

Native Bib 115823

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SOURCES OF WATER AVAILABLE TO ISLAND IN THE SKY
AND UPHEAVAL BOTTOM,
CANYONLANDS NATIONAL PARK

Introduction

A study of possible sources of water in and near the northern sector of Canyonlands National Park was made in May and June, 1965. All potential sources were examined or investigated and evaluated as described below:

1. Collection of natural precipitation and surface water.
2. Seepages and wells from base of Navajo Sandstone.
3. Seepages and wells from Moss Back Member of Chinle Formation.
4. Seepages and wells from base of Wingate Sandstone.
5. Wells from White Rim Sandstone.
6. Pumping directly from Colorado River or Green River.

Summary

Only direct pumping from the rivers or from wells into the White Rim Sandstone will provide reliably the estimated requirement of 30,000 to 50,000 gallons of water per day. Pumping from the rivers will require settling and purification in addition of protection from high waters. I recommend that a well be drilled above the flood plain on the margins of Upheaval Bottom to a depth of 300-400 feet, depending on location. This well will encounter the White Rim Sandstone, a very good aquifer, below the level of the Green River. If necessary, more than one well can be drilled.

Moss Back Member of Chinle Formation-50± feet thick, lenticular conglomeratic sandstone; porous and permeable, supports prominent ledge at base of Chinle slope; uraniferous.

Moenkopi Formation-600± feet thick, reddish brown to gray-green mudstone and siltstone; impervious, gypsiferous; contributes alkali to water that passes over or through it, gives rise to the name of Soda Springs Basin.

White Rim Sandstone Member of Cutler Formation-0-150 feet thick, white to gray, medium to coarse grained sandstone; very porous and permeable, forms ledge known as White Rim.

Organ Rock Tongue of Cutler Formation-reddish-brown siltstone and sandstone.

Island in the Sky

Figure 1 is a topographic map showing the location of seeps and springs in and near the Island in the Sky. Table I summarizes the information gathered at the numbered localities during May and June, 1965. It is expected that the flow of the seeps will decrease during the summer.

Figure 2 shows a typical alcove developed at the base of the Navajo Sandstone by seepage, and Figure 3 shows the actual wet rock.

It is readily apparent from Table I that the combined flows of all of the seeps on the edge of Island in the Sky, excluding Holeman Spring, is inadequate for the needs. Even if it were not, the problem of collecting numerous scattered seepages would be difficult, costly and probably unreliable.

If undeveloped the seeps will continue to provide for the wildlife and assure attractive foliage to the views from above.

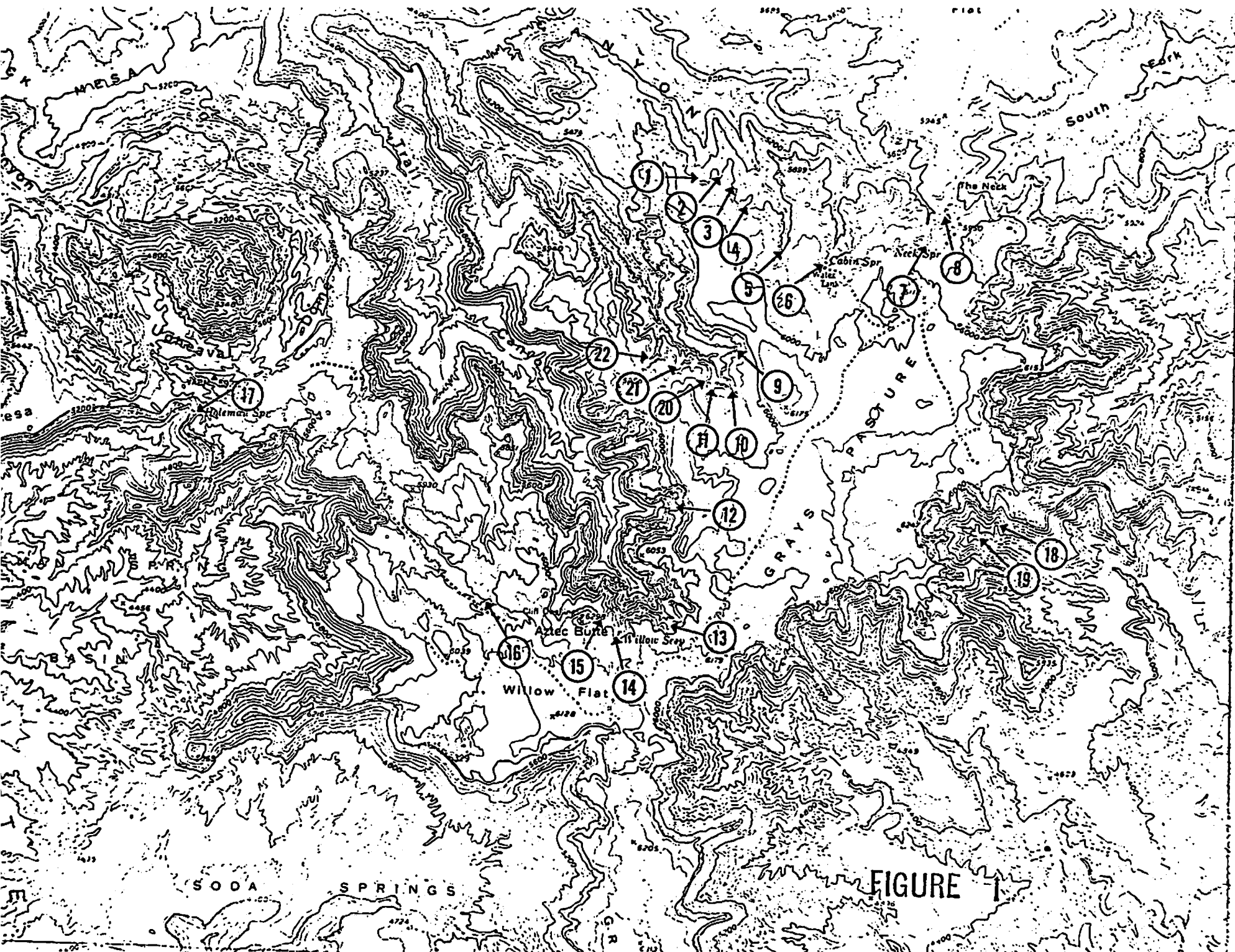


FIGURE 1

TABLE I

LIST OF WATER OCCURANCES IN VICINITY OF ISLAND IN THE SKY

No. on Fig. 1	Name	Elev.	Flow, May, '65 Gallons/day	Formation	Remarks
1		5600'+	48	Navajo Ss.	Small pool
2		5600'+	0	Navajo Ss.	Wet rock and ground
3		5640'	48	Navajo Ss.	Small pool
4		5600'+	48	Navajo Ss.	Small pool
5		5600'+	150	Navajo Ss.	Much loss to subchannel flow
6	Cabin Spring	5680'	1400	Navajo Ss.	Sampled for analysis, prior attempts to improve deliverability now in disrepair
7	Neck Spring	5650'	750	Navajo Ss.	Piped to trough 120' from collection box in channel at base of talus slope
8		5680'	90	Navajo Ss.	Piped to trough from collection box with lateral feeders at seepage face
9		5680'	270	Navajo Ss.	Two seepages combine and flow 700'
10		5680'	180	Navajo Ss.	Additional 45 gallons per day flows from seepage 400' north on east wall of canyon
11		5680'	45	Navajo Ss.	Additional 66 gallons per day flows from seepage 500' northwest (see #20)
12		5720'		Navajo Ss.	Not visited because of difficult access, wet streak on Kayenta ledges visible from southwest side of canyon
13		5800'	0	Navajo Ss.	Damp soil and two tall pines, one dead.
14	Willow Seep	5800'	380	Navajo Ss.	
15		5920'	0	Navajo Ss.	Wet rocks and soil.
16		5920'	12	Kayenta Ss.	Pipe from concrete box blasted out of sandstone
17	Holeman Spg.	5000'+	21,600	Navajo Ss.	Drips from sandstone ledge; weir placed in stream channel 2200 ft. downstream measured 95,040 gallons per day declining
18		4680'	360	Shinarump	Uranium mine; water very salty
19		4680'	720	Shinarump	Seepage coated with alkali
20		5680'	66	Navajo Ss.	
21		5660'	45	Navajo Ss.	
22		5660'	10	Navajo Ss.	
COLORADO RIVER		3950'			
GREEN RIVER		3950'			



FIGURE 2 - The Neck Spring alcove at base of Navajo Sandstone cliffs. The surface at top of cliffs is part of The Island in the Sky. Seepage from lower part of cliff has caused undercutting and supports heavy vegetation. Reddish shales and sandstones of Kayenta Formation can be seen below cliff at left margin of photograph.

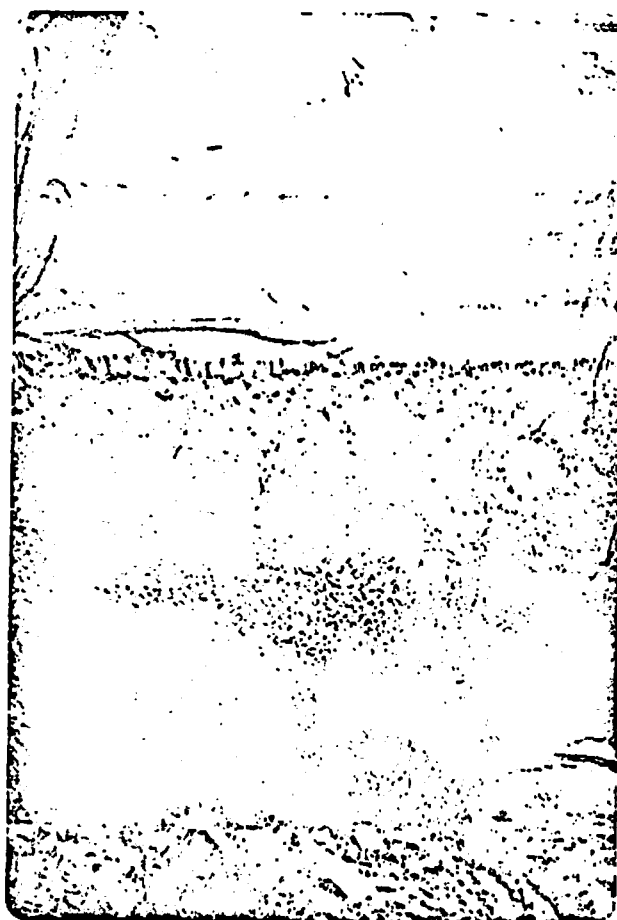


FIGURE 3 - Seepage from lower 2 feet of Navajo Sandstone shows a band of dark streaks at base of cliff. The water immediately disappears into soil and rubble supporting relatively dense vegetation. This photograph is a close-up of part of the left side of Figure 2.

The regional dip of these strata is northward and northwestward at about 100 feet per mile. Water in the sandstones moves in the direction of the dip.

Superimposed on the regional dip is a broad, shallow syncline which plunges northwestward across Grays Pasture, the wide part of Island in the Sky just south of The Neck. The seeps on the north side of Grays Pasture are fed by water falling on the surface, percolating down through the Navajo Sandstone and moving northwestward down the trough of the syncline until it emerges in the canyon walls.

Also superimposed on the regional dip is Upheaval Dome, an anomalous steep-sided structural dome with a rim syncline. This feature disrupts the regional condition in a small area with a diameter of about 2 miles. The effect of Upheaval Dome on ground water recharge, movement or release is probably limited to the immediate locale. Holeman Spring issues from the base of the Navajo Sandstone where the lower part of the rim syncline has been breached by erosion.

On May 24, 1965, Holeman Spring was visited in the company of Superintendent Wilson. The water dripping from the Navajo Sandstone was estimated to be flowing at the rate of 21,000 gallons per day. The water disappeared and reappeared several times in the channel below the spring. At a point 2200 feet downstream a measurement of 95,000 gallons per day was made with a weir.

This abnormally high flow should be rechecked from time to time as it may indicate addition by subsurface flow from the Wingate Sandstone or faults, or more possibly the flow might

On June 30, 1965, Mr. Ed Fothfuss visited Holeman Spring and reported that the stream flowing past the point of the previous weir measurement was similar to the description of the earlier visit by Wilson and myself. He also noted that the stream contained more water than was supplied by the seep from the base of the Navajo Sandstone. It is logical to assume that additional water enters the base of the rubble and soil which covers the Wingate Sandstone and that the water seeps out through the fractures developed in the massive Navajo and Wingate sandstones where they are tightly folded around Upheaval Dome.

Holeman Spring may be the most important water source in the northern part of the Canyonlands National Park. The volume of flow should be measured systematically during each year. Water samples have been taken and will probably verify good quality culinary water. The water from Holeman Spring can readily be piped to facilities on the White Rim.

Table I summarizes the water occurrences visited during this project. All intervening canyons and alcoves were visited and found to be dry.

The amount of flow from the seeps and springs was measured with a v-notch weir when possible and with various combinations of troughs and cans when necessary. It is probable that the yields are maximum for the year and will gradually decrease through the summer. It is also probable that most of the seeps could be improved to yield up to 50% more than the measurements given in Table I. The very small amounts of water from sources scattered along the bases of cliffs in the canyons do not appear to justify the expense of improvement and collection.

ADDITIONAL SOURCES OF WATER

In additiona to The places listed on Table I several sources of water outside of the Park were considered.

1. Big Flat Reservoir and another reservoir in Sections 25 & 26, T. 26 S., R. 19 E. were dry when visited in May, 1965. These catch some water from cloudbursts during the summer. They are considered good evidence of unreliability and insufficient quantity of surface water run-off as a source for the Island in the Sky.
2. Horse Thief Spring #1 and #2, Sections 27 & 28, T. 26 S., R. 18 E. These springs issue from the base of the Navajo Sandstone. The spring in Section 27 flowed 500 gallons per day in May, 1965 but is reported to dry up before the end of each summer. The spring in Section 28 supports a small ranch, and its flow is estimated at 4,320 gallons per day by the owner.
3. In the 1930's the C.C.C. drilled the Dubinky well in Section 26, T. 24 S., R. 18 E. to a depth of 580 feet. This puts the bottom of the well near the base of the Navajo Sandstone. The well is equiped with a windmill and is operated seasonally by the B.L.M. who estimates the yield at $1\frac{1}{2}$ gallons per minute or 2160 gallons per day. The C.C.C. also drilled the Hell Roaring well to approximately 600 feet in Section 21, T. 25 S., R. 19 E. This well also bottomed near the base of the Navajo Sandstone. No record of pump rate is available, and the windmill has been removed.

The small production from these wells is

indicate that wells drilled to the base of the Navajo on the Island in the Sky would be inadequate.

4. Springs, seeps and surface run-off collection below the base of the Wingate and above the top of the White Rim were eliminated from consideration because of the alkaline qualities of all water derived from the Chinle, Moss Back and Moenkopi Formations.
5. Southern Natural Gas Company drilled two wells for oil in the East Fork of Shafer Canyon, Section 6, T. 27 S., R. 20 E. They also drilled a well which was used to supply water for the drilling. The Well was drilled from a elevation of about 4400 feet. It is about 1-3/4 miles south of the Colorado River which is at an elevation of 3940 feet. I believe that the water well produced water that was charged from the river, and that the production came from a sandstone in the Rico Formation. Quite possibly the quality of the water was below normal requirements.

UPHEAVAL BOTTOM

Figure 4 is a topographic map of the Upheaval Bottom area. The bench area designated "A" on the map is between the 4000 feet and the 4040 feet contour lines and is a possible development site. Area designated "B" on the map could be swept by flash floods from either Taylor Canyon or Upheaval Canyon. Point "C" is the location from which Figure 5 was photographed.

In the Upheaval Bottom area there are two possibilities for water: (1) the Green River, and (2) drilling a well into the top of the White Rim Sandstone.

The White Rim Sandstone gets its name from the White Rim bench and cliff it forms around the canyons above the rivers in the Canyonlands National Park. The White Rim can be seen to dip northward and to pass below the level of the Green River and into the subsurface between Beaver Bottom and Potato Bottom in approximately Section 26, T. 27 S., R. 17 E.

Northward from its submergence it was encountered at a depth of 1495 feet or 3480 feet above sea level in Pure Oil #1 U.S.A.-Mineral Point (Section 7, T. 26 S., R. 18 E.) where the samples and gamma ray log indicate excellent porosity. Farther north, Texaco #2 Govt.-Smoot (Section 17, T. 23 S., R. 17 E.) flowed an estimated 30 gallons of fresh water per minute from the White Rim Sandstone at a depth of 2472 feet or 1827 feet above sea level.

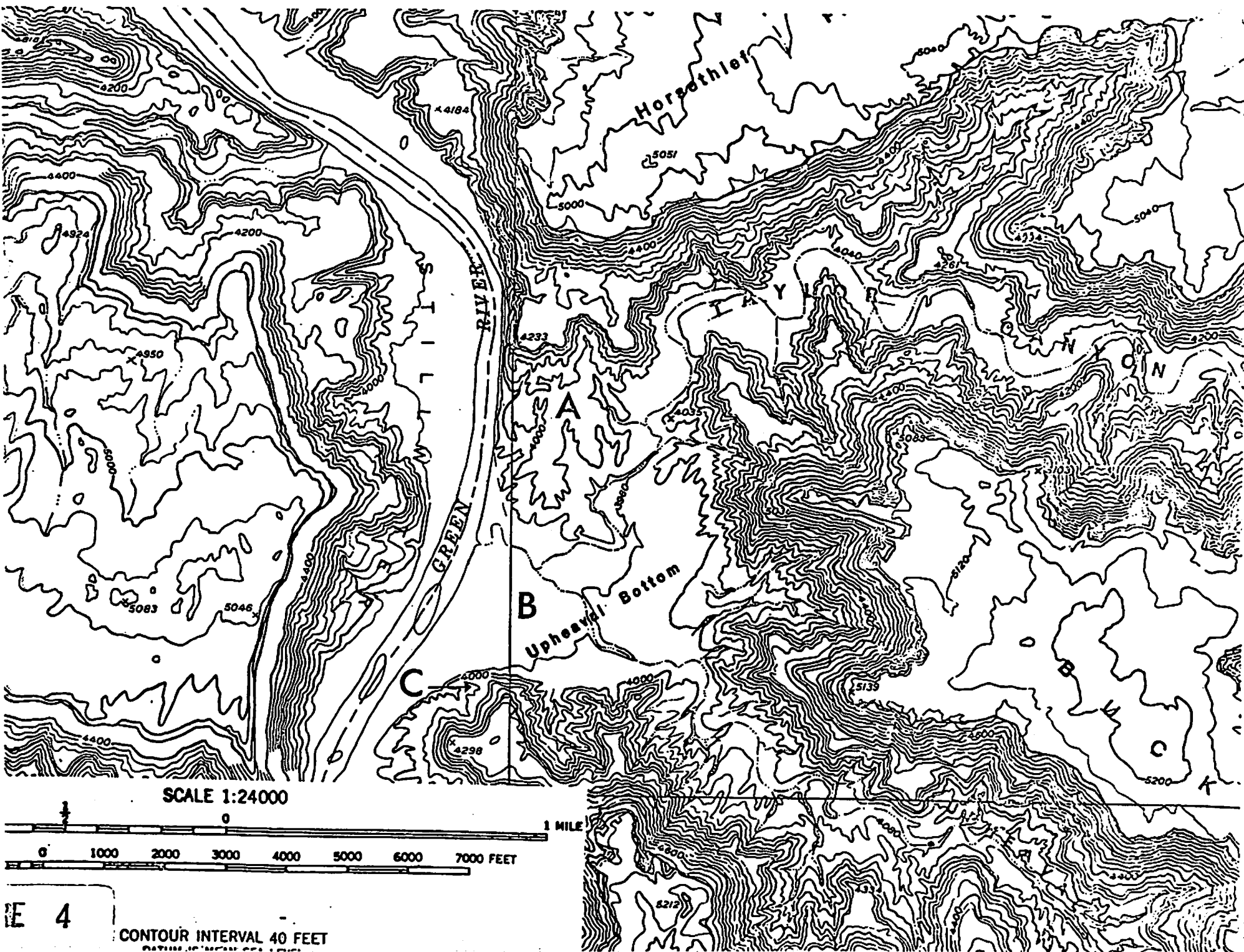




FIGURE 5 - View north across Upheaval Bottom from point "C" on Figure 4. Trees are along stream channel formed by joining of Taylor Canyon and Upheaval Canyon drainages. Area south of channel is flood plain designated area "B" on Figure 4. North of channel are red exposures of Moenkopi Formation with gray gravel bars deposited by Green River lying on top.

The upper part of the Moenkopi is light gray band capped by ledge-forming Moss Back Member at base of slopes developed on red Chinle shale. Massive vertical cliffs are Wingate Sandstone.

All evidence indicates that a well drilled into the White Rim Sandstone at Upheaval Bottom will produce 30 gallons or more per minute. The well should be drilled back from the Green River far enough to avoid flooding and contamination, and it should be above the flood plain of the creek channels which cross Upheaval Bottom. The depth of the well will depend on the location and the depth of penetration into the 150 feet thick sandstone, but it will be about 350 feet deep.

CONCLUSION

An investigation of possible sources of water for the Island in the Sky and Upheaval Bottom was begun on May 17, 1965. This involved measuring the flow of numerous seeps and study of geologic factors which influence the movement and quality of ground water.

On June 18, 1965 it was learned that the expected requirement was 30,000 to 50,000 gallons of water per day. This required amount automatically eliminated from consideration the small seepages and wells from the base of the Navajo Sandstone cliffs which surround the Island in the Sky.

The only possible sources which might prove adequate are:

1. Colorado River or Green River.
2. Holeman Spring and additional water that enters the channel below the spring.
3. Well(s) drilled into the White Rim Sandstone north of Section 26, T. 27 S., R. 17 E.

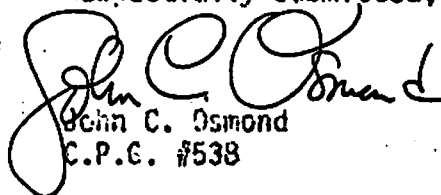
The level of water in the Colorado and Green Rivers is about 3950 feet. There is unappropriated water in both rivers for use in Utah. The high silt and bacteria content of the river waters plus seasonal fluctuations and flooding present collection and purification problems. The lift to the Island in the Sky is about 2100 feet.

Holeman Spring is a potential source, but it can be properly evaluated only by measurement of the flow at various times throughout the year.

Wells drilled at Upheaval Bottom to a depth of about 350 feet should find water in the White Rim Sandstone. The aquifer is charged by the Green River which flows over the outcrop about $3\frac{1}{2}$ miles to the south. Water moving downdip, northward, will be filtered as it passes through the sandstone.

At least one well should be drilled to determine the yield and quality of the water from this reservoir. No water wells drilled into the White Rim close enough to Upheaval Bottom to be useful as guides were found.

Respectfully submitted, June 30, 1965,


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