

Figure 1.--Index map showing location of study area.

INTRODUCTION

This report contains water-quality data collected by the U.S. Geological Survey in the Eagle River valley (see index map, fig. 1) during 1976. The investigation was done in cooperation with the Colorado Department of Natural Resources, Division of Water Resources, Office of the State Engineer.

The purpose of the investigation was to determine the chemical characteristics of shallow ground waters and surface waters in the valley. Parts of the valley have undergone rapid population growth in recent years in response to an increase of winter sports activities. This rapid growth has resulted in an increased demand for information relating to the chemical characteristics of the ground and surface waters. A knowledge of the quality of ground and surface waters in the valley will allow a more efficient development of the resource.

The investigation included identification of aquifers and determination of the chemical characteristics of the water within the aquifers. This was accomplished by reviewing published geologic maps and reports, and collecting and analyzing water samples from the wells and springs throughout the Colorado Department of Natural Resources, Division of Water Resources, Office of the State Engineer.

Forty-nine ground-water samples from wells and springs were collected and analyzed by the U.S. Geological Survey during the study. Eight surface-water samples were collected from the Eagle River and its tributaries. Seven of the surface-water samples were collected by the New Jersey Zinc Co., and analyzed by Grand Junction Laboratories, a private laboratory. The analyses were given to the U.S. Geological Survey for use in this investigation. One surface-water sample was collected and analyzed by the U.S. Geological Survey. All the water samples were analyzed for major cations and anions, selenium, and arsenic. The seven surface-water samples collected by the New Jersey Zinc Co. also were analyzed for trace elements. Ground-water and surface-water-quality data are presented in tables 1 and 2. The analyses in the two tables are keyed by numbers to site locations on the map (fig. 2).

The potential of ground and surface waters in the Eagle River valley can be determined by comparing the chemical data in tables 1 and 2 with the recommended drinking-water-quality standards of the U.S. Public Health Service (1962) presented at the top of the tables. Most of the analyses indicate that only a few chemical constituents (dissolved solids, iron, manganese, and sulfate) occur in excess of these standards.

Although the concentrations of these constituents exceed the recommended water-quality standards, they do not necessarily indicate a health hazard. For example, high dissolved-solids concentrations may impart a noticeable taste to the water supply; high iron and manganese concentrations may cause discoloring of utensils and fixtures; and high-sulfate concentrations may have a laxative effect. The occurrence of selenium in excess of the recommended limits in two samples could be a health hazard. Individuals with water supplies that contain selenium above the recommended drinking-water-quality standard need to investigate an alternative source of drinking water. Ground water from the Eagle Valley Evaporite and the Pierre Shale is the most highly mineralized water in the study area.

METRIC CONVERSION FACTOR

For the use of those readers who may prefer to use metric units rather than English units, the conversion factor for the term used in this report is listed below:

To convert English unit Multiply by To obtain metric unit

miles (mi) 1.609 kilometers (km)

SYSTEM OF NUMBERING WELLS

The well numbers in the tables of ground-water analyses (table 1) indicate the well location as shown on the site-location map (fig. 2). The numbers are based on the U.S. Bureau of Land Management system of land subdivision, and show the location of the well by quadrant, township, range, section, and position within the section. A graphic illustration of this method of well location is shown on figure 3. The first letter "M" preceding the location number means that the site is located in the area governed by the Sixth principal meridian. The second letter indicates the quadrant in which the well is located. Four quadrants are formed by the intersection of the base line and the principal meridian--A indicates the northeast quadrant, B the northwest, C the southwest, and D the southeast. The first numeral indicates the township, the second the range, and the third the section in which the well is located. The letters following the section number locate the well within the section. The first letter denotes the quarter section, the second the quarter-quarter section, and the third the quarter-quarter-quarter section. The letters are assigned within the section in a counter-clockwise direction, beginning with (A) in the northeast quarter. Letters are assigned within each quarter section and within each quarter-quarter section in the same manner. Where two or more locations are within the smallest subdivision, consecutive numbers beginning with 1 are added in the order in which the wells were inventoried. For example, SC0040816AAD indicates a well or spring in the NE1/4SE1/4 sec. 16, T. 4 N., R. 84 W.; the "M" indicates the township is south of the baseline and that the range is west of the Sixth principal meridian.

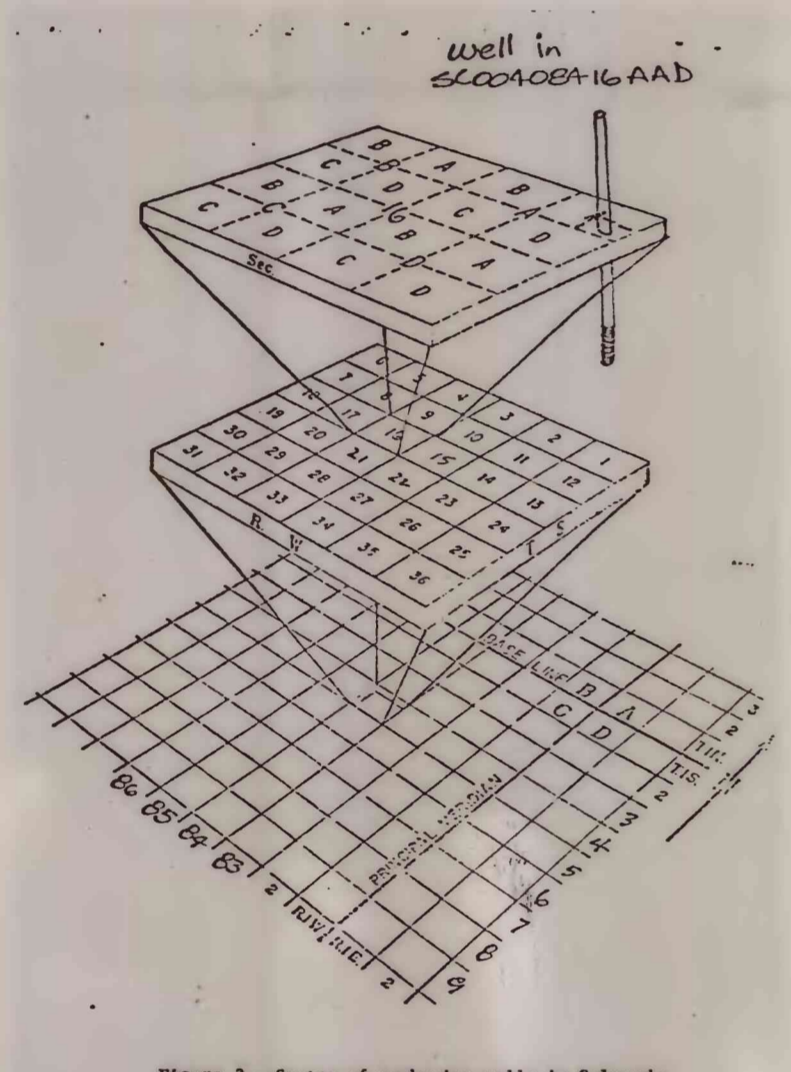


Figure 3.--System of numbering wells in Colorado.

SELECTED REFERENCES

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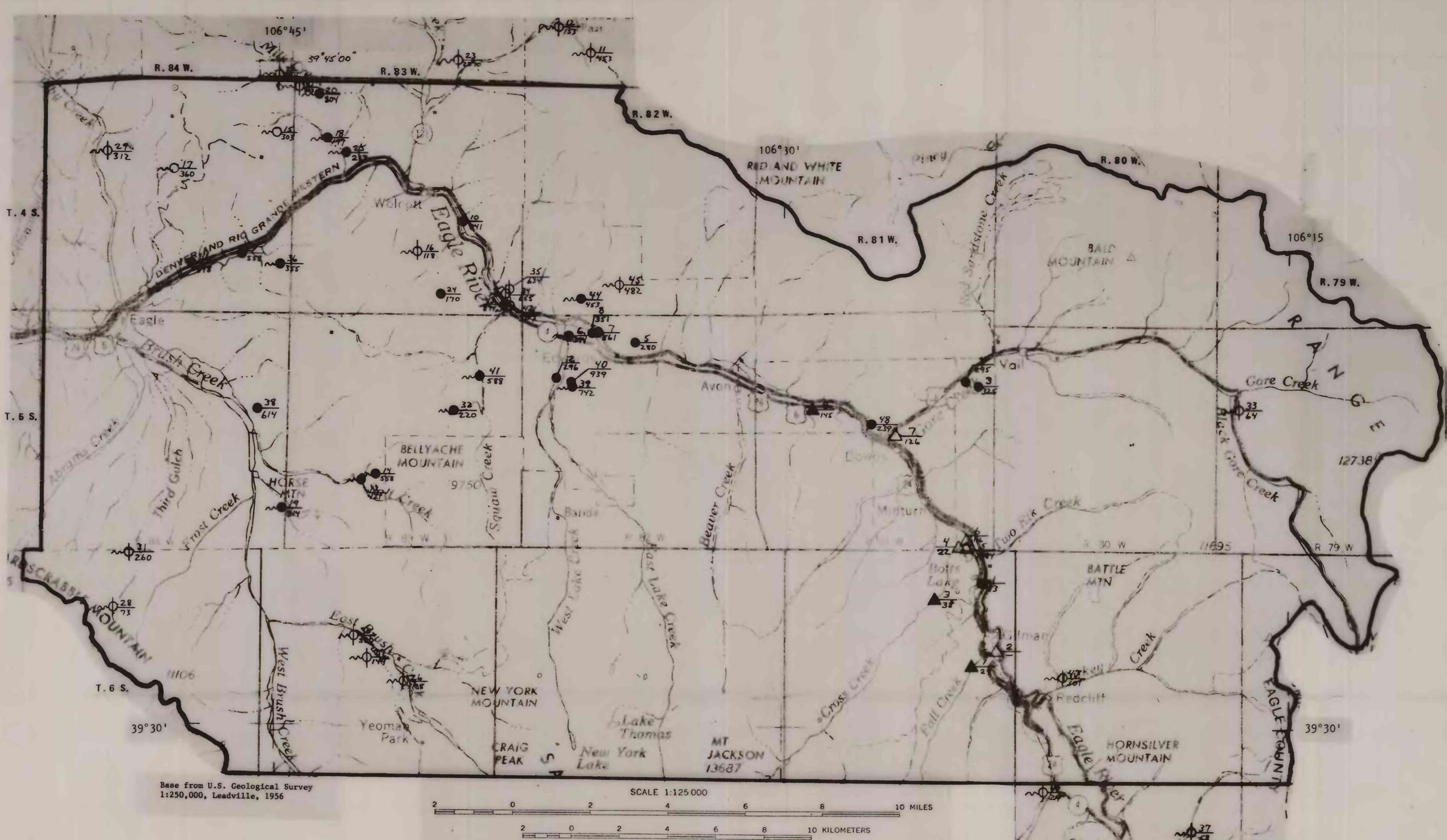


Figure 2.--Locations of water-sampling sites.

- EXPLANATION
- 3/325 WELL USED FOR DOMESTIC SUPPLY--Upper number refers to map number in table 1. Lower number is dissolved-solids concentrations, in milligrams per liter
 - 14/358 SPRING USED FOR DOMESTIC SUPPLY--Upper number refers to map number in table 1. Lower number is dissolved-solids concentrations, in milligrams per liter
 - 17/360 SPRING USED FOR STOCK SUPPLY--Upper number refers to map number in table 1. Lower number is dissolved-solids concentrations, in milligrams per liter
 - 23/2370 SPRING--Upper number refers to map number in table 1. Lower number is dissolved-solids concentrations, in milligrams per liter
 - ▲ 3/38 STREAM USED FOR DOMESTIC SUPPLY--Upper number refers to map number in table 2. Lower number is dissolved-solids concentrations, in milligrams per liter
 - △ 6/176 STREAM SAMPLING SITE--Upper number refers to map number in table 2. Lower number is dissolved-solids concentrations, in milligrams per liter
 - BOUNDARY OF STUDY AREA

Table 1.--Chemical analyses of water from wells and springs [Analyses by the U.S. Geological Survey; MG/L = milligrams per liter; UG/L = micrograms per liter; recommended concentrations of the U.S. Public Health Service (1962) for drinking water indicated below column headings]

MAP NO.	LATITUDE AND LONGITUDE	LOCATION	NAME	DATE OF SAMPLE (M-D)	GEOLOGIC UNIT	DIS-SOLVED SILICA (SI(02)) (MG/L)		DIS-SOLVED MAN-GAN-ES-E (MANG) (MG/L)		DIS-SOLVED CAL-CI-UM (CAL) (MG/L)		DIS-SOLVED MAG-NE-SI-UM (MAG) (MG/L)		DIS-SOLVED POTAS-SI-UM (POT) (MG/L)		BICAR-BON-ATE (BIC) (MG/L)		CAR-BON-ATE (CAR) (MG/L)		ALKA-LINITY (AL) (MG/L)		DIS-SOLVED SUL-FATE (SUL) (MG/L)		DIS-SOLVED CHLO-RIDE (CHL) (MG/L)		DIS-SOLVED FLU-O-RIDE (FLU) (MG/L)		NITR-ATE (NIT) (MG/L)		DIS-SOLVED PHOS-PH-ORUS (PHOS) (MG/L)		DIS-SOLVED URANI-UM (UR) (MG/L)		DIS-SOLVED ARSE-NIC (ARS) (MG/L)		DIS-SOLVED SELE-NI-UM (SEL) (MG/L)		DIS-SOLVED ZINC (ZNC) (MG/L)		DIS-SOLVED COP-PER (COP) (MG/L)		DIS-SOLVED LEAD (LEA) (MG/L)		DIS-SOLVED MER-CURY (MERC) (MG/L)		DIS-SOLVED SILVER (SILV) (MG/L)		DIS-SOLVED NICKEL (NICK) (MG/L)		DIS-SOLVED CHRO-MI-UM (CHRO) (MG/L)		DIS-SOLVED MANG-ANESE (MANG) (MG/L)		DIS-SOLVED MOLY-BDENUM (MOLY) (MG/L)		DIS-SOLVED CAD-MI-UM (CAD) (MG/L)		DIS-SOLVED BARI-UM (BAR) (MG/L)		DIS-SOLVED MLI-UM (MLI) (MG/L)		DIS-SOLVED NI-UM (NI) (MG/L)		DIS-SOLVED COB-ALT (COB) (MG/L)		DIS-SOLVED CUP-RUM (CUP) (MG/L)		DIS-SOLVED VAN-ADI-UM (VAN) (MG/L)		DIS-SOLVED CHRO-MI-UM (CHRO) (MG/L)		DIS-SOLVED MANG-ANESE (MANG) (MG/L)		DIS-SOLVED MOLY-BDENUM (MOLY) (MG/L)		DIS-SOLVED CAD-MI-UM (CAD) (MG/L)		DIS-SOLVED BARI-UM (BAR) (MG/L)		DIS-SOLVED MLI-UM (MLI) (MG/L)		DIS-SOLVED NI-UM (NI) (MG/L)		DIS-SOLVED COB-ALT (COB) (MG/L)		DIS-SOLVED CUP-RUM (CUP) (MG/L)		DIS-SOLVED VAN-ADI-UM (VAN) (MG/L)		DIS-SOLVED CHRO-MI-UM (CHRO) (MG/L)		DIS-SOLVED MANG-ANESE (MANG) (MG/L)		DIS-SOLVED MOLY-BDENUM (MOLY) (MG/L)		DIS-SOLVED CAD-MI-UM (CAD) (MG/L)		DIS-SOLVED BARI-UM (BAR) (MG/L)		DIS-SOLVED MLI-UM (MLI) (MG/L)		DIS-SOLVED NI-UM (NI) (MG/L)		DIS-SOLVED COB-ALT (COB) (MG/L)		DIS-SOLVED CUP-RUM (CUP) (MG/L)		DIS-SOLVED VAN-ADI-UM (VAN) (MG/L)		DIS-SOLVED CHRO-MI-UM (CHRO) (MG/L)		DIS-SOLVED MANG-ANESE (MANG) (MG/L)		DIS-SOLVED MOLY-BDENUM (MOLY) (MG/L)		DIS-SOLVED CAD-MI-UM (CAD) (MG/L)		DIS-SOLVED BARI-UM 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(MG/L)		DIS-SOLVED VAN-ADI-UM (VAN) (MG/L)		DIS-SOLVED CHRO-MI-UM (CHRO) (MG/L)		DIS-SOLVED MANG-ANESE (MANG) (MG/L)		DIS-SOLVED MOLY-BDENUM (MOLY) (MG/L)		DIS-SOLVED CAD-MI-UM (CAD) (MG/L)		DIS-SOLVED BARI-UM (BAR) (MG/L)		DIS-SOLVED MLI-UM (MLI) (MG/L)		DIS-SOLVED NI-UM (NI) (MG/L)		DIS-SOLVED COB-ALT (COB) (MG/L)		DIS-SOLVED CUP-RUM (CUP) (MG/L)		DIS-SOLVED VAN-ADI-UM (VAN) (MG/L)		DIS-SOLVED CHRO-MI-UM (CHRO) (MG/L)		DIS-SOLVED MANG-ANESE (MANG) (MG/L)		DIS-SOLVED MOLY-BDENUM (MOLY) (MG/L)		DIS-SOLVED CAD-MI-UM (CAD) (MG/L)		DIS-SOLVED BARI-UM (BAR) (MG/L)		DIS-SOLVED MLI-UM (MLI) (MG/L)		DIS-SOLVED NI-UM (NI) (MG/L)		DIS-SOLVED COB-ALT (COB) (MG/L)		DIS-SOLVED CUP-RUM (CUP) (MG/L)		DIS-SOLVED VAN-ADI-UM (VAN) (MG/L)		DIS-SOLVED CHRO-MI-UM (CHRO) (MG/L)		DIS-SOLVED MANG-ANESE (MANG) (MG/L)		DIS-SOLVED MOLY-BDENUM (MOLY) (MG/L)		DIS-SOLVED CAD-MI-UM (CAD) (MG/L)		DIS-SOLVED BARI-UM (BAR) (MG/L)		DIS-SOLVED MLI-UM (MLI) (MG/L)		DIS-SOLVED NI-UM (NI) (MG/L)		DIS-SOLVED COB-ALT (COB) (MG/L)		DIS-SOLVED CUP-RUM (CUP) (MG/L)		DIS-SOLVED VAN-ADI-UM (VAN) (MG/L)		DIS-SOLVED CHRO-MI-UM (CHRO) (MG/L)		DIS-SOLVED MANG-ANESE (MANG) (MG/L)		DIS-SOLVED MOLY-BDENUM (MOLY) (MG/L)		DIS-SOLVED CAD-MI-UM (CAD) (MG/L)		DIS-SOLVED BARI-UM (BAR) (MG/L)		DIS-SOLVED MLI-UM (MLI) (MG/L)		DIS-SOLVED NI-UM (NI) (MG/L)		DIS-SOLVED COB-ALT (COB) (MG/L)		DIS-SOLVED CUP-RUM (CUP) (MG/L)		DIS-SOLVED VAN-ADI-UM (VAN) (MG/L)		DIS-SOLVED CHRO-MI-UM (CHRO) (MG/L)		DIS-SOLVED MANG-ANESE (MANG) (MG/L)		DIS-SOLVED MOLY-BDENUM (MOLY) (MG/L)		DIS-SOLVED CAD-MI-UM (CAD) (MG/L)		DIS-SOLVED BARI-UM (BAR) (MG/L)		DIS-SOLVED MLI-UM (MLI) (MG/L)		DIS-SOLVED NI-UM (NI) (MG/L)		DIS-SOLVED COB-ALT (COB) (MG/L)		DIS-SOLVED CUP-RUM (CUP) (MG/L)		DIS-SOLVED VAN-ADI-UM (VAN) (MG/L)		DIS-SOLVED CHRO-MI-UM (CHRO) (MG/L)		DIS-SOLVED MANG-ANESE (MANG) (MG/L)		DIS-SOLVED MOLY-BDENUM (MOLY) (MG/L)		DIS-SOLVED CAD-MI-UM (CAD) (MG/L)		DIS-SOLVED BARI-UM (BAR) (MG/L)		DIS-SOLVED MLI-UM (MLI) (MG/L)		DIS-SOLVED NI-UM (NI) (MG/L)		DIS-SOLVED COB-ALT (COB) (MG/L)		DIS-SOLVED CUP-RUM (CUP) (MG/L)		DIS-SOLVED VAN-ADI-UM (VAN) (MG/L)		DIS-SOLVED CHRO-MI-UM (CHRO) (MG/L)		DIS-SOLVED MANG-ANESE (MANG) (MG/L)		DIS-SOLVED MOLY-BDENUM (MOLY) (MG/L)		DIS-SOLVED CAD-MI-UM (CAD) (MG/L)		DIS-SOLVED BARI-UM (BAR) (MG/L)		DIS-SOLVED MLI-UM (MLI) (MG/L)		DIS-SOLVED NI-UM (NI) (MG/L)		DIS-SOLVED COB-ALT (COB) (MG/L)		DIS-SOLVED CUP-RUM (CUP) (MG/L)		DIS-SOLVED VAN-ADI-UM (VAN) (MG/L)		DIS-SOLVED CHRO-MI-UM (CHRO) (MG/L)		DIS-SOLVED MANG-ANESE (MANG) (MG/L)		DIS-SOLVED MOLY-BDENUM (MOLY) (MG/L)		DIS-SOLVED CAD-MI-UM (CAD) (MG/L)		DIS-SOLVED BARI-UM (BAR) (MG/L)		DIS-SOLVED MLI-UM (MLI) (MG/L)		DIS-SOLVED NI-UM (NI) (MG/L)		DIS-SOLVED COB-ALT (COB) (MG/L)		DIS-SOLVED CUP-RUM (CUP) (MG/L)		DIS-SOLVED VAN-ADI-UM (VAN) (MG/L)		DIS-SOLVED CHRO-MI-UM (CHRO) (MG/L)		DIS-SOLVED MANG-ANESE (MANG) (MG/L)		DIS-SOLVED MOLY-BDENUM (MOLY) (MG/L)		DIS-SOLVED CAD-MI-UM (CAD) (MG/L)		DIS-SOLVED BARI-UM (BAR) (MG/L)		DIS-SOLVED MLI-UM (MLI) (MG/L)		DIS-SOLVED NI-UM (NI) (MG/L)		DIS-SOLVED COB-ALT (COB) (MG/L)		DIS-SOLVED CUP-RUM (CUP) (MG/L)		DIS-SOLVED VAN-ADI-UM (VAN) (MG/L)		DIS-SOLVED CHRO-MI-UM (CHRO) (MG/L)		DIS-SOLVED MANG-ANESE (MANG) (MG/L)		DIS-SOLVED MOLY-BDENUM (MOLY) (MG/L)		DIS-SOLVED CAD-MI-UM (CAD) (MG/L)		DIS-SOLVED BARI-UM (BAR) (MG/L)		DIS-SOLVED MLI-UM (MLI) (MG/L)		DIS-SOLVED NI-UM (NI) (MG/L)		DIS-SOLVED COB-ALT (COB) (MG/L)		DIS-SOLVED CUP-RUM (CUP) (MG/L)		DIS-SOLVED VAN-ADI-UM (VAN) (MG/L)		DIS-SOLVED CHRO-MI-UM (CHRO) (MG/L)		DIS-SOLVED MANG-ANESE (MANG) (MG/L)		DIS-SOLVED MOLY-BDENUM (MOLY) (MG/L)		DIS-SOLVED CAD-MI-UM (CAD) (MG/L)		DIS-SOLVED BARI-UM (BAR) (MG/L)		DIS-SOLVED MLI-UM (MLI) (MG/L)		DIS-SOLVED NI-UM (NI) (MG/L)		DIS-SOLVED COB-ALT (COB) (MG/L)		DIS-SOLVED CUP-RUM (CUP) (MG/L)		DIS-SOLVED VAN-ADI-UM (VAN) (MG/L)		DIS-SOLVED CHRO-MI-UM (CHRO) (MG/L)		DIS-SOLVED MANG-ANESE (MANG) (MG/L)		DIS-SOLVED MOLY-BDENUM (MOLY) (MG/L)		DIS-SOLVED CAD-MI-UM (CAD) (MG/L)		DIS-SOLVED BARI-UM (BAR) (MG/L)		DIS-SOLVED MLI-UM (MLI) (MG/L)		DIS-SOLVED NI-UM (NI) (MG/L)		DIS-SOLVED COB-ALT (COB) (MG/L)		DIS-SOLVED CUP-RUM (CUP) (MG/L)		DIS-SOLVED VAN-ADI-UM (VAN) (MG/L)		DIS-SOLVED CHRO-MI-UM (CHRO) (MG/L)		DIS-SOLVED MANG-ANESE (MANG) (MG/L)		DIS-SOLVED MOLY-BDENUM (MOLY) (MG/L)		DIS-SOLVED CAD-MI-UM (CAD) (MG/L)		DIS-SOLVED BARI-UM (BAR) (MG/L)		DIS-SOLVED MLI-UM (MLI) (MG/L)		DIS-SOLVED NI-UM (NI) (MG/L)		DIS-SOLVED COB-ALT (COB) (MG/L)		DIS-SOLVED CUP-RUM (CUP) (MG/L)		DIS-SOLVED VAN-ADI-UM (VAN) (MG/L)		DIS-SOLVED CHRO-MI-UM (CHRO) (MG/L)		DIS-SOLVED MANG-ANESE (MANG) (MG/L)		DIS-SOLVED MOLY-BDENUM (MOLY) (MG/L)		DIS-SOLVED CAD-MI-UM (CAD) (MG/L)		DIS-SOLVED BARI-UM (BAR) (MG/L)		DIS-SOLVED MLI-UM (MLI) (MG/L)		DIS-SOLVED NI-UM (NI) (MG/L)		DIS-SOLVED COB-ALT (COB) (MG/L)		DIS-SOLVED CUP-RUM (CUP) (MG/L)		DIS-SOLVED VAN-ADI-UM (VAN) (MG/L)		DIS-SOLVED CHRO-MI-UM (CHRO) (MG/L)		DIS-SOLVED MANG-ANESE (MANG) (MG/L)		DIS-SOLVED MOLY-BDENUM (MOLY) (MG/L)		DIS-SOLVED CAD-MI-UM (CAD) (MG/L)		DIS-SOLVED BARI-UM (BAR) (MG/L)		DIS-SOLVED MLI-UM (MLI) (MG/L)		DIS-SOLVED NI-UM (NI) (MG/L)		DIS-SOLVED COB-ALT (COB) (MG/L)		DIS-SOLVED CUP-RUM (CUP) (MG/L)		DIS-SOLVED VAN-ADI-UM (VAN) (MG/L)		DIS-SOLVED CHRO-MI-UM (CHRO) (MG/L)		DIS-SOLVED MANG-ANESE (MANG) (MG/L)		DIS-SOLVED MOLY-BDENUM (MOLY) (MG/L)		DIS-SOLVED CAD-MI-UM (CAD) (MG/L)		DIS-SOLVED BARI-UM (BAR) (MG/L)		DIS-SOLVED MLI-UM (MLI) (MG/L)		DIS-SOLVED NI-UM (NI) (MG/L)		DIS-SOLVED COB-ALT (COB) (MG/L	
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