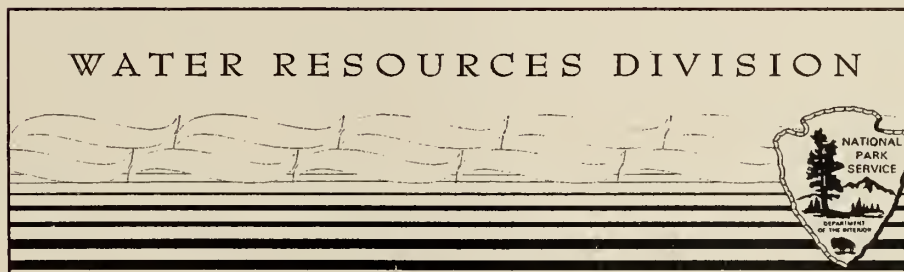


# **DRINKING WATER SOURCE PROTECTION PLAN**

## **Canyonlands National Park**

March 2001



National Park Service - Department of the Interior  
Fort Collins - Denver - Washington



# DRINKING WATER SOURCE PROTECTION PLAN

## Canyonlands National Park

March 2001

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National Park Service - Department of the Interior  
Fort Collins - Denver - Washington



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## EXECUTIVE SUMMARY

The Needles area of Canyonlands National Park is the only area of the Park having a public water supply source. Water for public use in the Maze area is hauled from Moab. Water for public consumption at Island in the Sky is hauled from Arches National Park.

Potable water for the Needles area is supplied from a shallow well near Cave Spring. Various other shallow wells in this general area have been the water source in the past. The wells have obtained water from the alluvial sands or the upper part of the Cedar Mesa Sandstone Member of the Cutler Formation in the Squaw Canyon Creek and Salt Creek drainages. Saline groundwater is encountered in wells drilled deeper than 200 feet.

Available information does not allow us to delineate the area of groundwater flow to the well for various travel times, as prescribed by Utah Division of Drinking Water. Hydrologic data is inadequate to determine even the direction of groundwater flow, although it is generally believed that groundwater flow is northwesterly, toward the Colorado River. Therefore, we used the optional two-mile radius for developing this drinking water source protection plan.

There are few potential contaminants in the area. There are no potential contaminant sources in the area that are not under the direct control of the National Park Service.

The following procedures are recommended to reduce the potential for contamination of the ground-water resource and drinking water supply at the Needles area of Canyonlands National Park.

1. Continue periodic monitoring of water quality at monitor wells adjacent to the abandoned landfill.
2. Continue leak detection monitoring at the diesel fuel and gasoline storage tanks.



3. Provide secondary containment for all fuel, oil, and solvent containers.
4. Continue periodic inspection of areas where paint, solvents, etc. are stored in the maintenance area.
5. Purchase paint, solvents, etc. on an as-needed basis to reduce quantities stored on site.
6. Plug and abandon all unused wells in the Needles area. This probably includes Well Nos. 3A, 3B, 4, 5 and 6. Piezometers and monitor wells associated with these wells should also be plugged and abandoned.



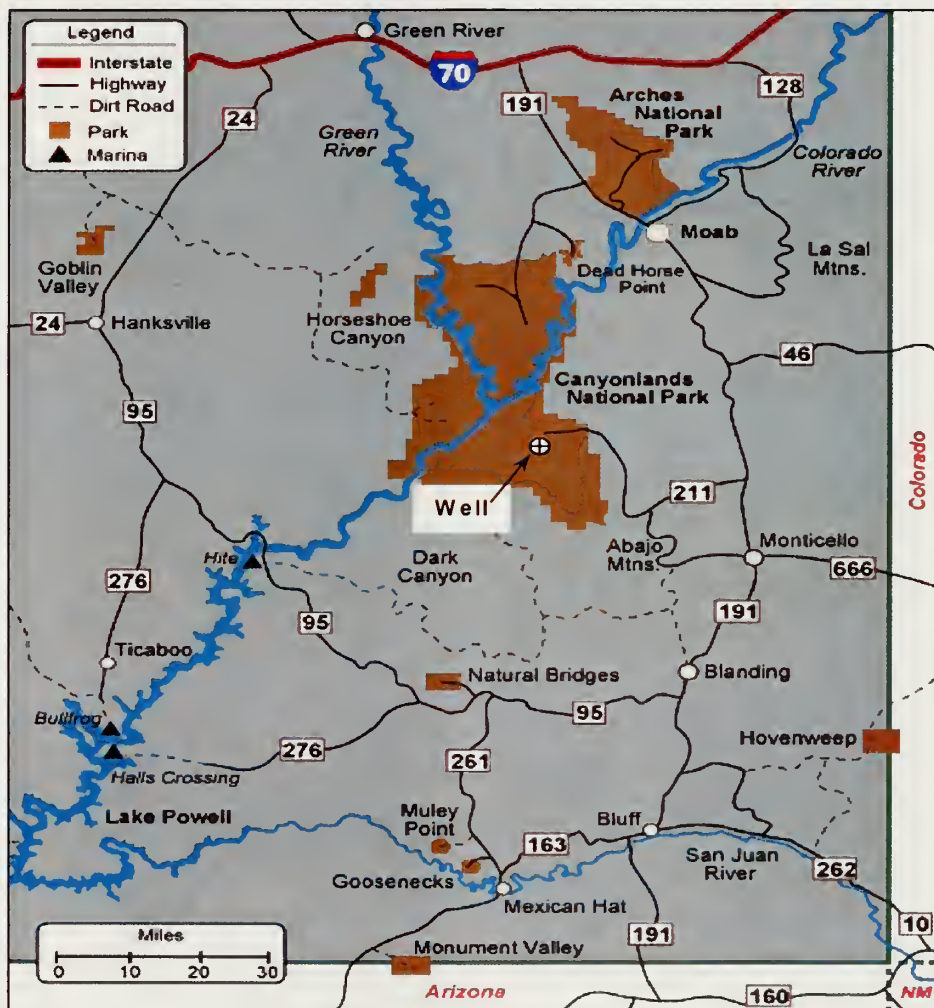
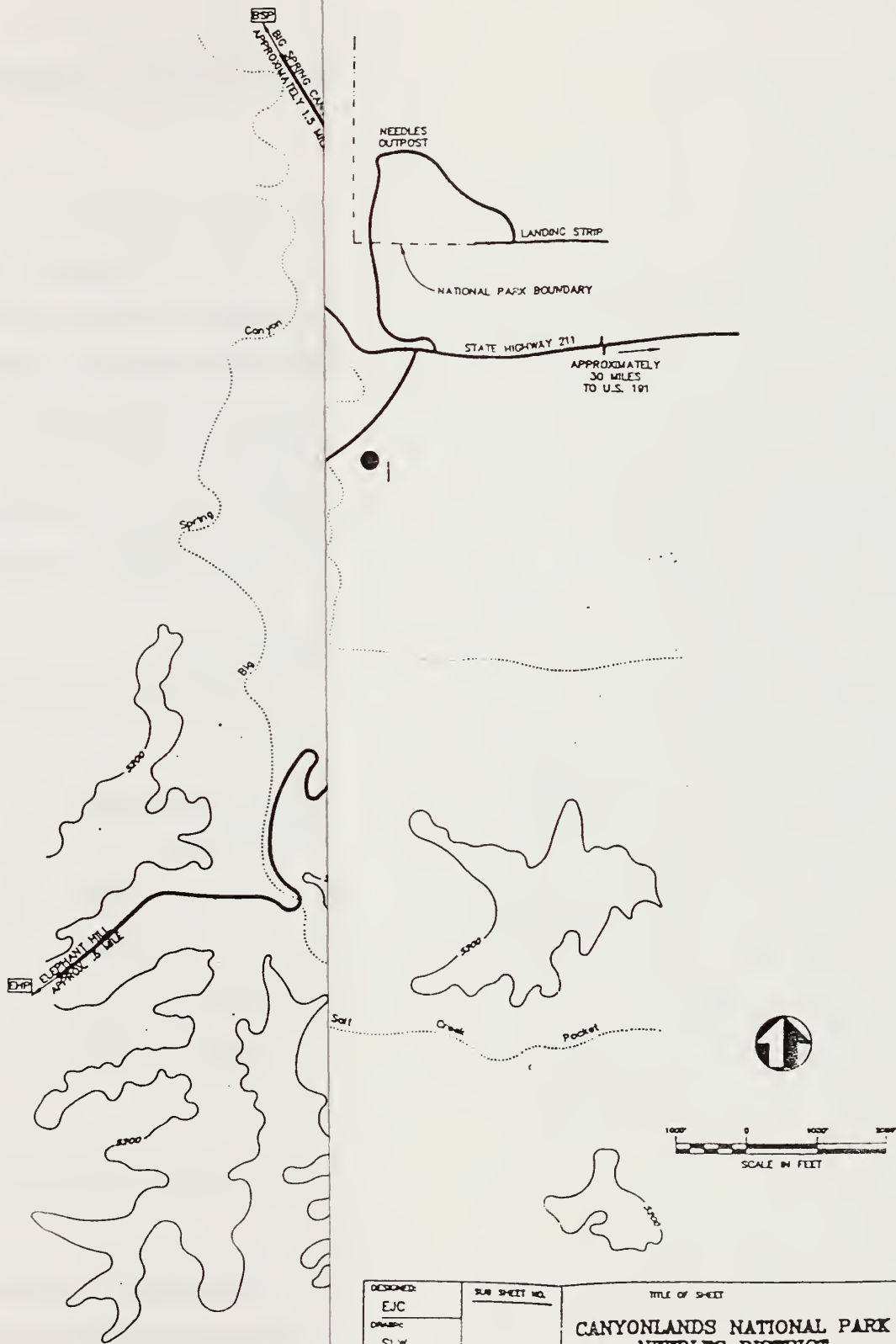


Figure 1. General Location Map





DESIGNED:  
EJC  
DRAWN:  
SLW  
TECH. REVIEW:  
EJC  
DATE:  
05/20/92

SUB SHEET NO.  
  
CP-1

TITLE OF SHEET  
  
CANYONLANDS NATIONAL PARK  
NEEDLES DISTRICT  
COMPREHENSIVE PLAN

|                    |            |
|--------------------|------------|
| DRAWING NO.<br>164 |            |
| 41,030A            |            |
| PROJ. NO.<br>203   | SHEET<br>3 |
| OF<br>136          |            |



The legal description of the well location is; SE¼ of SE¼ of SW¼, Section 20, T30S, R20E SLBM.

Water is used for drinking and restroom facilities by park visitors at the Visitor Center and Squaw Flat Campground. Water from this system is also used by park staff at administrative and maintenance buildings. There are 19 employee residences at Needles, including single-family and multiple unit dwellings. Water use ranges from about 1.0 – 1.5 million gallons per year. In winter months, when visitation is low, demand is about 50,000 gallons per month. In summer months, when visitation increases, water demand is about 150,000 gallons per month. Water use at Needles for 1992-98 is shown in Figure 3.

### 1.3 Designated Person - R309-113-5:

|                  |                                                  |                       |
|------------------|--------------------------------------------------|-----------------------|
| Owner:           | National Park Service                            |                       |
| Superintendent:  | Jerry Banta                                      | Phone: (435)-719-2100 |
| Facility Manager | Mike Hunter                                      | Phone: (435)-719-2150 |
| Operator:        | Don Tyree                                        | Phone: (435)-259-8859 |
| Address:         | 2822 South West Resource Blvd.<br>Moab, UT 84532 |                       |

### 2.0 THE DELINEATION REPORT - R309-113-9 (5)

The primary sources of hydrogeologic information for this report are unpublished reports, memos, and other documents in the files of the National Park Service Water Resources Division in Ft. Collins, Colorado. Two published reports, Sumison and Bolke (1972) and Richter (1980), describe the hydrogeology of the area in a regional context.



**Average Monthly Water Use at Needles,  
Canyonlands National Park  
1992-98**

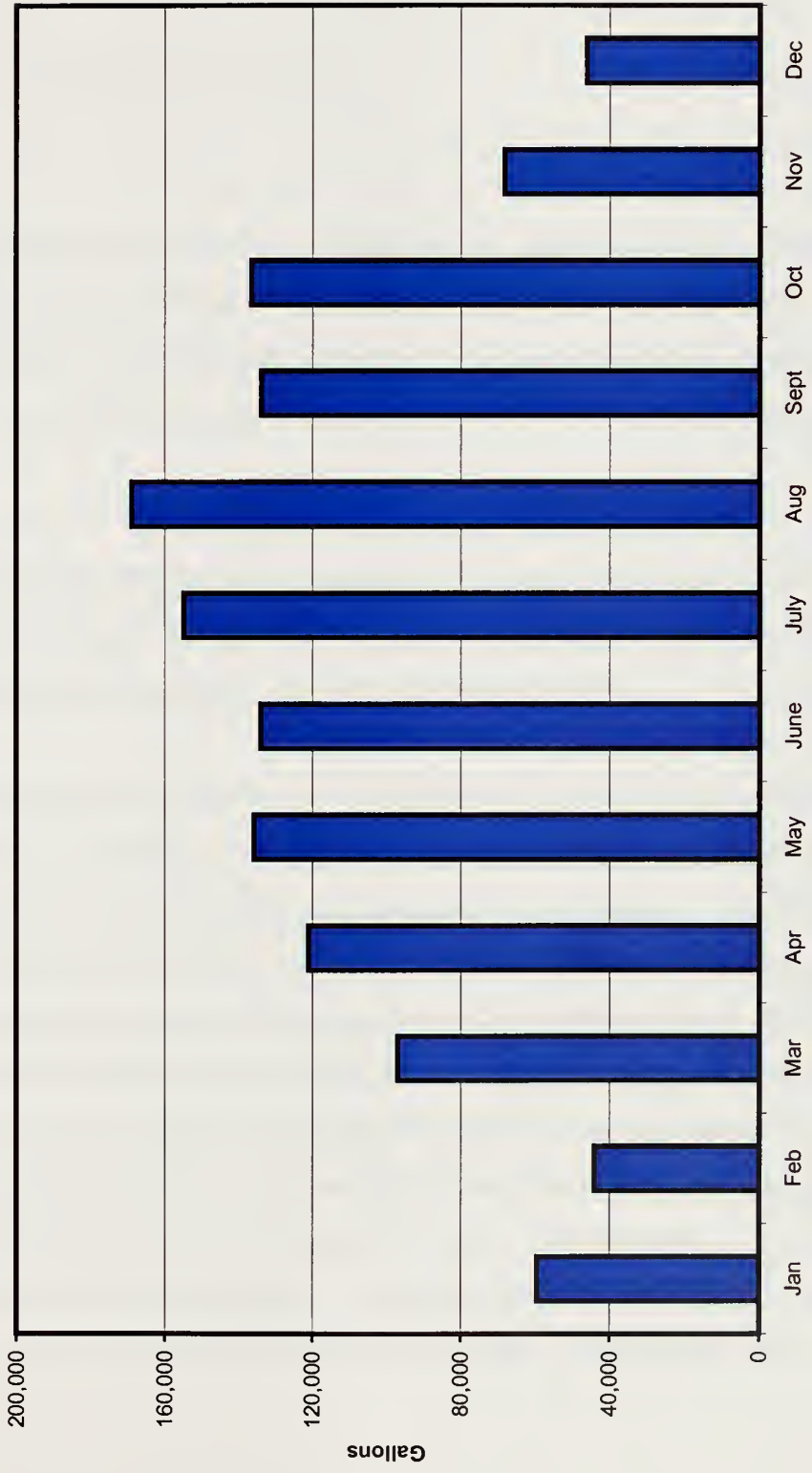


Figure 3. Water Use at Needles, Canyonlands National Park



There are no water supply wells within several miles of the site, other than those constructed by the National Park Service to supply developments in the Needles area.

## 2.1 Geologic Data - R309-113-9 (5)(a)(i)

### Hydrogeology

The only two aquifers of concern in this area are the Quaternary Alluvium and the Cedar Mesa Sandstone Member of the Cutler Formation. Deeper geologic formations contain saline water. Only one well in the area has been drilled deeper than 80 feet (Well No. 1). It encountered saline water and was immediately plugged and abandoned.

Quaternary Alluvium is the shallowest aquifer in the area, occurring in association with Squaw Canyon Creek and Salt Creek. The general lithology of these aquifers is characterized as sand, gravel and silt, with good water quality.

The Cedar Mesa Sandstone Member of the Cutler Formation is the predominant geologic formation outcropping in the area. It is composed of massive, cross-bedded sandstones and forms dissected plateaus and escarpment slopes. The thickness of the Cedar Mesa Sandstone varies from 200 to 1200 feet. The primary permeability of the Cedar Mesa Sandstone is along fractures, joints, and bedding planes. Richter (1980) and Huntoon (1979) indicate intergranular permeability in the Cedar Mesa Sandstone. However, the retention of water in potholes for sustained periods following precipitation events indicates that intergranular permeability is very likely low (Ecosystems Research Institute, 1984a). Numerous springs and seeps have been identified as flowing from outcrops of the Cedar Mesa Sandstone. As observed by Richter (1980), most of these springs occur in association with faults, joints, and partings in bedding planes of the sandstone.



## Water Quality

Water quality data for Well No. 7 are summarized in Table 1. Samples collected from Well No. 7 in 1990, at the time of the original well construction, were analyzed for a suite of volatile organic compounds, but none were found above detection limits. In general, the water quality is suitable for potable uses. Water is passed through a green-sand filter to reduce iron and manganese concentrations. Water is chlorinated and stored in three 20,000-gallon underground tanks and distributed to all National Park Service facilities in the Needles area.

### 2.2 Well Construction Data - R309-113-9 (5)(a)(ii) & (iii)

During 1965, the National Park Service drilled four wells in the Needles area. Well No. 1 was located east of Salt Creek in an area where a silty or very-fine sand facies of the Cedar Mesa Sandstone Member failed to yield much water. Drilling continued into the underlying Rico Formation, which yielded saline water. The well was plugged and abandoned. Well Nos. 2, 3, and 4 were successfully completed in alluvium and the upper part of the Cedar Mesa Sandstone Member of the Cutler Formation. In 1968, Canyonlands Needles Outpost constructed Well No. 5 on National Park Service land near the confluence of Squaw Canyon Creek and Salt Creek. In 1971, Well No. 3B was drilled 55 feet from Well No. 3. Subsequently Well No. 3 became known as Well No. 3A. In 1988, two (1" PVC) observation wells were constructed near Well No. 2 and four (1" PVC) observation wells were constructed near Well Nos. 3A and 3B to facilitate testing of the aquifer and wells. Also in 1988, a test well (Well No. 6) and observation wells were constructed at Cave Springs. In 1990, Well No. 7 was constructed at Cave Springs.

Table 2 contains a summary of construction information for wells in the Needles area. Well locations are shown on Figure 4.



Table 1. General water quality, Well No. 7

| Date                          | 11/13/90 | 8/28/95 | 10/18/93 |  |
|-------------------------------|----------|---------|----------|--|
| pH                            | 7.5      |         |          |  |
| Turbidity, NTU                | 1.1      | 1.5     |          |  |
| Spec. Cond. (umhos)           | ---      | 565     |          |  |
| Hardness (CaCO <sub>3</sub> ) | 235      | 240     |          |  |
| TDS (mg/l)                    | 505      | 326     |          |  |
| Ca (mg/l)                     | 66       | 55      |          |  |
| Mg (mg/l)                     | 18       |         |          |  |
| Na (mg/l)                     | 48       |         |          |  |
| K (mg/l)                      | 1.8      |         |          |  |
| HCO <sub>3</sub> (mg/l)       | 226      |         |          |  |
| SO <sub>4</sub> (mg/l)        | 89       | 54      | 46       |  |
| Cl (mg/l)                     | 35       | 33      |          |  |
| NO <sub>3</sub> (mg/l)        | 0.143    | <0.02   |          |  |
| Fluoride (mg/l)               | 0.30     |         |          |  |
| Arsenic (mg/l)                | 0.006    | <0.005  |          |  |
| Barium (mg/l)                 | 0.15     |         |          |  |
| Boron (mg/l)                  | <0.001   |         |          |  |
| Cadmium (mg/l)                | <0.0002  | <0.001  |          |  |
| Chromium (mg/l)               | 0.001    |         |          |  |
| Copper (mg/l)                 | 0.008    |         |          |  |
| Iron (mg/l)                   | 0.62     | 0.54    |          |  |
| Lead (mg/l)                   | <0.001   |         |          |  |
| Manganese (mg/l)              | 0.019    | 0.04    |          |  |
| Mercury (mg/l)                | <0.00005 | <0.0002 |          |  |
| Silver (mg/l)                 | 0.0002   |         |          |  |
| Selenium (mg/l)               | <0.001   | <0.001  |          |  |
| Zinc (mg/l)                   | 0.014    |         |          |  |



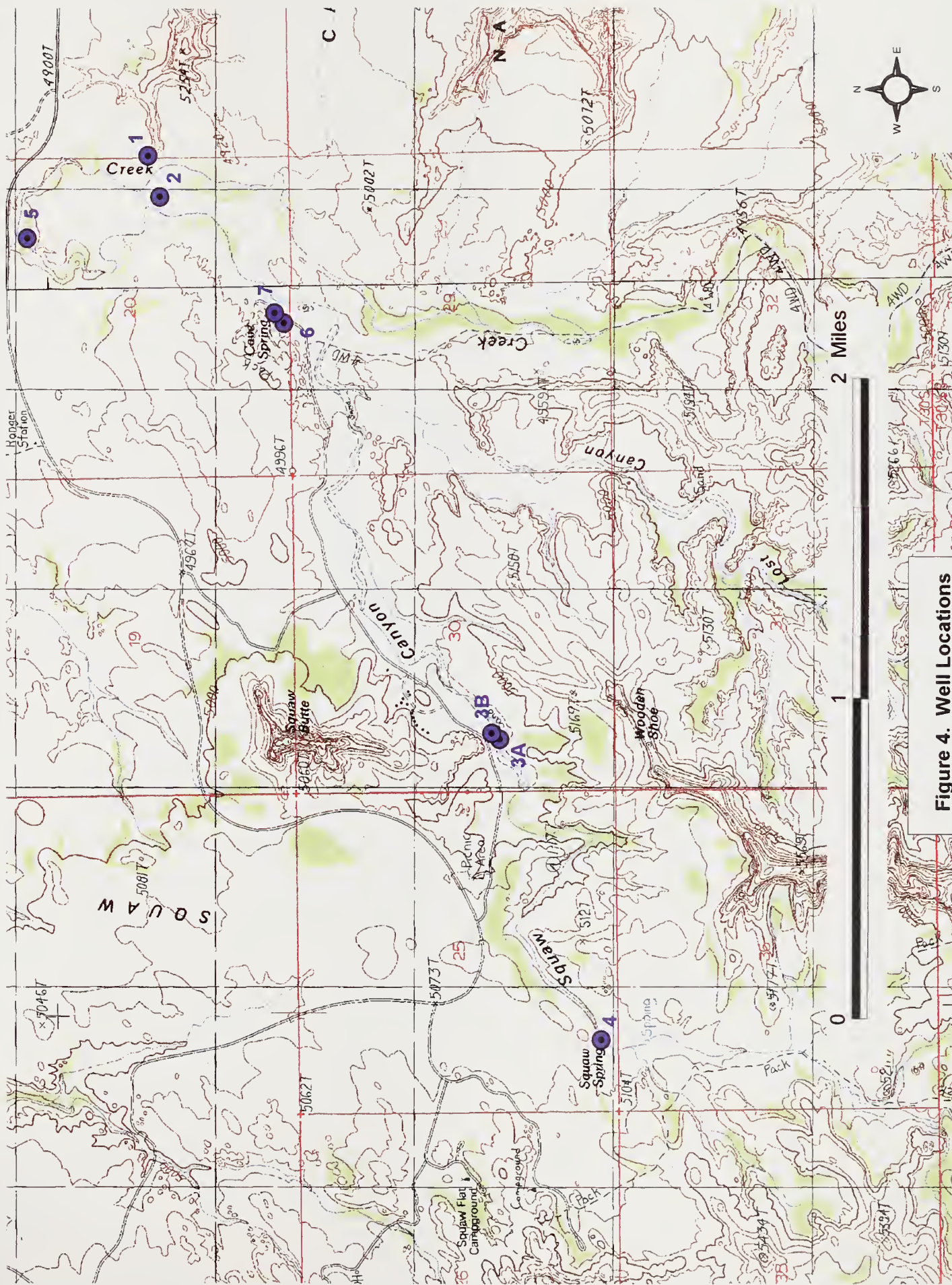


Figure 4. Well Locations



Table 2. Summary of well construction in Needles area

| Well No. | Location                           | Date Drilled | Depth (feet) | Depth to Water (ft) | Yield (gpm)               | Perforated Interval (ft) |
|----------|------------------------------------|--------------|--------------|---------------------|---------------------------|--------------------------|
| 1        | NW¼,SW¼,<br>Sec. 21,<br>T30S, R20E | 1965         | 253          | ---                 | Plugged<br>&<br>Abandoned | ---                      |
| 2        | NE¼,SE¼,<br>Sec. 20,<br>T30S, R20E | 1965         | 65           | 21                  | 33                        | 24-65                    |
| 3A       | NW¼,SW¼,<br>Sec. 30,<br>T30S, R20E | 1965         | 52           | 18                  | 4                         | 32-50                    |
| 3B       | NW¼,SW¼,<br>Sec. 30,<br>T30S, R20E | 1971         | 46           | 19                  | ---                       | 19-37                    |
| 4        | SW¼,SW¼,<br>Sec. 25,<br>T30S, R19E | 1965         | 77           | 26                  | 13                        | 44-77                    |
| 5        | NW¼,NE¼,<br>Sec. 20,<br>T30S, R20E | 1968         | 78           | 23                  | 44                        | ---                      |
| 6        | SE¼,SW¼,<br>Sec. 20,<br>T30S, R20E | 1988         | 80           | 8                   |                           | ---                      |
| 7        | SE¼,SW¼,<br>Sec. 20,<br>T30S, R20E | 1990         | 72           | 8                   | 40                        | 32½-67½                  |

Well No. 7 is currently the only well supplying water to the distribution system at Needles. No other wells have connections to the distribution system. Canyonlands Needles Outpost hauls chlorinated water from an overhead fill pipe at the water treatment plant for use at their facilities. Well No. 2 is designated as the backup well, but is not connected to the system.

A copy of the Driller's report for Well No. 7 is included in the Appendices of this report. The well was drilled to a total depth of 72 feet. The depth of the completed well is 67½ feet. The well was constructed of 6-inch PVC casing and well screen. PVC slotted well screen (0.020") was installed from 32½ to 67½ feet. The well was gravel packed using 20/40 sand to a depth of 26 feet below ground surface. A bentonite well seal was



placed from the top of the gravel pack to land surface. Installation of the surface seal was witnessed by Mark Page, Utah Division of Water Rights. Well No. 7 was tested by pumping at 40 gpm for 24 hours, resulting in 23 feet of drawdown. Land surface elevation at Well No. 7 is about 4920 feet. The design, construction, and geology of Well No. 7 are shown in Figure 5.

### 2.3 Aquifer Data - R309-113-9 (5)(a)(iv)

An aquifer test was conducted at Well No. 7 when it was constructed in 1990. The well was pumped at a rate of 40 gpm for 24 hours, resulting in 23 feet of drawdown. Analysis of water level recovery data from this test resulted in an estimate for transmissivity of 4000 ft<sup>2</sup>/day. The primary source of water for Well No. 7 is a 20-foot sequence of coarse sand and gravel from 31-51 feet. Hydraulic conductivity for the aquifer is estimated to be 200 ft/day. These results are reasonable for a coarse sand and gravel aquifer (Heath, 1983). The raw data for this test is not available, so we could not conduct independent analyses.

Western Engineers conducted aquifer tests at Well No. 2 in 1988 (Chamberlain Architects, 1988). Well No. 2 is located about 2200 feet northeast of Well No. 7 and is in a similar hydrogeologic setting. The estimated transmissivity from those tests was 15,000 gpd/ft, or 2000 ft<sup>2</sup>/day. Estimates of storage coefficient ranged from 0.0001 to 0.0002. These values are indicative of confined aquifer conditions, supporting the theory that the primary aquifer is the coarse sand and gravel layer confined by the underlying Cedar Mesa Sandstone and the overlying silty sand.

A Level II site investigation at the abandoned landfill ½ mile south of Well No. 7 found the water table slope in the alluvial sediments to be about 0.01 ft/ft toward the east (Roybal Corporation, 1998). The slope of the water table in the alluvial sediments would be expected to be approximately the same as the slope of the land surface

The first part of the paper discusses the importance of the study and the objectives of the research. It also outlines the methodology used in the study and the results obtained. The second part of the paper discusses the implications of the study and the conclusions drawn from the research. The third part of the paper discusses the limitations of the study and the areas for future research.

The study was conducted in a laboratory setting and the results were compared with those obtained from field studies. The study was limited to a specific population and the results may not be generalizable to other populations. The study was limited to a specific time period and the results may not be applicable to other time periods.

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## Canyonlands National Park Needles Area -- Well No. 7

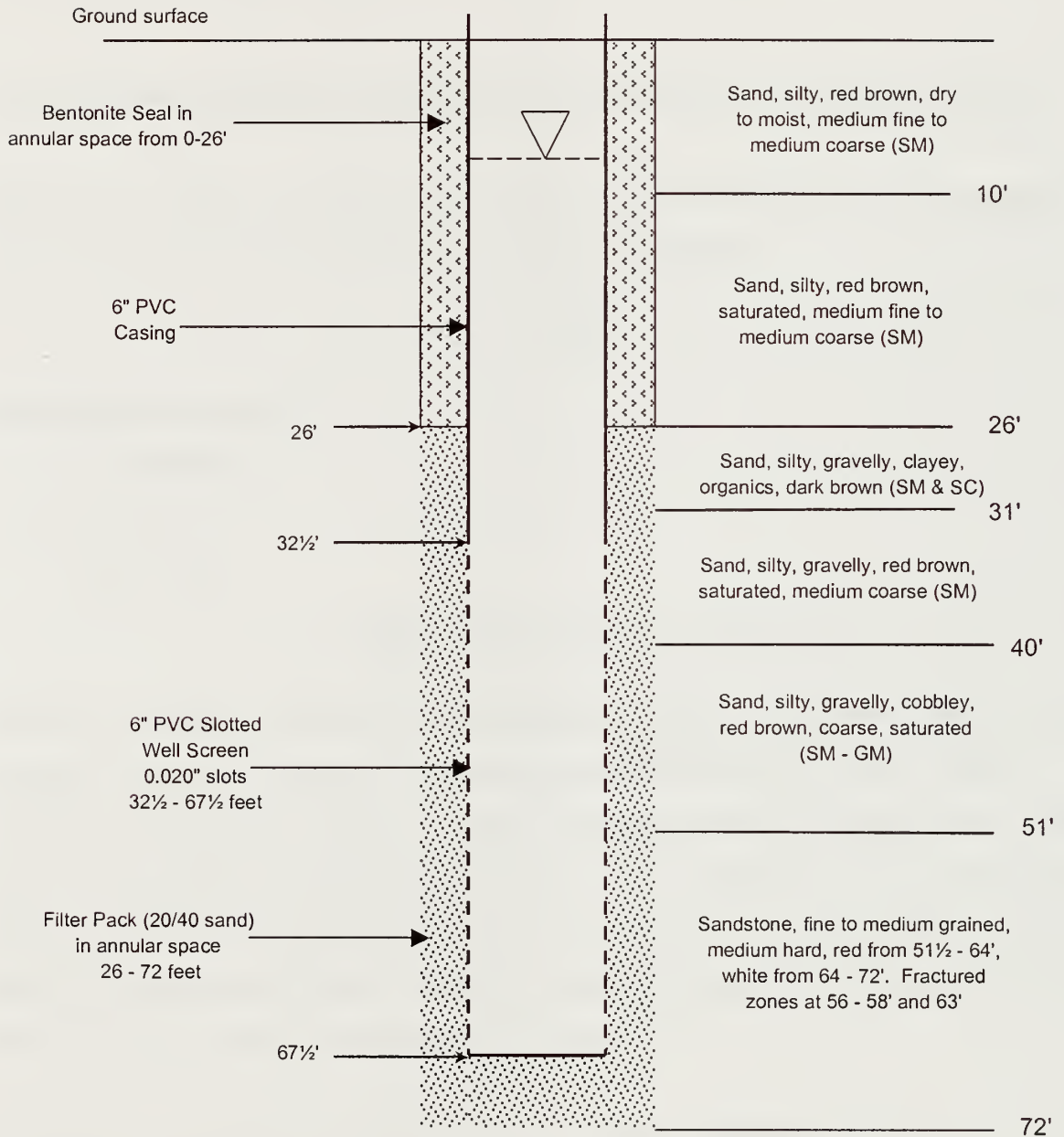


**Figure 5. Sketch of well completion, not to scale**



following the creeks. In the vicinity of Well No. 7, the slope of the land surface parallel to the creeks is approximately 0.008 ft/ft.

## 2.4 Hydrogeologic Methods, Procedures, and Calculations - R309-113-9 (5)(a)(vii)

Simple groundwater velocities were calculated as a first approximation of the extent of source protection zones for Well No. 7. Using the equation;

$$v = \frac{K dh}{n dl}$$

and substituting values of;

$$K = 200 \text{ ft/day}$$

$$n = 0.2$$

$$dh/dl = 0.01$$

$$v = \frac{K dh}{n dl} = \frac{200 \text{ ft/d}}{0.2} \times 0.01 = 10 \text{ feet/day}$$

This is a very high velocity for groundwater flow, but not unexpected since this analysis is based on data for a sand and gravel layer found in Well Nos. 7 and 2. We can compute a 3-year and 15-year travel zone for groundwater flowing toward these wells, even in the absence of groundwater pumping. Source protection zones for Well No. 7 would extend about 11,000 feet for the 3-year travel zone and about 55,000 feet (more than 10 miles) for the 15-year travel zone. Protection zones would extend even further after factoring in groundwater pumping from Well No. 7.

It is likely that the coarse sand and gravel deposits encountered in Well Nos. 7 and 2 are not continuous. These permeable deposits may extend downstream in the alluvium of Salt Creek. Well No. 5, constructed in that area, also produced a good quantity of water (44 gpm) before it filled with sand and was abandoned. Several other wells drilled in the Needles area of Canyonlands National Park did not produce much water because those wells did not intersect the more permeable sands and gravels. We do



not have a good idea of the extent of the permeable sands and gravels. Also, we do not have a good estimate of the hydraulic parameters of the finer-grained alluvium or the underlying sandstone.

Fortunately, the Needles area is very remote. The only potential sources of contamination are from National Park Service facilities. Potential contaminant sources at Needles Outpost would not affect the National Park Service well(s) because Needles Outpost is about a mile downgradient from the water supply wells. All of the Squaw Canyon drainage basin is within the boundary of the Park. The Salt Creek drainage basin is almost entirely within the park boundary. Only the uppermost part of the drainage basin on Salt Creek Mesa is outside the park boundary. That part of the Salt Creek drainage basin that is beyond the park boundary is a minimum of 11 miles upstream from the wells in the Needles area.

The optional two-mile radius includes all potential contaminant sources for Well No. 7. Therefore, the optional two-mile radius delineation will be used to delineate the wellhead protection area. The only potential contaminant sources in the Squaw Canyon Creek drainage basin are those under the direct control of the National Park Service. Those sources will be discussed in this plan. The only potential contaminant source in the Salt Creek drainage basin within two miles of Well No. 7 is the abandoned landfill, which will be discussed in this plan. There are no other contaminant sources in the Salt Creek drainage basin within the park boundary, a distance of 11 miles in the West Fork of Salt Creek and 14 miles in the East Fork of Salt Creek. The headwaters of the Salt Creek drainage basin are a high plateau (7000 feet) called Salt Creek Mesa. Primary land use in this area is summer grazing for cattle. It is unlikely that there are any potential contaminants present in significant quantities on the mesa.



## 2.5 Map Showing Boundaries of the DWSP Zones - R309-113-9 (5)(a)(viii)

Figure 6 is a map showing the area within two miles of the supply well.

## 2.6 Protected or Unprotected Aquifer Classification – R309-113-9 (3) & (6)

The aquifer supplying water to wells in the Needles area does not meet the criteria for classification as a protected aquifer, as described in the Utah DEQ guidelines for source water protection plans. In order for the aquifer to be classified as “protected” would require an overlying clay layer having a minimum thickness of 30 feet. There is no clay layer protecting the alluvial aquifer in the Needles area. The wells are completed in alluvium and the upper part of the Cedar Mesa Sandstone Member of the Cutler Formation. None of the wells in the Needles area is more than 100 feet deep.

## 3.0 THE INVENTORY OF POTENTIAL CONTAMINATION SOURCES - R309-113-10

### 3.1 List Potential Contamination Sources - R309-113-10 (1)

Potential contaminant sources within two miles of Well No. 7 include: sewer lines and leachfields, fuel tanks, and small quantities of paint, oil, fuel, solvents, etc. in the maintenance shop at the Park.

A privately owned and operated business, Canyonlands Needles Outpost, is located within two miles of Well No. 7. It is about 1¼ miles downgradient from Well No. 7 in the southwest corner of Section 16. The area was not inspected for potential contaminants. It is downgradient from the wells at Needles. Any contaminants that might be released at the Outpost would flow down Salt Creek toward the Colorado River. Groundwater flow in the area is also northeasterly, toward the Colorado River.





Figure 6. Area Within Two Miles of Water Supply Well



There are two septic leachfields associated with the employee housing area. Additionally, there are septic leachfields at the Visitor Center, the Maintenance Shop, and the Squaw Flat Campground.

At the generator building, there are various containers of oil and antifreeze. An above ground fuel tank contains diesel fuel for operating the generators.

At the Maintenance Shop, the Park stores cleaning supplies and paint for use in the Needles area. Outside there is a 4,000-gallon gasoline storage tank and an 18,000-gallon propane tank. In the fueling building are various containers of motor oil, gasoline mixes for 2-cycle engines, paint, and sealer.

There is an abandoned landfill about ½ mile south of Well No. 7. The landfill was operated from about 1966 to 1988. Garbage from the campground and residential areas was disposed in trenches dug at the site. After the plastic bags of trash were placed in the pit, they were covered with dirt. Canyonlands Resort, the business venture that preceded Needles Outpost, also deposited garbage from their business operation at the landfill. Canyonlands Resort also operated a small airstrip and probably sent waste associated with airstrip operation to the landfill. After 1988, garbage was stored in containers and transported out of the Park by a private hauler.

A Level II site investigation of the landfill site was performed by Roybal Corporation (1998). The investigation detected toluene, ethylbenzene, and xylene, but the concentrations were substantially lower than Utah DEQ regulatory levels. These organic chemicals are generally indicative of gasoline spills. Metals concentrations were all below the Utah DEQ regulatory levels. Therefore, it does not appear that there is significant contaminant transport from the abandoned landfill.



### 3.2 Identify Hazards:

Potential contaminant sources, hazardous substances associated with each of the possible potential contaminant sources, and approximate quantities of each hazardous substance are listed in Table 3.

### 3.3 Prioritize the Inventory - R309-113-10 (1)

The abandoned landfill is the greatest potential threat to the drinking water supply for the Needles area. Although it is generally believed that most of the material placed in the landfill was common household garbage, unknown quantities of unknown material from the maintenance shop may have been placed in the landfill. Human sewage pumped from vault toilets may have been placed in the landfill. The landfill was unlined and would have a direct hydrologic connection with alluvial aquifers in adjacent creeks.

Fuel storage tanks (diesel, gasoline, and propane) are a secondary threat to the water supply. Fuel storage tanks are located upgradient, about one mile up Squaw Canyon Creek from Well No. 7. Contents of tanks are regularly monitored to detect leaks. Secondary containment is provided for all tanks.

Paint, thinner, solvents, fuel, oil, etc. are stored in small containers at the maintenance shop, fueling building, and generator building. These materials are generally stored in small quantities, in areas where leaks could be readily observed, and secondary containment is provided.

Abandoned wells may present a risk to the water supply. Well No. 5 is downgradient from Well No. 7 and presents no risk. Other wells that are upgradient from Well No. 7 are capped, but have not been sealed. Well Nos. 3A, 3B, 4, and 5 should be plugged and abandoned. PVC monitor wells near Well 3A and 3B and Well No. 2 should also



Table 3. Hazardous substances associated with each potential contaminant source

| Potential Source                  | Hazardous Substances                                                                    | Approximate Quantity                                                                                                                                                                                                                                                    |
|-----------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Abandoned landfill                | Believed to be primarily household garbage with some contribution from maintenance shop | Unknown                                                                                                                                                                                                                                                                 |
| Fuel tanks                        | Gasoline<br>Diesel fuel<br>LPG (Propane)                                                | One 4,000-gallon tank, above ground.<br>One 6000-gallon tank, above ground<br>All tanks are above ground.<br>18,000 gallons at maintenance compound<br>2,000 gallons at visitor center<br>500 gallons at water treatment building<br>Two 250 gallon tanks at campground |
| Fueling building                  | Motor oil, fuel mixes, paint, sealer                                                    | Various quantities in containers generally less than 1-gallon size. Approximately 25-30 containers                                                                                                                                                                      |
| Maintenance shop                  | Solvents, degreasers, cleaning solutions<br>Paint and floor sealer<br>Paint locker      | Various quantities in 1-5 gallon containers<br>10 5-gallon buckets<br>Various quantities, generally 1-gallon or less, stored in a paint locker                                                                                                                          |
| Generator building                | Lubricating oil, antifreeze                                                             | Several 1-5 gallon containers and 55-gallon barrels                                                                                                                                                                                                                     |
| Sewer lines<br>Septic leachfields | Sewage                                                                                  | Sewage from the visitor center, administrative offices, maintenance area, housing area, and campground is collected and disposed in septic leachfields at various locations                                                                                             |
| Abandoned wells                   | Pathway for contaminants to enter aquifer                                               | 5 wells                                                                                                                                                                                                                                                                 |



be plugged and abandoned. Test Well No. 6 and associated piezometers and monitor wells at Cave Springs should be plugged and abandoned. Abandoned wells provide a pathway for contaminants to enter the aquifer.

Septic leachfields present a negligible risk to the water supply. The largest volume leachfields (Visitor Center, employee housing area, campground) are located downgradient, or in areas where the effluent would flow away from Well No. 7. The leachfield serving the Maintenance Shop is about a mile upgradient from Well No. 7.

### 3.4 Potential Contamination Source Location - R309-113-10 (1)

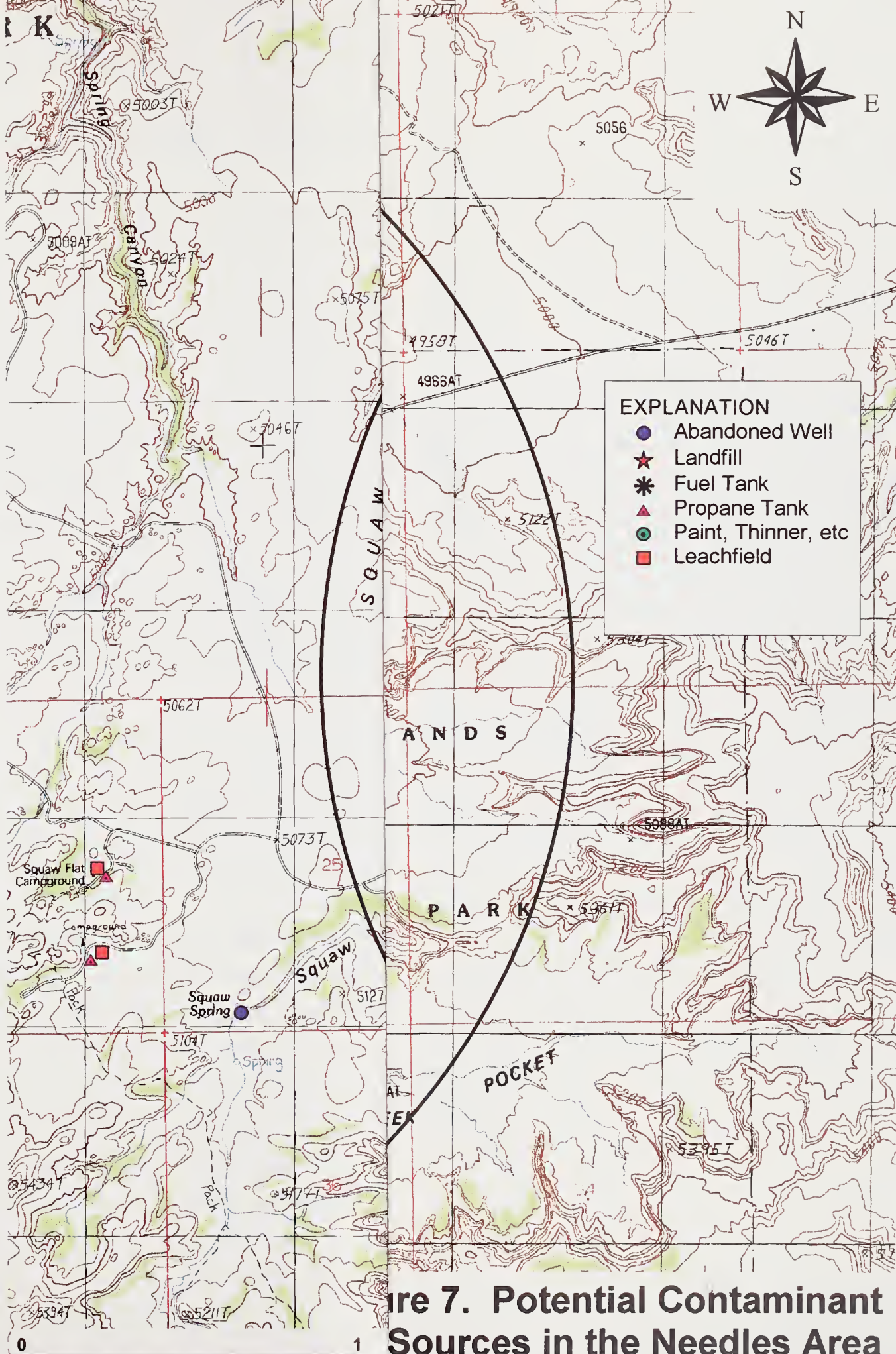
None of the potential contaminant sources is within the Zone 1 protection zone, 100-foot radius from the well. The nearest potential contaminant source is the abandoned landfill located approximately ½ mile south of Well No. 7. All potential contaminant sources identified in Table 3, with the exception of the septic leachfield at Squaw Flat Campground, are within the two-mile radius from the well. There are no potential contaminant sources upgradient of Well No. 7 for a distance of at least 11 miles, other than those potential sources identified in the preceding sections of this plan.

All potential contaminant sources within two miles of Well No. 7 are under the direct control of the National Park Service.

### 3.5 Potential Contamination Sources Plotted on Map

Potential contamination sources are plotted on the map in Figure 7.





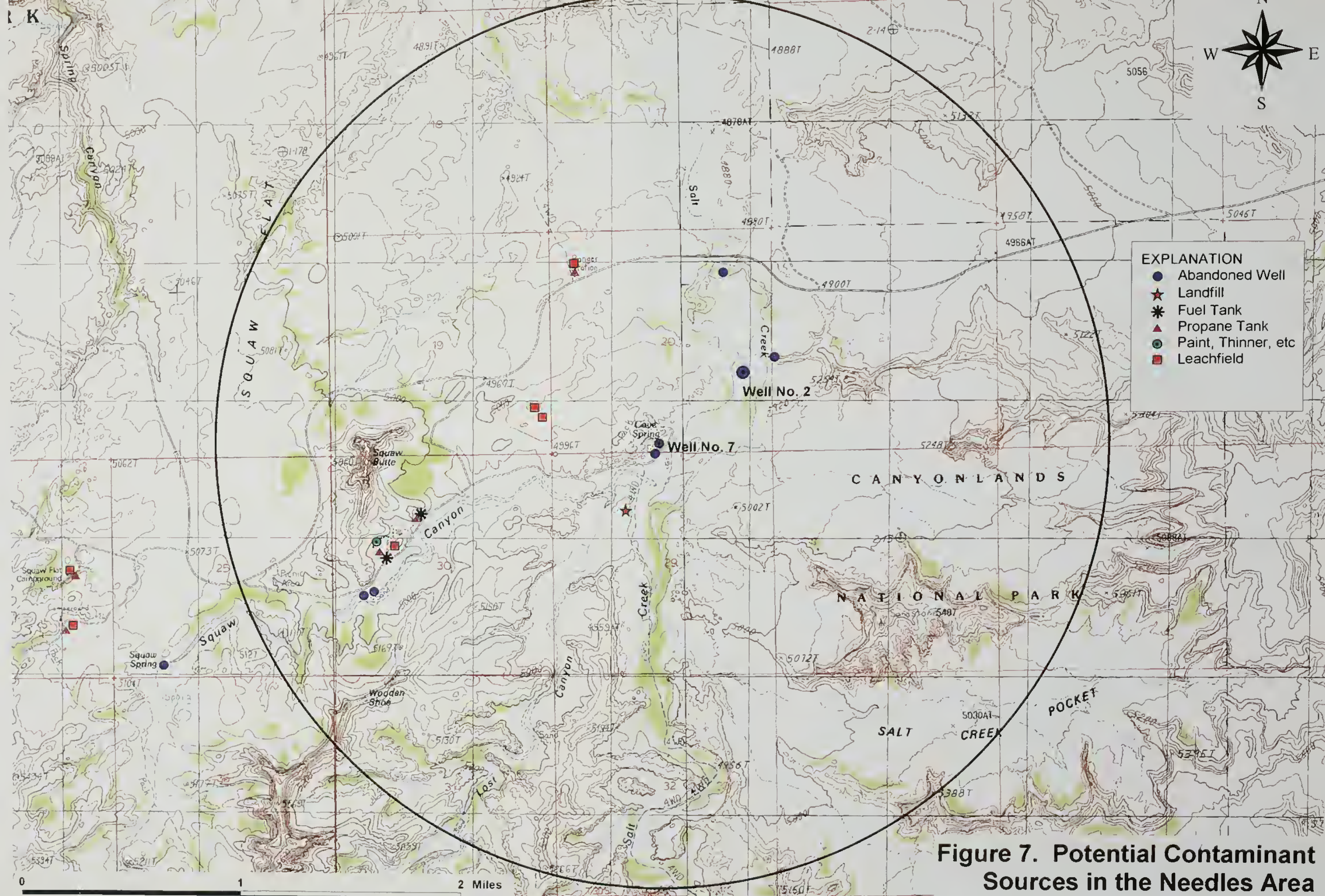


**Figure 7. Potential Contaminant Sources in the Needles Area**

#### 4.0 THE ASSESSMENT OF POTENTIAL CONTAMINATION SOURCE HAZARDS

All potential contamination sources are under the direct control of the National Park Service. Potential contaminants at the Park are primarily associated with the maintenance shop, including fuel storage tanks. Solvents, degreasers, paint, and similar materials (which might be classified as hazardous) are purchased and stored in small quantities, reducing the potential for release of large quantities of contaminants. The Park will continue to follow Best Management Practices to prevent or control release of potential contaminants. These practices include routine monitoring of fuel storage tanks, secondary containment vessels for fuel tanks and oil drums, and eliminating large inventories of potential contaminants

Septic leachfields and LPG tanks at the Campground, Visitor Center, and employee housing areas are downgradient from Well No. 7. Any release of potential contaminants at these areas would flow away from the water supply well.

Fuel storage tanks are equipped with computerized interstitial leak detection monitoring devices and are inspected on a regular basis. Tanks are above ground to allow visual observation of any leaks or spills. Secondary containment is provided for 110% of the tank capacities. Distribution lines are double-walled steel.

Secondary containment vessels are provided for oil and fuel storage containers. Paint, solvents, cleaning fluids, and similar materials are stored on shelves in buildings with concrete floors. There are no floor drains in areas where potential contaminants are stored.

Paint, solvents, cleaning fluids, etc. are purchased on an as needed basis. Only negligible quantities are stored on site.



Potential contaminant sources mentioned above are adequately controlled through a combination of hydrogeologic conditions and regulatory, operational, physical, and negligible quantity controls. No further land management strategies will be planned or implemented, unless conditions change.

Potential contaminants emanating from the abandoned landfill are not controlled. Site investigations and groundwater monitoring have provided no evidence of contamination at the abandoned landfill. The abandoned landfill is an uncontrolled potential contaminant source.

## 5.0 THE MANAGEMENT PROGRAM FOR EXISTING POTENTIAL CONTAMINATION SOURCES - R309-113-11

In general, existing regulatory, operational, physical, and negligible quantity controls are adequate to prevent the accidental spill or release of potential contaminants. Recommendations for minor changes to insure better protection of the groundwater resources in the Needles area are in the last paragraph of this section.

Several site investigations and groundwater monitoring at the abandoned landfill have failed to identify any groundwater contamination or contaminant transport away from the landfill. It may be that no hazardous materials were ever disposed at the landfill, or that quantities of hazardous materials were negligible. It may also be that natural attenuation and dilution have effectively eliminated hazardous materials from the site. Continued monitoring at Well No. 7 will be conducted, as required for public water supplies, to detect any contamination that might emanate from the abandoned landfill. Additional water quality monitoring is planned in 2001 for the monitor wells at the landfill. The four monitor wells at the landfill, Well No. 7, and Well No. 2 should be resampled for the complete suite of organic and inorganic parameters, and metals to verify that there is no apparent groundwater contamination from the abandoned landfill.



Water supply wells in the area that are no longer used should be plugged and abandoned according to Utah regulations. Abandoned wells present a small, but real, risk to the water supply. Well No. 5 is downgradient from Well No. 7 and presents no risk. Other wells that are upgradient from Well No. 7 are capped, but have not been sealed. Wells Nos. 3A, 3B, 4, and 5 should be plugged and abandoned. PVC monitor wells near Well Nos. 3A and 3B and Well No. 2 should also be plugged and abandoned. Well No. 6, and associated piezometers and monitor wells, at Cave Springs should be plugged and abandoned. The Park is scheduled to receive funding through the repair/rehab program in FY-2002 to plug and abandon unused wells.

## 6.0 THE MANAGEMENT PROGRAM FOR FUTURE POTENTIAL CONTAMINATION SOURCES - R309-113-12

### 6.1 Management Program - R309-113-13 (4)

If there are any proposed changes to current land use and land management practices within two miles of the well, the National Park Service will review those proposed changes to determine whether the proposed change might have a deleterious impact on the water supply for the Park. No such changes are anticipated, as the area is remote and rural. The only land within two miles of Well No. 7 that is not under the direct control of the National Park Service is in Section 16, the location of privately owned Canyonlands Needles Outpost. Facilities at the Outpost are downgradient from Well No. 7 and have no potential to adversely impact groundwater resources at Well No. 7.

Most of the area upgradient of Well No. 7 is under the direct control of the National Park Service. All of the Squaw Canyon drainage basin is within the boundary of the Park. The Salt Creek drainage basin is almost entirely within the park boundary. Only the



uppermost part of the drainage basin on Salt Creek Mesa is outside the park boundary. That part of the Salt Creek drainage basin that is beyond the Park boundary is a minimum of 11 miles upstream from the wells in the Needles area (Figure 8).

#### 7.0 THE IMPLEMENTATION SCHEDULE - R309-113-7 (1)(e)

No new land management strategies will be implemented under this plan. Current management practices are adequate to protect the groundwater resources at Well No. 7, which supplies all National Park Service facilities in the Needles area.

#### 8.0 THE RESOURCE EVALUATION - R309-113-7 (1)(f)

The Park will continue to monitor water quality at monitoring wells at the abandoned landfill and at Well No. 7, as necessary, to comply with regulations of Utah DEQ and to insure that the water supply is safe. Additional funding will be programmed in FY 2002 to plug and abandon unused wells in the area.

Land use and ownership in this remote area makes it likely that no potential contaminant sources would ever be located within the source area for this well.

#### 9.0 THE RECORDKEEPING SECTION - R309-113-7 (1)(g)

This plan was developed by National Park Service staff. The plan will be reviewed and updated, as necessary, in 5 years, January 2006.



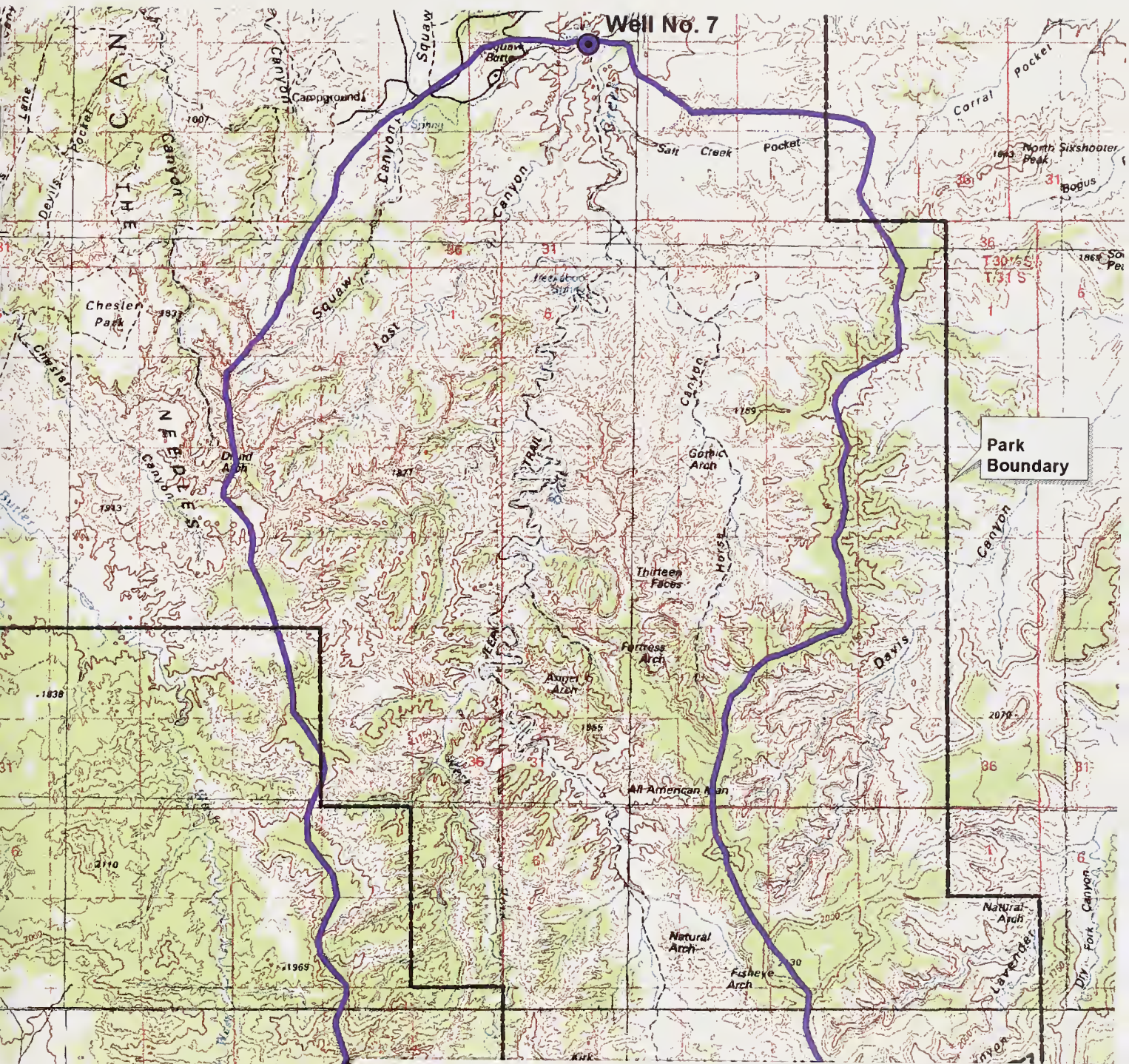


Figure 8. Dra.

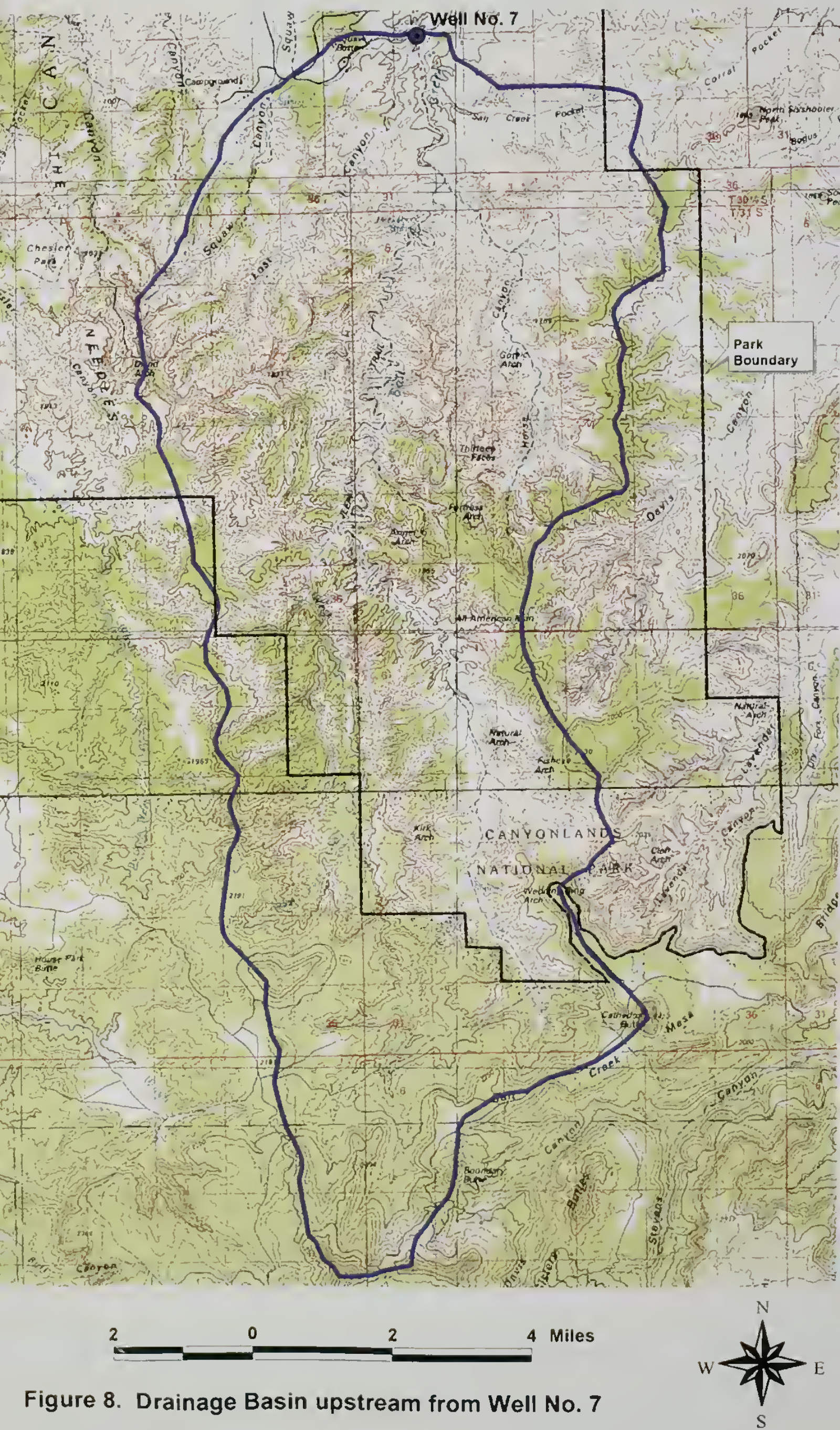


Figure 8. Drainage Basin upstream from Well No. 7

## 10.0 THE CONTINGENCY PLAN - R309-113-14

Well No. 2 is currently designated as the backup supply for National Park Service facilities in the Needles area. Additional water quality testing would be required for approval to connect Well No. 2 to the National Park Service distribution system. Currently there is no connection. A permanent connection from Well No. 2 would be problematic, as it would require the pipeline to cross the drainage of Squaw Canyon Creek. Floodflows could scour the channel, causing breaks in the pipeline to Well No. 2.

Although unlikely, the alluvial aquifer supplying Well No. 7 could become contaminated from spills or leaks of materials at the maintenance shop and fuel storage areas. The abandoned landfill might still prove to be a source of uncontrolled groundwater contamination. Should either of these occur, the Park could probably identify an alternative location for a new well further up Salt Creek, upgradient from all potential contaminant sources.



## References

Chamberlain Architects, 1988, Comprehensive Plan Canyonlands National Park Needles District,

Ecosystem Research Institute, 1984a, Water Resources Assessment Canyonlands National Park Needles District and Adjacent BLM Lands, Volume I, 124 pp.

Ecosystem Research Institute, 1984b, Water Resources Description and Data Base Canyonlands National Park Needles District and Adjacent BLM Lands, Volume III

Heath, Ralph C., 1983, Basic Ground-Water Hydrology, USGS Water-Supply Paper 2220, 84 pp.

Huntoon, P.W., 1977, The Hydrogeologic Feasibility of Developing Ground-Water Supplies in the Northern Part of Canyonlands National Park and Natural Bridges National Monument, Utah, Wyoming Water Resources Research Institute and Department of Geology, University of Wyoming, Laramie, 24 pp.

Richter, Henry R., Jr., 1980, Ground Water Resources in the Part of Canyonlands National Park East of the Colorado River and Contiguous Bureau of Land Management Lands, Utah, M.S. Thesis, University of Wyoming Geology Department, 80 pp.

Roybal Corporation, 1998, National Park Service Needles Landfill Site Canyonlands National Park Level II Site Investigation, 13 pp.

Sumison, C.T. and Bolke, E.L., 1972, Water Resources of Part of Canyonlands National Park, Southeastern Utah, USGS Open-File Report, 1972, 75 pp.

Utah Division of Drinking Water website, <http://www.deq.state.ut.us/eqdw/Index.html>



## Appendices



NEEDLES DISTRICT WATER WELLS

WELL NO. 1: Salt Creek - Abandoned

LOCATION: 38°35' W, 3807 ft. from N¼ Corner, Sec. 21, T30S,  
R20E, SLB&M, San Juan County

DATE DRILLED: March 14, 1965

DEPTH: 253 ft.

STATIC WATER LEVEL: N/A

WELL LOG: Clay/sand ..... 0 - 16 ft.  
          Sandstone ..... 16 - 200 ft.  
          Lime (stone) ..... 200 - 230 ft.  
          Salt water (seep) ..... 207 ft.  
          Sandstone ..... 230 - 253 ft.

The well was abandoned; plugged at 25 ft. and filled to the surface.

###



NEEDLES DISTRICT WATER WELLS

WELL NO. 2: Salt Creek Well

LOCATION: S 10<sup>0</sup>5' W, 3433 ft. from NE corner, Sec. 20, T30S,  
R20E, SLB&M, San Juan County

DATE DRILLED: April 10, 1965

DEPTH: 65 ft.

STATIC WATER LEVEL: 21 ft.

WELL LOG: Sand ..... 0 - 5 ft.  
          Sand/silt ..... 5 - 15 ft.  
          Sand ..... 15 - 30 ft.  
          Sand/clay ..... 30 - 32 ft.  
          Water ..... 32 ft.  
          Sand (with water ..... 32 - 50 ft.  
          Sand/gravel (with water) ..... 50 - 55 ft.  
          Sandstone ..... 55 - 65 ft.

PUMP TEST: 33 gpm with 10 ft. drawdown after 48 hrs.

WATER TEMPERATURE: 58<sup>0</sup> when drilled.

CASING: 55 ft. of 8 in. casing;

67 ft. of 6 in. casing perforated between 24 ft. and 65 ft.

CONSTRUCTION: Surface sealed to 10 ft. with cement.

PUMPING WATER LEVEL: 24 ft.

\*\*\*



NEEDLES DISTRICT WATER WELLS

WELL NO. 3A: Headquarters Well

LOCATION: N 25°29' E, 2019 ft. from SW corner, Sec. 30,  
T30S, R20E, SLB&M, San Juan County

DATE DRILLED: April 27, 1965

DEPTH: 52 ft.

STATIC WATER LEVEL: 18 ft.

WELL LOG: Sand ..... 0 - 15 ft.  
          Sand and gravel ..... 15 - 34 ft.  
          Water ..... 32 ft.  
          Sandstone ..... 34 - 38 ft.  
          Sand ..... 38 - 42 ft.  
          Sandstone ..... 42 - 52 ft.

PUMP TEST: 4 gpm with 20 ft. drawdown after 48 hrs.

WATER TEMPERATURE: 60°F when drilled.

CASING: 33 ft. of 8 in. casing;

52 ft. of 6 in. casing perforated between 32 ft. and 50 ft.

CONSTRUCTION: Gravel packed from 42 ft. to 30 ft.,  
                  surface sealed to 10 ft. with cement.

PUMPING WATER LEVEL: 38 ft.

§ § §



NEEDLES DISTRICT WATER WELLS

WELL NO. 3B: Headquarters Well

LOCATION: N 25°29' E, 2019 ft. from SW corner, Sec. 30,  
T30S, R20E, SLB&M, San Juan County (located  
55 ft. from Well No. 3A)

DATE DRILLED: May 20, 1971

DEPTH: 46 ft.

STATIC WATER LEVEL: 19 ft.

WELL LOG: Sand ..... 0 - 26 ft.  
          Sand and gravel ..... 26 - 34 ft.  
          Water ..... ? ft.  
          Sandstone ..... 34 - 46 ft.

PUMP TEST: Unknown

WATER TEMPERATURE: Unknown

CASING: 37 ft. of 10 in. casing;

43 ft. of 6 in. casing perforated between 19 ft. and 37 ft.

CONSTRUCTION: Floor plate at 39 ft.;

Well screen 26 ft. to 32 ft.;

Surface seal unknown

PUMPING WATER LEVEL: In well screen area.

0 0 0



NEEDLES DISTRICT WATER WELL

WELL NO. 4: Squaw Springs Well

LOCATION: N  $78^{\circ}12'$  W, 1347 ft. from S $\frac{1}{4}$  corner, Sec. 25,  
T30S, R19E, SLB&M, San Juan County

DATE DRILLED: May 20, 1965

DEPTH: 77 ft.

STATIC WATER LEVEL: - 26 ft.

WELL LOG: Sand ..... 0 - 8 ft.  
          Sandstone ..... 8 - 77 ft.  
          Water ..... 51 $\frac{1}{2}$  ft.

PUMP TEST: 13 gpm with 28 ft. drawdown after 24 hrs.

WATER TEMPERATURE: 59 $^{\circ}$ F when drilled.

CASING: 77 ft. of 6 in. casing perforated from 44 ft. to 77 ft.

CONSTRUCTION: Surface sealed to 10 ft. with cement inside 8 in.  
                  casing.

PUMPING WATER LEVEL: N/A

# # #



Application No. 05-5541 (A-157)  
 Claim No. \_\_\_\_\_  
 Coordinate No. \_\_\_\_\_

Well Driller's Statement:

This well was drilled under my supervision, and this report is true to the best of my knowledge and belief.

Name Ray Scilling Co  
(Firm, firm, or corporation)

Address East Route 101, N. H. (Type or print)  
84535

(Signed) Allen T. Scilling (Well Driller)

License No. 351 Date \_\_\_\_\_





## A H D I V I S I O N O F D R I N K I N G W A T E R

## PUBLIC WATER SUPPLY INFORMATION SYSTEM

01/11/01

WATER SYSTEM NUMBER: 19042

|                               |                              |                                    |
|-------------------------------|------------------------------|------------------------------------|
| NAME: CANYONLANDS NEEDLES HQ  | RATING: APPROVED             | POPULATION: 30                     |
| OWNER: NATIONAL PARK SERVICE  | RATING ASSIGNED: 04/09/96    | RESIDENTIAL CONN.: 19              |
| ADDRESS: 2282 SW RESOURCE BLV | INVENTORY REVIEWED: 07/31/00 | OTHER CONNECTIONS: 2               |
| MOAB UT 84532                 | INVENTORIED BY: HANSEN       | TOTAL NO. CONNECTIONS: 21          |
| AREA: SAN JUAN                | LAST SURVEYED: 06/02/00      | TYPE OTHER CONN: NO CLASSIFICATION |
| COUNTY: SAN JUAN              | SURVEYED BY: MEYER           | OUTSIDE USE PERMITTED: NO          |
| TYPE: NATIONAL PARKS & REC.   | LAST PLAN APPR.: 03/26/91    | CALC PEAK DEMAND (GPD): 16,800     |
| MANGR.: BILL KEY              | SYSTEM ENGINEER: NPS         | GPD/1440 = DEMAND (GPM): 1,200     |
| PHONE: 259-3911               | BEGIN OPERATION: 01/01       | PEAK HOURLY DEMAND: 9,600          |
| OPER.: JOHN JOHNSON           | END OPERATION: 12/31         |                                    |
| PHONE: 259-8336               |                              |                                    |

|                         |                       |                        |                              |
|-------------------------|-----------------------|------------------------|------------------------------|
| -BACTERIOLOGIC QUALITY- | - - - -STORAGE- - - - | - - - TREATMENT- - - - | - - - - DISTRIBUTION - - - - |
| SAMPLES REQ/QUAR.: 1    | NUMBER OF UNITS: 3    | TYPE: IRON REMOVAL     | PUMP/GRAVITY: PUMPED         |
| QUAR. INSUF. SAMPLS: 0  | MATERIAL: FIBERGLASS  | PLANT: MN-GREENSAND    | FIRE HYDRANTS: YES           |
| QUAR. UNSAT RESULT: 0   | CAPACITY: 60,000      | CAPACITY (MGD): 580.36 | PRESSURE ADEQ.: YES          |
| RECORD SATIS.: YES      | ADEQUATE: YES         | INSTALLED: 1991        | PCT METERED: 100             |
| 12 MOS END.: 12/31/99   |                       |                        | MASTER METER:                |

| SOURCE |           |              | - - WELL - - |     | YIELD | SOURCE |                   | SOURCE LOCATION |             |
|--------|-----------|--------------|--------------|-----|-------|--------|-------------------|-----------------|-------------|
| * NO.  | TYPE      | SOURCE NAME  | TYPE         | DIA | (GPM) | CONCUR | TYPE OF TREATMENT | -LATITUDE -     | -LONGITUDE- |
|        |           |              |              |     |       |        |                   | DEG MIN SEC     | DEG MIN SEC |
| *N01   | WELL      | WELL 3A(OUT) | SHALLOW      |     |       |        | NONE              |                 | .           |
| *N02   | WELL      | WELL 3B(OUT) | SHALLOW      |     |       |        | NONE              |                 | .           |
| *N03   | WELL      | WELL #2      |              | 6   |       |        | NONE              | 38 09 23.0      | 109 45 05.2 |
| 04     | WELL (GW) | CAVE SPRINGS | SHALLOW      | 6   | 40    |        | IRON REMOVAL      | 38 09 23.0      | 109 45 05.2 |

## S T A F F C O M M E N T S :

PRIOR WTP BUILT 1964 & TREATED DATE: 03/28/91 INITIALS: BHH  
0.005 MGD.NEW GREENSAND (4-91)  
WTP CAN RUN @ 25 GPM MAX. WILL  
ABAND 2 OLD TANKS OF 25800 GAL



# Summary of Chemical Quality (Form 1)

19-Jan-01



## CANYONLANDS NEEDLES HO

| System Number | Date Collected | Source # | Source Name  | In Use ? | Lab Number | Total          |                 | Beryllium (µg/L) | Cadmium (µg/L) | Cyanide (µg/L) | Turbidity (NTU) | Dissolved Iron (µg/L) | Total Iron (mg/L) | Total Manganese (µg/L) |
|---------------|----------------|----------|--------------|----------|------------|----------------|-----------------|------------------|----------------|----------------|-----------------|-----------------------|-------------------|------------------------|
|               |                |          |              |          |            | Arsenic (µg/L) | Antimony (µg/L) |                  |                |                |                 |                       |                   |                        |
| 19042         | 07/16/83       | 01       | WELL 3A(OUT) |          | C832517    | < 0.5          |                 | < 1              |                |                | 1.6             |                       | 0.03              | 55                     |
| 19042         | 09/11/83       | 02       | WELL 3B(OUT) |          | C833462    |                |                 |                  |                |                | 20.5            |                       |                   |                        |
| 19042         | 07/16/83       | 02       | WELL 3B(OUT) |          | C832518    | 1              |                 | 1                |                |                | 7.7             |                       | 0.03              | 20                     |
| 19042         | 08/29/89       | 03       | WELL #2      |          | C895936    | < 5            |                 | < 1              |                |                | 12              |                       | 0.28              | 120                    |
| 19042         | 05/03/88       | 03       | WELL #2      |          | C882345    |                |                 |                  |                |                |                 |                       |                   |                        |
| 19042         | 08/02/84       | 03       | WELL #2      |          | C842985    |                |                 |                  |                |                | 15              |                       |                   |                        |
| 19042         | 07/24/84       | 03       | WELL #2      |          | C842986    |                |                 |                  |                |                | 10              |                       |                   |                        |
| 19042         | 06/01/84       | 03       | WELL #2      |          | C841873    |                |                 |                  |                |                | 15              |                       |                   |                        |
| 19042         | 05/28/84       | 03       | WELL #2      |          | C841769    |                |                 |                  |                |                | 25              |                       |                   |                        |
| 19042         | 05/16/84       | 03       | WELL #2      |          | C841656    |                |                 |                  |                |                | 8               |                       |                   |                        |
| 19042         | 03/20/84       | 03       | WELL #2      |          | C840932    | 9.5            |                 | 1                |                |                | 65.3            |                       | 2.33              | 80                     |
| 19042         | 03/19/81       | 03       | WELL #2      |          | C811132    | 4              |                 | < 1              |                |                | 0.8             |                       | 0.37              | 45                     |
| 19042         | 09/20/99       | 04       | CAVE SPRINGS | I        | C909115    |                |                 |                  |                |                |                 |                       |                   |                        |
| 19042         | 04/12/99       | 04       | CAVE SPRINGS | I        | C992670    |                |                 |                  |                |                |                 |                       |                   |                        |
| 19042         | 07/07/97       | 04       | CAVE SPRINGS | I        | C976353    |                |                 |                  |                |                |                 |                       |                   |                        |
| 19042         | 09/24/96       | 04       | CAVE SPRINGS | I        | C968758    |                |                 |                  |                |                |                 |                       |                   |                        |
| 19042         | 08/28/95       | 04       | CAVE SPRINGS | I        | C959266    | < 5            | < 3             | 1                | < 1            | 50             | 1.5             |                       | 0.54              | 40                     |
| 19042         | 06/20/94       | 04       | CAVE SPRINGS | I        | C946102    |                |                 |                  |                |                |                 |                       |                   |                        |
| 19042         | 10/18/93       | 04       | CAVE SPRINGS | I        | C930572    |                |                 |                  |                |                |                 |                       |                   |                        |
| 19042         | 04/27/93       | 04       | CAVE SPRINGS | I        | C933070    |                |                 |                  |                |                |                 |                       |                   |                        |
| 19042         | 11/13/90       | 04       | CAVE SPRINGS | I        | x362691    | < 5            |                 | < 1              |                |                |                 |                       | 0.38              | 0.1                    |

Primary or secondary drinking water limit :

50 6 4 5 200 5 300 0.3 50



Summary of Chemical Quality (Form 2)

CANYONLANDS NEEDLES HO

| System Number | Date Collected | Source # | Source Name  | In Use? | Lab Number | Nitrite as N (mg/L) | Nitrate as N (mg/L) | Total Mercury (µg/L) | Dissolved Selenium (µg/L) | Total Selenium (µg/L) | Sulfate (mg/L) | TDS (mg/L) | Thallium (µg/L) |
|---------------|----------------|----------|--------------|---------|------------|---------------------|---------------------|----------------------|---------------------------|-----------------------|----------------|------------|-----------------|
| 19042         | 07/16/83       | 01       | WELL 3A(OUT) | N       | C832517    | <0.02               | 0.04                | < 0.1                | < 0.5                     | < 0.5                 | 101            | 564        |                 |
| 19042         | 09/11/83       | 02       | WELL 3B(OUT) | N       | C833462    |                     |                     |                      |                           |                       |                |            |                 |
| 19042         | 07/16/83       | 02       | WELL 3B(OUT) | N       | C832518    | <0.02               | 0.04                | < 0.1                | < 0.5                     | < 0.5                 | 106            | 575        |                 |
| 19042         | 08/29/89       | 03       | WELL #2      | N       | C895936    | <0.01               | < 0.01              | 0.2                  | < 1                       | < 1                   | 280            | 1180       |                 |
| 19042         | 05/03/88       | 03       | WELL #2      | N       | C882345    |                     | 0.01                |                      |                           |                       | 250            |            |                 |
| 19042         | 08/02/84       | 03       | WELL #2      | N       | C842985    |                     |                     |                      |                           |                       |                |            |                 |
| 19042         | 07/24/84       | 03       | WELL #2      | N       | C842986    |                     |                     |                      |                           |                       |                |            |                 |
| 19042         | 06/01/84       | 03       | WELL #2      | N       | C841873    |                     |                     |                      |                           |                       |                |            |                 |
| 19042         | 05/28/84       | 03       | WELL #2      | N       | C841769    |                     |                     |                      |                           |                       |                |            |                 |
| 19042         | 05/16/84       | 03       | WELL #2      | N       | C841656    |                     |                     |                      |                           |                       |                |            |                 |
| 19042         | 03/20/84       | 03       | WELL #2      | N       | C840932    | 0.04                | < 0.01              | < 0.1                | < 0.5                     | < 0.5                 | 222            | 914        |                 |
| 19042         | 03/19/81       | 03       | WELL #2      | N       | C811132    | <0.05               | < 0.05              | < 0.1                | < 1                       | < 1                   | 188            | 854        |                 |
| 19042         | 09/20/99       | 04       | CAVE SPRINGS | I       | C909115    | <0.1                | < 0.1               |                      |                           |                       |                |            |                 |
| 19042         | 04/12/99       | 04       | CAVE SPRINGS | I       | C992670    | <0.1                | < 0.1               |                      |                           |                       |                |            |                 |
| 19042         | 07/07/97       | 04       | CAVE SPRINGS | I       | C976353    | <0.02               | < 0.02              |                      |                           |                       |                |            |                 |
| 19042         | 09/24/96       | 04       | CAVE SPRINGS | I       | C968758    | <0.02               | < 0.02              |                      |                           |                       |                |            |                 |
| 19042         | 08/28/95       | 04       | CAVE SPRINGS | I       | C959266    | <0.02               | < 0.02              | < 0.2                | < 1                       | < 1                   | 54             | 326        | < 1             |
| 19042         | 06/20/94       | 04       | CAVE SPRINGS | I       | C946102    | <0.02               | < 0.02              |                      |                           |                       |                |            |                 |
| 19042         | 10/18/93       | 04       | CAVE SPRINGS | I       | C930572    |                     |                     |                      |                           |                       | 46             |            |                 |
| 19042         | 04/27/93       | 04       | CAVE SPRINGS | I       | C933070    | <0.02               | < 0.02              |                      |                           |                       |                |            |                 |
| 19042         | 11/13/90       | 04       | CAVE SPRINGS | I       | x362691    |                     |                     | < 0.2                | < 0.1                     | < 0.1                 |                |            |                 |

Primary or secondary drinking water limit :

1

10

2

50

50

500

1000

2



Water Quality Measurements  
For Corrosion Control  
CANYONLANDS NEEDLES HQ



01/19/01

| Source Name  | Source # | Lab Number | Date Collected | pH  | Alkalinity (mg/L) | Tot Fe (mg/L) | Tot Mn (µg/L) | Turbidity (NTU) | Ca (mg/L) | Total Hardness (mg/L) | TDS (mg/L) | Specific Conductance µmho/cm | Chloride (mg/L) | Sulfate (mg/L) | Phosphorous as P (mg/L) |
|--------------|----------|------------|----------------|-----|-------------------|---------------|---------------|-----------------|-----------|-----------------------|------------|------------------------------|-----------------|----------------|-------------------------|
| WELL 3A(OUT) | 01       | C832517    | 07/16/83       | 7.9 | 313               | <0.03         | 55            | 1.6             | 110       | 380                   | 564        | 940                          | 61              | 101            | <0.02                   |
| WELL 3B(OUT) | 02       | C833462    | 09/11/83       |     |                   |               |               | 20.5            |           |                       |            |                              |                 |                |                         |
| WELL 3B(OUT) | 02       | C832518    | 07/16/83       | 7.7 | 307               | <0.03         | 20            | 7.7             | 102       | 370                   | 575        | 930                          | 61              | 106            | <0.02                   |
| WELL #2      | 03       | C895936    | 08/29/89       | 8   | 485               | 0.28          | 120           | 12              | 43        | 642                   | 1180       | 1919                         | 210             | 280            | 0.02                    |
| WELL #2      | 03       | C882345    | 05/03/88       |     |                   |               |               |                 |           |                       |            |                              |                 | 250            |                         |
| WELL #2      | 03       | C842985    | 08/02/84       |     |                   |               |               | 15              |           |                       |            |                              |                 |                |                         |
| WELL #2      | 03       | C842986    | 07/24/84       |     |                   |               |               | 10              |           |                       |            |                              |                 |                |                         |
| WELL #2      | 03       | C841873    | 06/01/84       |     |                   |               |               | 15              |           |                       |            |                              |                 |                |                         |
| WELL #2      | 03       | C841769    | 05/28/84       |     |                   |               |               | 25              |           |                       |            |                              |                 |                |                         |
| WELL #2      | 03       | C841656    | 05/16/84       |     |                   |               |               | 8               |           |                       |            |                              |                 |                |                         |
| WELL #2      | 03       | C840932    | 03/20/84       | 7.9 | 420               | 2.33          | 80            | 65.3            | 34        | 520                   | 914        | 1650                         | 178             | 222            | 0.01                    |
| WELL #2      | 03       | C811132    | 03/19/81       | 8.1 | 407               | 0.37          | 45            | 0.8             | 92        | 490                   | 854        | 1410                         | 88              | 188            | 0.06                    |
| CAVE SPRINGS | 04       | C909115    | 09/20/99       |     |                   |               |               |                 |           |                       |            |                              |                 |                |                         |
| CAVE SPRINGS | 04       | C992670    | 04/12/99       |     |                   |               |               |                 |           |                       |            |                              |                 |                |                         |
| CAVE SPRINGS | 04       | C976353    | 07/07/97       |     |                   |               |               |                 |           |                       |            |                              |                 |                |                         |
| CAVE SPRINGS | 04       | C968758    | 09/24/96       |     |                   |               |               |                 |           |                       |            |                              |                 |                |                         |
| CAVE SPRINGS | 04       | C959266    | 08/28/95       | 198 | 0.54              |               | 40            | 1.5             | 55        | 240                   | 326        | 565                          | 33              | 54             | 0.02                    |
| CAVE SPRINGS | 04       | C946102    | 06/20/94       |     |                   |               |               |                 |           |                       |            |                              |                 |                |                         |
| CAVE SPRINGS | 04       | C930572    | 10/18/93       |     |                   |               |               |                 |           |                       |            |                              |                 | 46             |                         |
| CAVE SPRINGS | 04       | C933070    | 04/27/93       |     |                   |               |               |                 |           |                       |            |                              |                 |                |                         |
| CAVE SPRINGS | 04       | x362691    | 11/13/90       |     | 0.38              |               | 0.1           |                 | 60        |                       |            |                              |                 |                |                         |

Recommended Limit : 0.3 50 5.0 400 500 250 250





