on July 16, 1964 near the Fox Hollow east weir. The drill-hole penetrated only metamorphosed-basalts of the Catoctin Formation below 20 feet of overburden, and was terminated at a depth of 200 feet. A pump test conducted on July 21, 1964 had a final discharge of only two gallons per minute from a pumping level of 161.5 feet. A partial chemical analysis of a water sample collected at the termination of the pump test was prepared by the Virginia Division of Mineral Resources; the water was found to be soft and of good chemical quality.

Test Hole No. 4 was also drilled by the Frank W. Martin Drilling Company at a site approximately 600 feet north-northeast of Test Hole No. 3. This test hole was completed on July 22, 1964, after penetrating 290 feet of metamorphosed-basalts of the Catoctin Formation beneath 10 feet of weathered rock. No water was encountered, and no pump tests or water analyses were conducted.

The exploratory hole (Test Hole No. 5) was drilled between July 13 and August 24, 1965 by the Valley Drilling Corporation. It had been intended to deepen Test Hole No. 1 to a depth of 1000 feet, but the driller encountered a plug in the hole which he could not remove. A new drilling site was then selected approximately 10 feet from Test Hole No. 1. The exploratory hole penetrated only metamorphosed-basalts of the Catoctin Formation, and was

- 3 -

terminated at a depth of 650 feet after a water-filled fracture was encountered at 630 feet. On August 23 and 24, 1965, a test was conducted which indicated 35 gallons per minute were being discharged from a pumping level of 555 feet after approximately 28 hours of pumping.

Examination of the drawdown and recovery curves plotted from the pump-test data indicates that much of the water pumped from the well during this test may have been obtained by dewatering an extensive fracture system that does not receive recharge at a rate equal to the discharge rate of the pump test. It should be noted that only one hour of pumping-level stabilization was attained before the end of the pump test, and that the water level recovered at an average rate of only 1.6 feet, or 2.5 gallons per minute, during the 75-minute measured recovery period. If the stabilization period at the end of the pump test had been longer, the capacity of the well could have been determined. As long as only ten gallons per minute are required for the Dickey Ridge development the yield from Test Hole No. 5 should be adequate. If future development of the area increases the water requirements, it is recommended that an open-discharge pump test of 5- to 7-days duration be conducted to determine the long-term capacity of the well.

Enclosed are Water Well Completion Report forms, Geologic Logs, Pump Test Data Sheets, drawdown and recovery curves, driller's logs, and partial chemical analyses for test holes No. 3 and No. 5. Except for a drawdown curve and water analysis, similar information is enclosed for Test Hole No. 4 that was dry.

Virginia Division of Mineral Resources
Charlottesville, Virginia
January 27, 1967

**Water Resources Study and Cost Estimates Relating to the Dickey
Ridge Water System**

In order to scientifically determine the most economical means of supplying water to the Dickey Ridge Developed Area on a long-range basis, a considerable amount of engineering data, geographic information, spring flow data, historical facts, and cost figures have been collected. The following statements, tabulations, cost estimates and recommendations are based on the information collected:

1. The Dickey Ridge Developed Area, located on the west side of the Skyline Drive at approximately Miles 4.5, consists of a modern Visitor Center with rest rooms, a seasonal employees residential area, consisting of quarters for five families, and a large picnic area with one standard comfort station.

The area Master Plan indicates that the existing obsolete employee quarters units will be replaced, but the size of the development is not expected to change. From this, it is assumed that the amount of water required for the area will not change appreciably for many years.

2. The existing Dickey Ridge water system was installed in 1938 and consists of two mountain springs which produce a combined minimum dry weather flow of seven (7) gallons per minute; 19,800 linear feet of 2-1/4-inch cast iron supply line, a 20,000-gallon underground concrete reservoir; 4,672 linear feet of 3-inch cast iron distribution line; and a meter driven chlorinator unit located on the distribution line between the reservoir and the developed area. The entire system flows by gravity and the reservoir is located at an elevation of 115 feet above the average height of the developed area.

Some fire protection is provided by small obsolete hydrants near the buildings, but the old 3-inch distribution line and a 2-inch restriction at the chlorinator unit definitely limits the protection offered by the system.

From all indications, the seven (7) gallon per minute spring flow and 20,000 reservoir adequately supplies the development, but unfortunately an inferior type of cast iron pipe with threaded couplings was used for the supply and distribution lines. This pipe is prone to breaking at the threaded couplings under stresses created by temperature changes and earth settlement. Numerous failures have occurred throughout the history of the system.

and the failure frequency is definitely increasing. In view of this constantly increasing maintenance problem, replacement of the pipe is recommended within the next five years, if the existing system is to remain in service.

The attached Cost Estimate No. 1, to "Replace and Improve the Existing Dickey Ridge Water System" at a total cost of \$91,864.00, is based on current prices in the area.

3. The possibility of obtaining water for the Dickey Ridge Area from alternate springs located on the property of Judge R. V. Snead has also been carefully studied from an engineering and economic viewpoint.

There are six (6) flowing springs on this property. These springs are at an average distance of about 4,000 feet from the Dickey Ridge Developed Area. The combined flow of the six (6) springs is 22 gallons per minute. Two of the springs are at a higher elevation than the developed area, one of which has a 10-gallon per minute minimum flow, and is high enough to flow into the existing Dickey Ridge reservoir by gravity. This spring has furnished water for the large residence and apple orchard on the Snead property for many years and has proven to be very reliable.

Since the development requires a water supply of approximately seven (7) gallons per minute, the 10-gallon per minute spring on the Snead property would easily supply the water needed, and the other five (5) springs would be available as a supplemental supply for any unforeseen future development of the area.

In view of the fact that the Park has an option to purchase the Snead property, Cost Estimate No. 2, to "Repair and Improve the Dickey Ridge Water System Using Snead Property Spring" for the total amount of \$35,694.00, is attached.

A review of these estimates reveals a net construction savings of \$56,170.00, if the Snead property spring is used as a water supply in lieu of the existing springs which serve the area. The Government will realize further savings in the cost of maintaining the system throughout future generations, if the Snead spring is used.

4. A third possible water supply system for the Dickey Ridge Area was investigated. This investigation related to two springs located in Fox hollow, a distance of approximately 3,000 feet from the developed area. The main disadvantages of this supply are that the elevation of the springs is 400 feet below the average height of the Dickey Ridge Area and a powerful pumping system would be required. The installation of such pumping facilities would require the construction of about 6,000 feet of primary aerial power line

which would leave an objectionable scar. In view of these disadvantages, a Cost Estimate was not prepared for this system.

5. From the information obtained through this study, it is recommended that the Government purchase the Snead property to insure ownership of a long-range, economical, water system for the Dickey Ridge Area.

James M. Stump
Supervisory Park Engineer

Enclosures

1. Cost Estimate No. 1
2. Cost Estimate No. 2

Form 10-194
(Rev. 9/60)UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

SHENANDOAH NATIONAL PARK

(Park)

Check One:

Monthly
Estimate ☐Final
Estimate ☒

UNIT PRICE CONTRACT

ESTIMATE NO. 1	FOR (Period) July 14 - August 24, 1965	DATE September 8, 1965
CONTRACT NO. 14-10-0137-0182	COMPLETION DATE September 11, 1965	EXTENDED DATE September 16, 1965
CONTRACTOR Valley Drilling Corporation, Middleburg, Virginia		ORIGINAL CONTRACT : 11,320.00
PROJECT Drilling Test Wells Dickey Ridge & Big Meadows Areas		CHANGE ORDERS #1 : 1,625.00
LOCATION Shenandoah National Park		TOTAL CONTRACT : 12,945.00

ITEM NO.	CONTRACT QUANTITY	DESCRIPTION	QUANTITY TO DATE	UNIT PRICE	AMOUNT TO DATE
1.	800 ft.	Drilling below the 400' level at <u>Dickey Ridge Well No. 1</u> (See Change Order No. 1, 7/15/65)	250 ft.	\$7/foot	\$ 1,750.00
2.	1200 ft.	Drilling test wells of not less than 6" in diameter: <u>Dickey Ridge</u> (See CO #1) Big Meadows Well No. 1 Big Meadows Well No. 2 Total feet	400 ft. 265 ft. 500 ft. 1165 ft.	\$6/foot " "	6,990.00
3.	150 ft.	Furnish and install new six-inch inside diameter Schedule 40 black steel casing w/threaded or welded joints to a minimum depth of 50' or 6' into solid rock: <u>Dickey Ridge Well No. 1</u> (CO #1) Big Meadows Well No. 1 Big Meadows Well No. 2 Total feet	52 ft. 52 ft. 70 ft. 174 ft.	\$3/foot \$3/foot \$3/foot	522.00
4.	250 ft.	Grouting and sealing three-inch annular space around the casings of all production wells: <u>Dickey Ridge Well No. 1</u> (CO #1) Big Meadows Well No. 1 Big Meadows Well No. 2 Total feet	52 ft. 52 ft. 70 ft. 174 ft.	\$2.50/ft " "	435.00

NATIONAL PARK SERVICE		Shenandoah National Park (Park)		Check One: Monthly Estimate ☐ Final Estimate ☒	
		Page 2			
UNIT PRICE CONTRACT					
ESTIMATE NO. 1		FOR (Period)		DATE Sept. 8, 1965	
CONTRACT NO. 14-10-0137-0182		COMPLETION DATE		EXTENDED DATE	
CONTRACTOR Drilling Test Wells, Dickey Ridge & Big Meadows				ORIGINAL CONTRACT \$	
PROJECT				CHANGE ORDERS* \$	
LOCATION				TOTAL CONTRACT \$	
ITEM NO.	CONTRACT QUANTITY	DESCRIPTION	QUANTITY TO DATE	UNIT PRICE	AMOUNT TO DATE
5.	72 Hours	Pump test for minimum of twenty-four hours per production well:			
		Dickey Ridge Well No. 1	26 hrs.	\$10/hr w	
		Big Meadows Well No. 1	36 hrs.		
		Total hours	62		\$ 620.00
RECOMMENDED (Project Supervisor) <i>Jerry A. Eubanks</i> Jerry A. Eubanks, Chief of Park Maintenance			SUMMARY		
APPROVED (Contracting Officer) Jerry B. House Acting Mr. J. B. House, Superintendent			DATE		
			TOTAL TO DATE \$ 10,317.00		
			LESS RETAINED AMOUNT..... 0.00		
			NET..... 10,317.00		
			LESS PREVIOUS PAYMENTS..... 0.00		
			LESS LIQUIDATED DAMAGES..... 0.00		
			DUE THIS ESTIMATE..... 10,317.00		
			% COMPLETED TO DATE: 100%		

*Show Breakdown on Reverse

(See Reverse for Distribution)

SOUTHEAST REGION	
SEP 30 1964	
Regional Director	
Asst. Reg. Dir., (O)	
Asst. Reg. Dir., (A)	
Asst. Reg. Dir., (CA)	
Asst. to Reg. Dir. (PA)	
Asst. to Reg. Dir. (D)	
Resource Studies Adv.	

W
Jack
9/30/64

154
W14
September 24, 1964

Frank W. Martin Drilling Company
4117 Cravens Creek Road, SW
Roanoke, Virginia

Gentlemen:

In order that the final payment may be made on your Contract No. 14-10-0137-0161, for the Drilling, Casing, Grouting, Sealing and Pumping Test Wells, Shenandoah National Park, you are requested to execute the original and all copies of the enclosed Release of Claims. You should keep one copy for your files and return the original and other copies to this office.

The requirements for this release is contained in the General Provisions, Standard Form 23A, Clause 7, "Payments to Contractors," subparagraph (d).

If you have any claims against the Government arising under and by virtue of this contract, they should be excepted and described in sufficient detail to identify them and the amounts of each should be stated separately.

If you have no claims, you should have the words "No Exceptions" typed in the space immediately above the last sentence reading "This release has been executed...".

Final payment on your contract will not be made until this release has been signed by you and furnished this office.

Very truly yours,

Jerry B. House
Acting Superintendent
Contracting Officer

Enclosure 1

cc;
WASO
EODC
→SERO

RELEASE OF CLAIMS

For and in consideration of the receipt of final payment in the amount of \$12,388.55, making a final total payed under Contract of \$23,404.25, from the United States of America (hereinafter called the Government) under and pursuant to Contract No. 14-10-0137-0161, for the Drilling, Casing, Grouting, Sealing and Pumping Test Wells, Shenandoah National Park, the undersigned does remise, release, and discharge the Government, its officers, agents, and employees of and from any and all claims and demands whatsoever under and arising from the said contract, except specified claims in stated amounts listed as follows:

No Exceptions

This release has been executed this 26 day of Sept. 1964.

FRANK W. MARTIN DRILLING COMPANY

By *Frank W Martin*

Title *Owner*

Form 10-194
(Rev. 9/50)UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICEShenandoah National Park
(Park)

Check One:

Monthly
Estimate ☐Final
Estimate ☒

UNIT PRICE CONTRACT

ESTIMATE NO. 2	FOR (Period) June 17 - September 5, 1964	DATE SEP 29 1964
CONTRACT NO. 14-10-0137-0161	COMPLETION DATE September 23, 1964	EXTENDED DATE None
CONTRACTOR Frank W. Martin/Company, 4117 Cravens Creek Road, SW Roanoke, Virginia		ORIGINAL CONTRACT \$ 26,510.00
PROJECT Drilling, Casing, Grouting, Sealing and Pumping Test Wells		CHANGE ORDERS* \$ 0.00
LOCATION Shenandoah National Park, Virginia		TOTAL CONTRACT \$ 26,510.00

ITEM NO.	CONTRACT QUANTITY	DESCRIPTION	QUANTITY TO DATE	UNIT PRICE	AMOUNT TO DATE
1.	3225 Ft.	Drilling test wells of not less than 6" in diameter, including collection of samples, recording and furnishing Driller's Log:		\$6.00/Ft	
		Skyland Well No. 1	500'		3,000.00
		Skyland Well No. 2 (Comers Deadening)	365'		2,190.00
		Lewis Mountain Well No. 1	300'		1,800.00
		Dundo Well No. 1	615'		3,690.00
		Dundo Well No. 2	340'		2,040.00
		Dickey Ridge Well No. 1	200'		1,200.00
		Dickey Ridge Well No. 2	300'		1,800.00
		Rockfish Gap Well No. 1	535'		3,210.00
		Total Item 1	3155		\$18,930.00
2.	500 Ft.	Furnish & install new 6" inside diameter Schedule 40 black steel casing with threaded or welded joints to a minimum depth of fifty feet (50') or six feet (6') into solid rock:		\$3.95/Ft	
		Skyland Well No. 1	55		217.25
		Skyland Well No. 2 (Comers Deadening)	33		130.35
		Lewis Mountain Well No. 1	54		213.30
		Dundo Well No. 1	57		225.15
		Dundo Well No. 2	Casing removed and hole filled.		
		Dickey Ridge Well No. 1	20		79.00
		Dickey Ridge Well No. 2	14		55.30

Form 10-194
(Rev. 9/60)UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICEShenandoah National Park
(Park)

Check One:

Monthly
Estimate☐Final
Estimate☒

UNIT PRICE CONTRACT Page 2

ESTIMATE NO. 2	FOR (Period) June 17 - September 5, 1964	DATE
CONTRACT NO. 14-10-0137-0161	COMPLETION DATE	EXTENDED DATE
CONTRACTOR		ORIGINAL CONTRACT \$
PROJECT		CHANGE ORDERS* \$
LOCATION		TOTAL CONTRACT \$

ITEM NO.	CONTRACT QUANTITY	DESCRIPTION	QUANTITY TO DATE	UNIT PRICE	AMOUNT TO DATE
		Rockfish Gap Well No. 1	32		126.40
		Total Item 2	265'		\$1,046.75
3.	500 Ft.	Grouting and sealing three-inch (3") annular space around the casings of all production wells:		\$2.00/Ft	
		Skyland Well No. 1	53'		106.00
		Skyland Well No. 2 (Comers Deadening)	30'		60.00
		Lewis Mountain Well No. 1	52'		104.00
		Dundo Well No. 1	55'		110.00
		Dundo Well No. 2	--		---
		Dickey Ridge Well No. 1	--		---
		Dickey Ridge Well No. 2	--		---
		Rockfish Gap Well No. 1	-30'		-60.00
		Total Item 3	220'		\$ 440.00
4.	240 Hrs.	Pump test for minimum of twenty-four (24) hours per production well:		\$15.00/Hr	
		Skyland Well No. 1	24		360.00
		Skyland Well No. 2 (Comers Deadening)	25.5		382.50
		Lewis Mountain Well No. 1	43		645.00
		Dundo Well No. 1	24		360.00
		Dundo Well No. 2	--		---
		Dickey Ridge Well No. 1	24		360.00
		Dickey Ridge Well No. 2	--		---

Form 10-194
(Rev. 9/60)UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

Shenandoah National Park

(Park)

Page 3

UNIT PRICE CONTRACT

Check One:

Monthly
Estimate ☐Final
Estimate ☒

ESTIMATE NO. 2	FOR (Period) June 17 - September 5, 1964	DATE
CONTRACT NO. 14-10-0137-0161	COMPLETION DATE	EXTENDED DATE
CONTRACTOR		ORIGINAL CONTRACT \$
PROJECT		CHANGE ORDERS* \$
LOCATION		TOTAL CONTRACT \$

ITEM NO.	CONTRACT QUANTITY	DESCRIPTION	QUANTITY TO DATE	UNIT PRICE	AMOUNT TO DATE
		Rockfish Gap Well No. 1	24		360.00
		Total Item 4	164.5		\$2,467.50
5.	9 Moves	Moving equipment from one test well site to another well site:		\$65.00/Move	
		Skyland Well No. 1	--		--
		Skyland Well No. 2 (Comers Deadening)	1		65.00
		Lewis Mountain Well No. 1	1		65.00
		Dundo Well No. 1	2		130.00
		Dundo Well No. 2	1		65.00
		Dickey Ridge Well No. 1	1		65.00
		Dickey Ridge Well No. 2	1		65.00
		Rockfish Gap Well No. 1	1		65.00
		Total Item 5	8		\$ 520.00

RECOMMENDED (Project Supervisor)	SUMMARY
Jerry A. Dubanks, Supervisory Park Engineer	TOTAL TO DATE \$ 23,404.25
APPROVED (Contracting Officer)	LESS RETAINED AMOUNT..... 0.00
DATE	NET..... 23,404.25
SEP 29 1964	LESS PREVIOUS PAYMENTS..... 11,015.70
P. Taylor Hoskins, Superintendent	LESS LIQUIDATED DAMAGES..... 0.00
	DUE THIS ESTIMATE..... 12,388.55
	% COMPLETED TO DATE: 100%

*Show Breakdown on Reverse

(See Reverse for Distribution)

LS4 SEE(OLW)

JAN 28 1964

✓ 8-29
✓ 11/29
✓ Jan 1/77

Memorandum

To: Chief, EDBC

From: Acting Assistant Regional Director, Operations, Southeast Region

Subject: Preliminary Water Resources Reports - Loft Mountain and Dickey Ridge Areas, Shenandoah

Enclosed for your information are copies of the subject reports prepared by the Virginia Division of Mineral Resources, Charlottesville, Virginia.

Several months ago, Mr. Hoskins requested the State to restudy the area at Loft Mountain previously studied for water resources development in order to select additional well sites for future expansion of the existing well field. The drilling site for the test well recommended by the field geologist is located approximately 4000' north of the existing production wells and at a 600' lower elevation. The required pump installation and distribution line from the proposed well site to the existing water system would be quite costly. We believe the two existing wells are capable of producing a sufficient quantity of water to meet the present demands of the development. In a recent discussion with Superintendent Hoskins, it was decided that no test well would be drilled at this time until there is a further development of concession facilities by the Virginia Skyline Company.

An adequate water supply is urgently needed to replace the present water system and provide for the future needs of an expanded development at ~~Dickey Ridge~~. You will recall that previous water resources investigations were made in this area and several test wells drilled but to date a successful water well has not been found which will produce the desired yield.

The present water system for the development consists of two springs (7 gallons per minute flow) and a 20,000 gallon reservoir. The spring is located approximately four and one-half miles south of the Dickey Ridge Visitor Center. The existing supply and distribution line was constructed in 1938 and many breaks have occurred at the pipe couplings under stresses caused by temperature changes and earth settlement. It will be necessary to replace this line and develop an additional water source within the next few years at an estimated cost of \$75,000.

On February 12, 1965, Mr. Vick and members of the Park staff will meet Mr. Richard DeKay, Geologist, Virginia Division of Mineral Resources, at Park Headquarters for a discussion of the recently completed water resources study at Dickey Ridge. It can be noted in the enclosed report that the area studied was on private property adjacent to the Park. The selected test well site was located 2000' west of the Park boundary and at an elevation of about 1000' lower than the Visitor Center. Before drilling a test well at any of the three recommended well sites, we believe the geologist should explore the possibilities of obtaining a permanent water supply on Park property, even if it requires drilling a deeper well. The details for conducting another water resources investigation in the vicinity of Dickey Ridge will be worked out with Mr. DeKay on February 12.

(SIGNED)

W. Mikell

Enclosures 2

cc:

Director, w/encls.

Supt., Shenandoah

Mr. Henderson, USFWS

MEMORANDUM FOR THE FILES

June 25, 1964

Re: Water Resources Meeting held June 23, 1964

The meeting was held at Charlottesville in the office of the State Geologist to review the status of the current water resources studies being conducted in cooperation with the Virginia Division of Mineral Resources, and to formulate plans for accomplishing similar studies needed during the 1965 fiscal year. Those present at the meeting:

Virginia Division of Mineral Resources

Dr. James L. Calver, State Geologist
Richard DeKay, Geologist

Shenandoah National Park:

R. Taylor Hoskins, Superintendent
A. P. Koster, Administrative Officer
Jerry A. Eubanks, Park Engineer.

Mr. Hoskins explained that we had been fortunate to date in receiving adequate water at the first test wells drilled at Skyland and Lewis Mountain under the current drilling contract, and it would not be necessary to drill the additional test wells scheduled for these areas. In view of this, it may be possible to do some test well drilling needed at other locations by Change Order under the present contract. Dr. Calver and his staff will cooperate with us in determining location and depth of these additional test wells.

Dr. Calver expressed some concern about the pumping test results from the Skyland and Lewis Mountain wells and he and Mr. DeKay plan to meet with the Driller and the Park Engineer at Dundo June 24, to evaluate the pump testing methods.

During the 1965 fiscal year, provided funds in the amount of \$5,000 can be made available, the Virginia Division of Mineral Resources will conduct new studies and/or additional studies and recommendations for developing water supplies at the following locations, in the priority shown:

1. Corners Deadening - study completed - Presently P.A. 3
2. Rockfish Gap - Study in process.
3. Loft Mountain - Extended study area

H. DICKRY RIDGE

5. At sites selected for three comfort stations in the South District (exact locations to be determined).

6. Mount Marshall.

*2 sites between -
LOFT MTN. & ROCKY
CITY.*

The Park Engineer will furnish the State Geologist with Master Plan-type maps of the areas to be studied.

The meeting was opened at 1:30 P.M. and closed at 3:30 P. M.

/s/ Jerry A. Eubanks

Jerry A. Eubanks
Park Engineer

cc:

SERO (Fwded by ltr of transmittal)
Superintendent
Assistant Superintendent
Administrative Officer
Park Engineer

PRELIMINARY REPORT
Dickey Ridge (Fox Hollow) Area
Shenandoah National Park

National Park Service
Contract No. 14-10-0137-0150

Additional hydrogeologic investigations of the Dickey Ridge Area were conducted as recommended in a previous report of the Area (Virginia Division of Mineral Resources - September 5, 1963). The locale of this investigation is the portion north and east of the Dickey Ridge Visitor Center shown on the accompanying geologic map.

Geology

A relatively thin zone of cobbles and weathered material overlies the hard, dense greenstone of the Catoctin formation that is the bedrock on the entire top and east side of Dickey Ridge. The strike of the formation is northeast across the Area, and the dominant cleavage is steeply inclined to the southeast. As no lithologic or structural changes occur in the northeast portion, topographic and recharge conditions were utilized in the selection of drilling sites. Zones of rock weakness frequently are indicated by low topographic areas, and fractures are essential for the transmittal of water through the impermeable rocks. Adequate local recharge is also essential where the drilling site for a relatively shallow well is considerably elevated above the regional water table.

Hydrology

Two weirs are located in Fox Hollow approximately one half mile due east of Skyline Drive near milepost 3.5. These weirs have been constructed at an elevation of 1740 feet near the southwest end of the northeast-trending draw. Partial records are available for the west weir from July 19, 1961 to October 18, 1963. Maximum and minimum readings for this weir are 9.2 and 0.97 gallons per minute, respectively, although some drain stoppage and repair are reported. Partial records for the east weir are available only from May 10, 1962 to October 18, 1963, and indicate the weir is in such a poor state of repair that no flow readings have been made since May 25, 1962. It is estimated that these weirs, in proper condition, would not produce a combined flow of more than 10 gallons per minute during late summer months. Recharge to the weirs is from run-off waters from three slopes that nearly surround the hollow.

Test Drilling Recommendations

Test Hole No. 1 is located approximately 30 feet northeast of the east weir. This hole will penetrate approximately 20 feet of weathered material, and thereafter will be in greenstone to the recommended total depth of 200 feet.

Test Hole No. 2 is tentatively located approximately 500 feet northeast of Test Hole No. 1. This hole will encounter similar drilling conditions and should also be 200 feet deep, but drilling should not begin until the data from Test Hole No. 1 have been evaluated.

Virginia Division of Mineral Resources
Charlottesville, Virginia
December 23, 1963

National Park Service
Contract No. 14-10-0137-0135

FINAL REPORT
Dickey Ridge Area
Shenandoah National Park

Test hole drilling and evaluation

The first test hole was drilled at recommended site No. 1 and was completed at a depth of 250 feet. Only greenstone of the Catoclin formation was penetrated beneath the 15 feet of surficial boulders and weathered material. Test data indicate maximum drawdown was reached after 2 hours of pumping at the rate of 1 gallon per minute. A copy of the Water Well Completion Report form is attached, together with a copy of the geologic log prepared from microscopic examinations of the drill cuttings that have been entered into the Virginia Division of Mineral Resources repository as Well No. 863.

The second test hole was drilled at recommended site No. 2 and was also completed at a depth of 250 feet. Greenstone of the Catoclin formation was the only rock penetrated beneath the 25 feet of surficial boulders and weathered material. No air test was conducted as no water was encountered during drilling. A copy of the Water Well Completion Report form is attached, together with a copy of the geologic log prepared from microscopic examinations of the drill cuttings that have been entered into the Virginia Division of Mineral Resources repository as Well No. 864.

Recommendations

Each test hole is located on the Snead portion of the Dickey Ridge Area. Evaluation of the drilling data appears to support recommendations set forth in the Dickey Ridge Area Preliminary Report prepared by the Virginia Division of Mineral Resources on May 24, 1963. The tenor of this report was that the Area is poorly situated relative to the availability of ground water, and successful wells would yield very small supplies of water.

It appears that if water is to be obtained from wells having elevations similar to those of the 2 completed test holes, a test hole of much greater depth will have to be drilled. It is possible that more shallow wells would be successful at locations east and north of the Snead portion of Dickey Ridge, perhaps in the Fox Hollow area. Additional field work will be required in either case if it is still considered necessary to obtain water from wells in the Dickey Ridge Area.

Virginia Division of Mineral Resources
Charlottesville, Virginia
September 5, 1963

Shenandoah National Park
Contract # 14-10-0137-0135

Preliminary Report-Dickey Ridge Area

Location

The Area is in the Northern Park District, approximately five miles south of the Park entrance at Front Royal, Virginia. The Dickey Ridge Visitor Center is on the west side of Skyline drive near milepost 5.

Geology

The Catoctin and Pedlar formations are the only major rock units that occur in the Area. Dickey Ridge is capped entirely by greenstone of the Catoctin formation; granite and unakite of the Pedlar formation are present on the west slope of the Ridge below an elevation of approximately 1300 feet in the north and 1700 feet in the south. Swift Run metasediments normally occur between the greenstone and granite but were found only on a small portion of the slope west of the Visitor Center, and are believed to be of very limited thickness and extent in this Area.

Outcrops of the Catoctin formation near the Visitor Center and on the east slopes of Dickey Ridge indicate this formation is a dense basalt altered to greenstone. The formation has an approximate north-south strike, and a prominent cleavage direction to the southeast.

Hydrology

Topographic, lithologic, and recharge conditions are not favorable for the accumulation of a large ground-water reservoir in the Dickey Ridge

- 2 -

Area; consequently successful wells would yield only small quantities of water. The steep slopes and thin soil cover are conducive to rapid runoff, particularly on the western slopes. When the soil cover does become saturated the impermeable bedrock cannot absorb water except where fracture openings occur. Recharge to the Area is limited because it must be obtained directly from precipitation that falls on a relatively small, steep land area.

Test Drilling Recommendations

Two test hole sites have been located on the recently acquired Sneed Property on which are several springs. Water-filled fractures must be penetrated to obtain water, and as such fractures generally become smaller and fewer with depth in the greenstone neither test hole should be deeper than 350 feet. The location of test hole No. 2 is subject to change, and should not be drilled until data from test hole No. 1 have been analyzed.

Virginia Division of Mineral Resources
Charlottesville, Virginia
May 24, 1963

WATER SYSTEMS - SHENANDOAH NATIONAL PARK

Dec. 1939

General

Water supply systems have been developed in fifteen separate areas in Shenandoah National Park. Additional systems will be required as new areas are opened and the Skyline Drive is extended. Some of these are little more than a developed spring, a drinking fountain and connection pipe line.

Where practical, gravity supply systems are developed and at other points pumping plants are installed. The present system may be classified as follows:

<u>Group</u>	<u>Gravity Supply</u>	<u>Pumped Supply</u>
1		
	Panorama Swift Run Gap Elk Wallow <u>Dickey Ridge</u>	Skyland Big Meadows
		Serving Park Operator, Public and Government.
2		
	Sexton Knoll Hased Mountain Hughes River Gap Naked Creek Parking Area Bald Face Mountain South River Picnic Grounds Pass Mountain Clear Spring	Lewis Mountain
		Serving Public & Govern- ment only.

Charge for Water Service

This report deals with the water systems which jointly serve the National Park Service and the park operators (Group 1) where the cost of water service furnished is prorated on the basis of use.

Cost and utilization information has been estimated based upon limited data accumulated over the period November 1, 1938 -- November 30, 1939. As more complete data is obtained any necessary change in the rates can be made. Most of these installations have been equipped with water meters for measuring the output of the system and the individual consumption.

At certain developed areas where the park operator conducts operations and where park visitors, other than patrons of the park operator, assemble, the

Elk Wallow - 1936-37.

20,000 gal. concrete tank 18'x18'x9'		\$900.00	
Spring development - 3 springs		840.00	
2700 ft.-2" galv. W.I. pipe @ \$.61	\$1,645.00		
1650 ft.-1 1/2" " " " @ .55	908.00		
500 ft.-1" " " " @ .45	225.00		
800 ft.-3/4" " " " @ .39	<u>312.00</u>	5,000.00	
Drinking fountains 6 @ \$55		<u>330.00</u>	\$5,180.

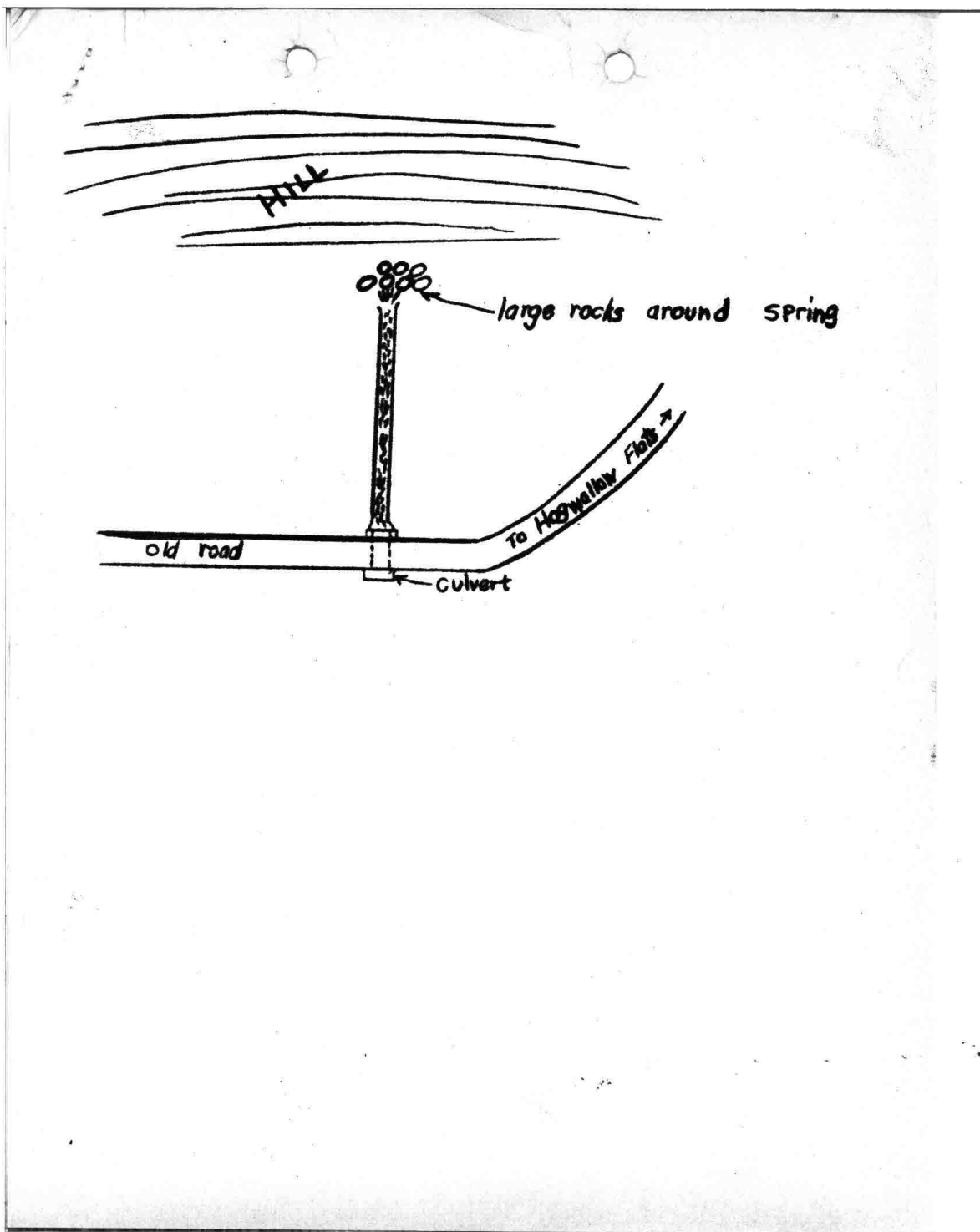
Dickey Ridge - 1938

20,000 gal. concrete tank		\$1,000.00	
Spring development		530.00	
4700 ft. 2" G.I. pipe @ \$1.00	\$4,700.00		
16,500 ft.-2 1/2" G.I. pipe .77	12,705.00		
500 ft.-3/4" galv. W.I. pipe .39	<u>117.00</u>	17,522.00	
Water meters 1 - 2" \$80			
1 - 1 1/2" 55		<u>133.00</u>	\$18,187.

Spring No. 9.

September 21, 1934.

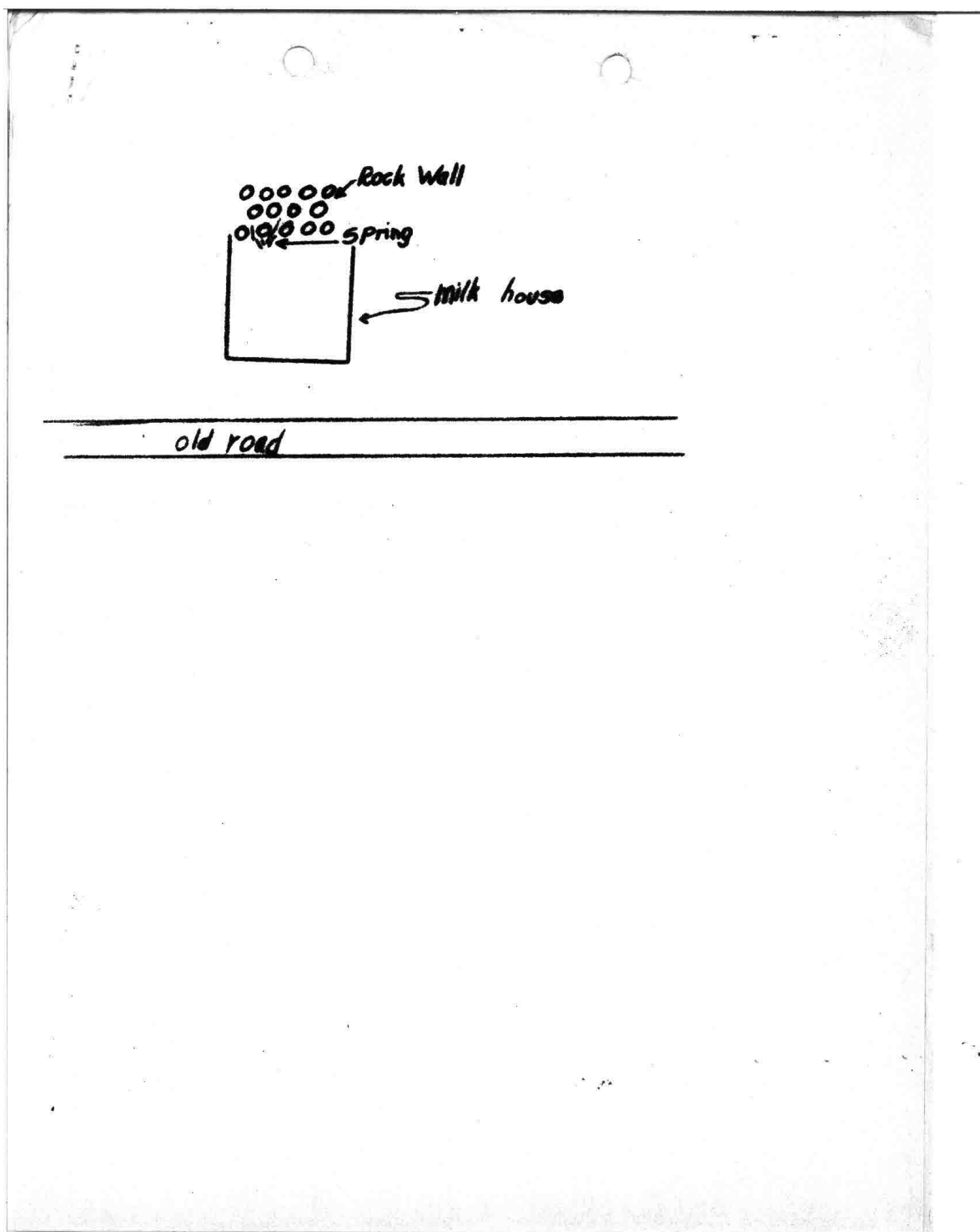
Spring has no name, is located about $3/4$ mile east of Skyline Drive and about 200' above old road leading from Hagsallow flats. Flow measured and found to be 26 gallons per minute, this flow is unusually large due to very heavy rains. Very little history of it could be found but several natives say they had never seen it dry but its flow gets very small. It is not being used and needs cleaning out very badly, water comes out of side of hill through a pile of rocks, measurement was made about 100' below its source.



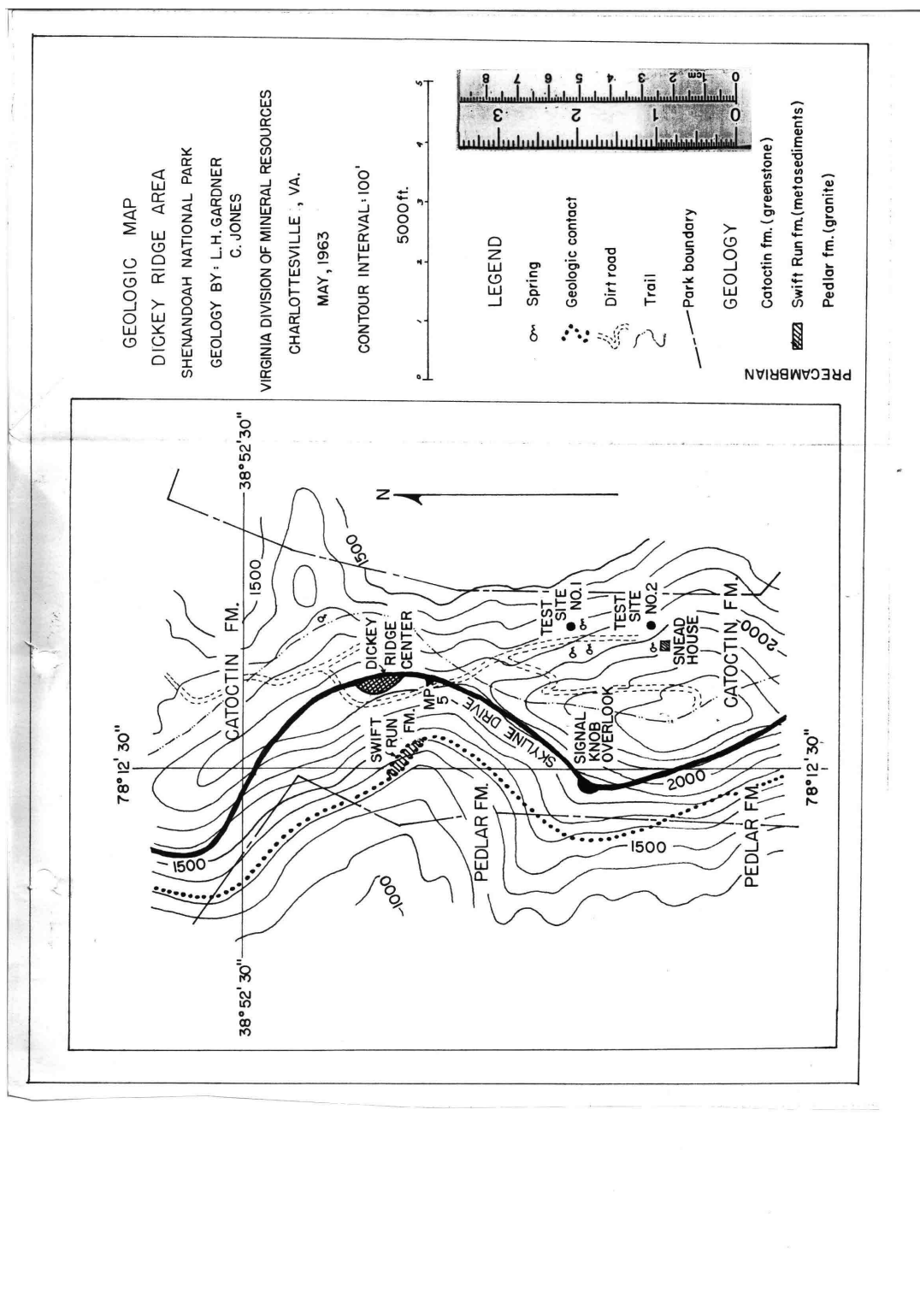
Spring No. 7.

September 18, 1934

Spring has no name and is said to keep a fairly even flow the year round, did not go dry in 1930. Water comes out of side of steep hill through crevices in solid rock. Spring is at present being used by road force for drinking water. Flow 3 gallons per minute. Temperature 57°. Water free from any danger of contamination. Would take a wall about 50' long to cut off all the water.



Maps and Miscellaneous Information



Docket Information

Number of Documents in Docket 59

Documents Dated from 12/15/1939 to 12/23/1968

Docket Compiled: 6/17/2011