U. S. DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

Mineral resource assessment of selected nonmetallic and metallic resources of the Coconino National Forest, Arizona

by

James D. Bliss[1]

Open-File Report

97-486

---

[1]U.S. Geological Survey, Tucson, Arizona

EXECUTIVE SUMMARY

Assessment of selected nonmetallic and metallic resources of the Coconino National Forest, Arizona

General

- The Coconino National Forest (CNF), located in the south-central Colorado Plateau, is an area with few base- and precious-metal mineral deposits.
- Demand for aggregate is increasing with population growth occurring in Flagstaff, Sedona, and Verde River Valley. Finding and establishing new sources of materials is a likely key future issue to be faced.

Industrial Minerals

- Scoria and cinder are unconsolidated and therefore easily mined for cinder block fabrication.
- The best sources of limestones for cement fabrication are the Redwall Limestone and the Martin Formation.
- Known gypsum deposits have grades comparable to those in production, but the deposits are small; future deposits will most likely be found in the Coconino and Moenkopi Formation.
- Industrial minerals associated with lake deposits include halite, sodium sulfate, diatomite, bentonite and various types of clays

Aggregate

- Sand and gravel deposits are scarce due to the types of bedrocks present.

- The future sources for aggregate are the Redwall Limestone, the Martin Formation, and younger basalts. Outcrops of the Redwall and Martin are either few and (or) problematic; the best source may be the more widely available younger basalts.

Metals

- Manganese is the only metal with an appreciable presence in the CNF albeit in limited amounts.
- Sources of base and precious metals are like to be from undiscovered remnants of solution-collapse breccia pipe uranium deposits. These small tonnage (< 11,000 t) deposits do not have uranium reported in production.

TABLES

FIGURES

ABBREVIATIONS USED

AASHTO	American Association of State Highway and Transportation Officials
ADOT	Arizona Department of Transportation
ASTM	American Society for Testing & Materials
CNF	Coconino National Forest
ft	feet
g/t	grams per metric ton
ha	hectares
km^2	square kilometers
m	meter
MRDS	Mineral Resource Data System, See figure 2 for locations, Appendix A for list of records sorted by commodities or byproduct commodities and Appendix B for full record listing.
NF	National Forest
PI	plastic index
ppb	parts per billion
RD	Ranger district
t	metric tons
ton	unknown, but likely short ton

Appendices

CONTENTS

Introduction

The Coconino National Forest (CNF), Arizona, contains approximately 814,000 hectares (ha) (2 million acres) in six Ranger Districts (RDs) as shown in fig. 1. The purpose of this assessment is to provide information useful to Forest Service land managers primarily concerning the quantity of metals and materials in **deposits yet to be discovered in the CNF**. Of course, known deposit types in or adjacent to the CNF are useful in identifying appropriate deposit types. Two different mineral resource assessment techniques are used: one for metals and industrial minerals and a second for uranium.

While both are types of quantitative mineral resource assessments, the first type requires mineral deposit models like those found in Cox and Singer (1986) and Bliss (1992). The procedure is described by Singer and Ovenshine (1979) and Singer and Cox, (1988) and allows predictions of how much material remains in undiscovered deposits at different levels of certainty (Root and others, 1992; Spanski, 1992). The former U.S. Bureau of Mines (BOM) also successfully used USGS assessment results in their analysis of economic potential of future mineral development within an area (the East Mojave National Scenic Area, California (U.S. Bureau of Mines, 1992) and Kootenai National Forest (NF), Idaho and Montana (Gunther, 1992)). Grade and tonnage models are needed as well as an estimate of numbers of undiscovered deposits. Deposit types lacking grade and tonnage models cannot be assessed.

The assessment of uranium in solution-collapse breccia pipe uranium deposits is handled differently. The procedure used and the assessment results are found in a previous report by Bliss and Pierson (1994). **The predicted undiscovered uranium from this deposit type does not represent uranium endowments additional** to those reported by Finch and others (1990), but they suggest what portion of their endowment is found within the Coconino NF, Arizona (Bliss and Pierson, 1994). One site (Appendix B, MRDS No. 101--see below for explanation of abbreviation and number) was also noted during this part of the assessment (and **not** noted in Bliss and Pierson, 1994) may have evidence of solution-collapse breccia pipe uranium deposits in favorable area type B (Finch and others, 1990).

Industrial minerals have been and are likely to be the primary type of mineral commodity produced in the future in the CNF. Modeling industrial mineral deposit types is not as extensive as needed (Orris and Bliss, 1991; Orris and Bliss, 1992). New types of mineral deposit models may be required (Orris and Bliss, 1989). Unfortunately, mineral deposit models are not available for most of the industrial mineral commodity types found in the CNF. Flagstone is an important industrial mineral with a long production history in the adjacent Kaibab NF. An attempt was made to develop models for flagstone in an assessment of the Kaibab NF (Bliss, 1993), but it was unsuccessful due to poor and incomplete data.

Data about mineral deposits found in or adjacent to the CNF have come from various sources. A general source for mineral deposit data is the Mineral Resource Data System (MRDS), a world-wide computer

database with locality and commodity data. Additional sources for industrial minerals include Phillips (1987) and Houser (1992). Appendix A contains a selection of some of those records in or adjacent to the CNF as recorded in May, 1995 and are listed on figure 2 using sequence numbers. The records are also ordered by sequence number (upper left hand corner of each page) in Appendix B and specific sites are noted in the text by MRDS sequence number (MRDS No.).

Industrial minerals are covered first, followed by a brief discussion of metallic mineral deposits. Most tracts noted are bounded using stratigraphy or other geologic features which are best seen on regional maps including the following: Weir and others (1989) for the geologic map of the Sedona 30' X 60' quadrangle; Ulrich, and others (1984) for the Flagstaff 1° by 2° quadrangle; Moore and others (1960) for other areas of Coconino County; Arizona Bureau of Mines (1958) for other areas of Yavapai County; and Lane (1992, plate 2) for a compiled geologic map of the CNF as a whole. The San Francisco volcanic field is shown on a series of maps including Moore and Wolfe (1987) for the east part, Newhall and others (1987) for the southwest part, Ulrich and Bailey (1987) for the SP Mountain part, Wolfe, Ulrich, and Newhall (1987) for the northwest part, and Wolfe, Ulrich, Holm, and others (1987) for the central part.

A number of other reports applicable to areas in the CNF or adjacent areas were identified during preparation of the assessment. These include Chaffee and others (1996a, 1996b) release of analytical results for rock and stream-sediments collected in the CNF; a number of studies on breccia pipes including Van Gosen and Wenrich (1989), Wenrich (1985), and Wenrich and others (1986,1988, 1989); and reports prepared for Roadless area studies including ones for Strawberry Crater (Wolfe and Hahn, 1982; Wolfe and Hoover, 1982, Wolfe and Light, 1987), Fossil Springs (Weir and Beard, 1984; Weir and others, 1983), and West Clear Creek (Ulrich and Bielski, 1983).

Another source was the mineral-resource assessment of undiscovered resources of gold, silver, copper, lead, and zinc in the conterminous United States from 1993 through 1995 (Ludington and Cox, 1996). The assessment consists of probabilistic estimates of the amounts of undiscovered gold, silver, copper, lead, and zinc in conventional types of deposits. The assessment also identified significant known deposits and gave descriptions of the mineral deposit models used. Some tracts, mineral deposits and models used in that assessment are noted briefly here.

Four models of engineering characteristics of aggregate found in the report are prepared and depicted in the same general way as in Cox and Singer (1986). One difference is that each value is identified as belonging to a site, not an aggregate deposit, which needs either an estimate of volume and (or) of geometry. Neither were identifiable in this study. This fact, together with small sample sizes, makes these models preliminary.

This report is organized into three sections: 1) industrial minerals excluding aggregate, 2) aggregate, and 3) metals. The first section contains descriptions of geology, tracts, and other details which will not be repeated in the section on aggregate. Materials not covered elsewhere (for example,

sand and gravel) will be discussed in greater detail in the aggregate section.

This report lacks figures showing geology. Nearly all tracts identified as permissive for various commodities (or deposit types) are identified by geologic unit(s). Readers who are serious about using the information herein need access to geologic maps (most of which are listed above.)

Industrial Minerals

Introduction

Industrial minerals are historically the most important mineral commodities produced in the CNF. This section focuses on industrial minerals with uses other than for aggregate. However, some discussion on the use of materials as a source of aggregate is often unavoidable.

Some industrial minerals are also classified as metals. For example, hematite used as a pigment is considered an industrial mineral while its use as a source of iron makes it a metal. In this assessment, hematite is discusses under the "metals" section.

Marine carbonate rocks

Background

Most carbonate rocks are produced for making cement, processed for lime, or crushed for use as aggregate in construction. Limestone or other calcareous rocks make up 75-80 percent of the raw material used to make cement (Harben and Bates, 1984). Limestone is composed of 50 percent or more calcite and dolomite, with calcite greater than dolomite. Ultra-pure limestone contains greater than 97 percent $CaCO_3$; high calcium limestone contains greater than 95 percent $CaCO_3$ (Harben and Bates, 1984). Cement preparation requires not only $CaCO_3$, but also silica, alumina, and iron, which may be contributed by the clay, sand, and chert commonly found in limestones as it is quarried. These components (as well as other materials) need to be added during cement manufacture if they are absent or are insufficient in the limestone. Dolomite is tolerated in limestones up to about 5 percent of the raw material for cement manufacture (Harben and Bates, 1984).

Other uses of limestone or derivative products (e.g., lime) include dimension stone, rip rap, road metal, roofing granules, fillers (paper, asphalt), filters (water treatment), absorbents (gold leaching), ceramics, flux (steel), agriculture, glass, and well drilling fluids (Keith, 1969c; Lefond, 1983). In Arizona the copper industry uses lime in flue gas desulphurisation (O'Driscoll, 1990). Limestone is a common source of

aggregate wherever it is found. However limestones consisting of about equal parts dolomite and calcite which are used as aggregate in cement are more likely to have alkali-carbonate reactions which may destroy concrete competency (Marek, 1991).

Geology

As noted in Lane (1992) four limestone units are found in the CNF: 1) Martin Formation, 2) Redwall Limestone, 3) Kaibab Formation, and 4) limestone facies in the Verde Formation. In Arizona the Redwall Limestone of Mississippian age is one of two formations considered best for chemical and industrial use (Keith, 1969c). The limestone is massive, strong, high calcium and low dolomite, with chert in nodules and bands as the chief impurity. This limestone and the Escabrosa Limestone have been the principal source of material for cement production in Arizona (Keith, 1969c).

Quarries and tracts

Six sites are noted for limestone in MRDS (Appendix A). All sites in CNF are in the Peaks RD. One site (MRDS No. 101) consists of a breccia site containing significant lead and may be an expression of an undiscovered solution-collapse breccia pipe uranium deposit or remnant thereof (see Introduction). Lead may be considered as a possible contaminate of the limestone (probably Kaibab Formation) if the site were to be considered as a source of crushed stone. Limestone and marble are found in several carbonate bodies within the volcanic field on the margins of San Francisco Mountain. Wolfe and others (1987b) included the Redwall Limestone and Temple Butte Formation in the unit which crops out in Little Elder Mountain (probable location of the MRDS No. 76) on the southeast margin, and White Horse Hills, northwest margin, of San Francisco Mountain. Two other sites are noted in the Kaibab Formation (MRDS Nos. 102, 103).

One site (MRDS No. 30) included in Appendix A is an important production site for limestone for use in a cement plant in the Prescott NF (fig. 2) to the west of the CNF. The Clarkdale Cement Plant limestone quarry not only produces from the Redwall Limestone but also from the Devonian Martin Formation. Lane (1992) notes that the limestone provides the necessary $CaCO_3$, SiO_2, and MgO (which is in dolomitic lenses in the limestone) needed to manufacture cement. Whole-rock analyses for limestone samples are given by Lane (1992, table 2).

Three samples of limestone from the Verde Formation, analyzed by the U.S. Bureau of Mines from three sites (Lane, 1992, plate 3, fig. 3), suggest they are suitable for use in cement manufacture (Lane, 1992, table 2). However, the limestone is interbedded with clays, and other materials which would make mining difficult.

Tracts are defined by the outcrop areas of stratigraphic units dominated by carbonates or containing significant carbonate members. All outcrops of the Redwall Limestone in the CNF are permissive. A portion of the Coconino Sandstone may be worked given information about limestone

quality including impurities (i.e., chert concentrations, dolomite) and detail end-use specifications (cement, aggregate, and so forth).

Resource estimate status

Limestone is one of a number of bedded industrial mineral deposit types that lack models or strategies for quantitative assessment. Therefore, an estimate of undiscovered limestone resources is not available.

Marine and lacustrine environments

Gypsum

Background

Gypsum, or hydrous calcium sulfate ($CaSO_4 \cdot 2H_20$), is the most abundant naturally occurring sulfate (Harben and Bates, 1990). Upon loss of water gypsum becomes the mineral anhydrite ($CaSO_4$). Use of anhydrite is minor when compared to gypsum although neither mineral is found without the other (Appleyard, 1983). Unfortunately, currently unusable anhydrite represents the larger part of the world's extensive reserves of these sulfates (Appleyard, 1983). Calcined gypsum ($CaSO_4 \cdot 1/2H_20$) or plaster of Paris is an important product as a component of plasterboard and accounts for 70 percent of gypsum consumption (Harben and Bates, 1990). Harben and Bates (1984, p. 130) also notes that "uncalcined gypsum is used as a retardant in cement; as a fertilizer; as a filler in paper, paint, and toothpaste; and in the production of gypsum muds for oil well drilling." Due to the wide availability of gypsum, only readily accessible deposits at the surface are being worked. Strip mining is the common extraction method, with some operations exceeding 50 m in depth (Raup, 1991). Because transportation is a major contributive cost, proximity to infrastructure and markets is critical in deciding if a deposit will be worked. Gypsum and anhydrite constitute the largest known reserve of sulfur, although it is largely untapped and is currently an uneconomic source.

Geology

Gypsum and anhydrite occur as evaporites identified in rocks of Silurian age through Quaternary age (Appleyard, 1983). The proportion consisting of anhydrite increases with geologic age of the enclosing rock. Thus, younger deposits are more likely to be worked because they contain more gypsum. Gypsum is commonly found associated with other evaporites. Due to its high solubility, primary gypsum deposits are subject to considerable post-depositional modification, recrystallization, and remobilization.

Models

Two broad types of bedded gypsum deposits are recognized for modeling purposes: marine evaporite gypsum (Raup, 1991) and lacustrine gypsum (Orris, 1992c). Both types have permissive geology in the CNF. The descriptive model by Orris (1992c) suggests that most lacustrine gypsum deposits develop in closed or nearly closed continental basins (usually fault controlled) under semiarid to arid conditions. The descriptive model by Raup (1991) notes that marine gypsum deposits develop from the evaporation of sea water in marginal marine basins.

The preliminary grade and tonnage model by Orris (1992e) for marine gypsum deposits is based on data from 14 entities that include data from a mix of districts, areas, and single deposits. Ninety percent of the deposits have a size equal to or greater than 14 million t; 50 percent have a size equal to or greater than 280 million t; and 10 percent of the deposits have a size equal to or greater than 5.6 billion t (Orris, 1992e, fig. 35). Ninety percent of the deposits have a gypsum grade equal to or greater than 82 percent; 50 percent have a gypsum grade equal to or greater than 91 percent; and 10 percent of the deposits have a gypsum grade equal to or greater than 99.8 percent (Orris, 1992e, fig. 36).

The preliminary grade and tonnage model by Orris (1992c) for lacustrine gypsum deposits is also based on data from 14 entities. Ninety percent of the deposits have a size equal to or greater than 0.78 million t; 50 percent have a size equal to or greater than 14 million t; and 10 percent of the deposits have a size equal to or greater than 247 billion t (Orris, 1992c, fig. 35). Ninety percent of the deposits have a gypsum grade equal to or greater than 74 percent; 50 percent have a gypsum grade equal to or greater than 85 percent; and 10 percent of the deposits have a gypsum grade equal to or greater than 96 percent (Orris, 1992c, fig. 36). Lacustrine deposits tend to be both smaller and of lower grade than those for marine deposits.

Deposits and tracts

Two units found in the CNF contain evaporites and are, thus, permissive for marine gypsum deposits--Permian Coconino Sandstone and the Triassic Moenkopi Formation. The Toroweap Formation is commonly included with the Coconino Sandstone.

It is the Harrisburg Member of the Coconino Sandstone which contains evaporites. Gypsum, along with dolostone, sandstone, redbeds, chert, and minor limestone comprise the sequence (Hopkins, 1990). The member thickens to the west (up to 85 m) with significant bedded gypsum present. In fact, gypsum is mined from the Harrisburg member west of Las Vegas, Nevada at the Blue Diamond Hill Mine (Hopkins, 1990). A number of undeveloped occurrences and at least one gypsum mine have been identified in either the Coconino Sandstone and (or) Toroweap Formation in northwest Arizona (Keith, 1969b). To the best of my knowledge, no significant amounts of gypsum have been identified in the Harrisburg Member in the CNF. However, the Coconino Sandstone and Toroweap Formations are permissive for bedded gypsum.

Irregular gypsum lenses totaling 330,000 t of material at a grade of 97.5 percent gypsum have been described by Keith (1969b) in the Moenkopi Formation (Keith, 1969b; table 31). This tonnage is much smaller than the size distribution of deposits used in the grade and tonnage model by Orris (1992e); however, the gypsum grade in this deposit is within the grade distribution of the grade and tonnage model (Orris, 1992e; fig. 36). No significant amounts of gypsum have been identified in the Moenkopi Formation in the CNF. However, as noted previously, all parts of the Moenkopi Formation are permissive for bedded gypsum.

Lacustrine gypsum is found in the Verde Formation of Pliocene and Miocene ages (Weir and others, 1989) particularly in an area of 190 km^2 of evaporites extending about 16 km northwest, and 10 km southeast of Camp Verde (fig. 1) in the Verde basin (Twenter and Metzger, 1963, fig. 24). Gypsum in the Verde Formation has been mined at the Larson quarry located in a sequence of evaporites several square kilometers in area interbedded with mudstone and volcanic ash which can be 100 ft (30 m) thick (MRDS No. 1). Lane (1992) notes that the material mined is about 70-75 percent gypsum. This suggest that the deposit is low grade within the context of the grade and tonnage model of lacustrine gypsum (Orris, 1992c). Also located in these evaporites is the Wingfiled-Mcledd gypsum deposit (MRDS No. 15) where gypsum was produced for use in agriculture. Another gypsum occurrence (MRDS No. 14) was noted near the Camp Verde Gypsum property (MRDS No. 20) and as part of the stratigraphic sequence at the Verde River Deposit (MRDS No. 16). Several other sites in the Verde Formation are noted for gypsum (MRDS No. 16, 21). For assessment purposes, these sites are discovered gypsum deposit(s). Perhaps the whole sequence exposed at the surface may be considered a deposit partially worked within the context of deposits described in the grade and tonnage model (Orris, 1992c). The Verde Formation is considered to be the permissive area for lacustrine gypsum.

Resource estimate status

No estimate of undiscovered deposits of either type was made. Marine gypsum deposits like those in the grade and tonnage model are large but it is unknown how extensive (or exhaustive) exploration has been for bedded gypsum deposits in the CNF. Existing data suggests that the situation for lacustrine gypsum is more promising than for the marine type. Grade may be a problem if the worked portion at Larson Quarry represents the best quality of material available. However, the presence of undiscovered deposits without outcrop for both types cannot be discounted.

Lacustrine halite, sodium sulfate, and brines

Background

Halite (NaCl) or salt is used by the chemical and food industries and in snow and ice removal (Orris, 1992d). Lacustrine halite becomes important only locally when marine deposits are unavailable, as in Australia (Orris, 1992d). Halite is extracted by conventional mining to depths of 100 m; and by solution mining at depths greater than 500 m (Orris, 1992d). Proximity

to infrastructure and markets is critical in deciding if a deposit will be worked, because transportation is a major contributive cost. Halite need not be directly mined but may also be extracted from natural brines and sea water.

Most sodium sulfate produced is used in the manufacture of detergents, paper, and glass (Harben and Bates, 1990). Two minerals, thenardite (Na_2SO_4) and mirabilite (($Na_2SO_4 \bullet H_20$), commonly called Glauber's salt, are commercially important. Sodium sulfate is also extracted from brines.

Geology

Lacustrine halite occurs as either bedded or massive bodies in continental basins (Orris, 1992d). Most deposits are late Tertiary or Quaternary. Basins are closed or semi-closed and contain sediments and evaporites developed under arid conditions. Due to high solubility, halite deposits are subject to considerable post-depositional modification, recrystallization, and remobilization. Sodium sulfate is common in alkali lakes and is found with other evaporites including halite and gypsum.

Models

Only the preliminary descriptive model by Orris (1992d) without an associated grade and tonnage model is available for lacustrine halite; however a constituents model is available for sodium carbonate (sulfate, chloride) brines (Orris, 1992a). These are brines considered sufficiently concentrated to be a source of their contained constituents (G.J. Orris, 1995, oral commun.) Ninety percent of the brines have a sum of Na_2CO_3, Na_2SO_4, and NaCl constituents equal to or greater than 6,400 ppm; 50 percent have a sum equal to or greater than 33,000 ppm; and 10 percent of the brines have a sum equal to or greater than 220,000 ppm (Orris, 1992a, fig. 42-44). Neither a descriptive model nor a grade and tonnage model is available for sodium sulfate minerals.

Deposits and tracts

Lacustrine halite is found in the Verde Formation of the Pliocene and Miocene ages (Weir and others, 1989) particularly in an area of 190 km^2 of evaporites extending about 16 km northwest, and 10 km southeast of Camp Verde (fig. 1) in the Verde Basin (Twenter and Metzger, 1963, fig. 24). Halite in the Verde Formation has been mined, along with sodium sulfate, at the historic Camp Verde Mine (MRDS No. 21, Appendix A; fig. 2). The Verde Formation is a sequence of evaporites several square kilometers in area interbedded with mudstone and volcanic ash which can be as much as 100 ft (30 m) thick.

Not only are halite deposits recognized, but brines are also present. A saline water well near Camp Verde (MRDS No. 11) contains 177,000 ppm dissolved solids, predominantly sulfate and chloride. This well appears to be consistent with the concentrations noted in the brine model by Orris (1992a). This would still be true if only a half of the soluble solutes present are the same as those in the model. A sample collected in 1959 from a ground-water well about 4 mi (6 km) southeast of Camp Verde along West

Clear Creek was reported to contain 90,300 ppm dissolved solids largely dominated by sodium (+ potassium) and sulfate (Twenter and Metzger, 1963, table 10). This well may also be a source of usable brines (MRDS No. 31). Detailed chemical analyses are needed for both wells as is an estimate of the size of the brine reservoir. In addition, possible discharge rates are needed.

Lane (1992) notes that a sodium sulfate deposit was mined west of Camp Verde (Camp Verde Salt Mine, MRDS No. 21). Weisman and McIlveen (1983) describe the deposit as 46 m thick. It is unusual in that it contained pure mirabilite crystals.

For assessment purposes, these sites at the surface are for discovered halite/sodium sulfate deposit(s). The Verde Formation is considered to be the permissive area for lacustrine halite/sodium sulfate deposits and sodium carbonate (sulfate, chlorite) brines.

Resource estimate status

An estimate of undiscovered lacustrine halite/sodium sulfate deposits was not made, given the absence of a grade and tonnage model. At least one and perhaps two brine reservoirs of unknown sizes are inferred to exist.

Diatomite

One occurrence of diatomite is reported south of Camp Verde (MRDS No. 16). Lane (1992) cites oral communication (Ed Davidson, Superior Materials) that diatomite is present at the gypsum deposit 6 km southeast of Camp Verde [most likely Larson Quarry, MRDS No. 1]. Samples examined from various sites in the Verde Formation appear to be of poor quality (Lane, 1992). A descriptive model by Shenk (1991) is available; a grade and tonnage model is not.

Pliocene and Miocene clays

An unspecified type of clay is noted at the diatomite deposit south of Camp Verde (MRDS No. 16) and near Clarkdale (MRDS No. 23). **Brick clay** is found north of Clarkdale (MRDS No. 22) and is also suitable for use in cement manufacture. Lane (1992) noted that most clays in the Verde Formation are bentonitic, although Funnell and Wolfe (1964) as cited by Lane (1992) noted that low-expanding, high-calcium **montmorillonite** is found southeast of Camp Verde. See Lane (1992, table 1) for the chemical and physical characteristics of some clay samples collected in Verde Formation.

Lacustrine limestone

Three samples of limestone from the Verde Formation were collected by the BOM from three different sites (Lane, 1992, plate 3, fig. 3). The analyses indicate they are suitable for use in cement manufacture (Lane,

1992, table 2). However, the limestones are interbedded with clay and other materials which will make mining difficult.

Bentonite

Bentonite found associated with gypsum at the Larson Quarry was used as canal-reservoir sealer and for iron ore pelletization (see MRDS No. 1, Appendix B, for details).

Sandstones

The Coconino Sandstone and Moenkopi Formation are found in the CNF and have been a source of sandstones usable for flagging and ashlar. In fact, flagstone (and minor ashlar[1]) production from the Coconino Sandstone is an important industry in the Kaibab NF to the west and Prescott NF southwest of the Coconino NF. Models needed for making quantitative predictions about flagstone and ashlar resources have not been developed and the attempts to do so for the assessment of the Kaibab NF were largely not successful. See Bliss (1993) for details and background material which is still valid here but will not be repeated. However, one correction is needed. Extraction of flagging is easier where the sandstone bedding slopes in the same direction as the topographic slope, however, this situation does not seem to have been critical in the siting of most existing quarries.

Minor production of flagging has come from the Moenkopi Formation but the Moenkopi has chiefly been the source of large building blocks and ashlars prior to the 1930's (Keith, 1969e). The Moenkopi does not split easily for flagging. A basal, massive sandstone has provided the best material. Keith (1969e, p. 447) reports that it consists of a "poorly to well-sorted, fine to very-fine grained, lenticular bed, 20 to 40 feet thick." This massive sandstone contains about 80 percent silica, up to 4 percent iron and aluminum oxides, and 13 percent calcium carbonate (Keith, 1969e). Although the stone forms solid blocks for use in buildings, it does not retain sharp lines and angles (Burchard, 1914). Stein (1993) gave a detailed overview of the history of production from a Moenkopi sandstone quarry located three miles south of Flagstaff.

Volcanic rocks

DEFINITIONS

Block pumice--a legal definition, includes pumice which is greater than 5.2 cm in one dimension (Hoffer, 1991).

---

[1]Ashlar are rectangular or square stone blocks usually smooth on two parallel sides commonly used for building facing.

Pumice--light-colored, highly vesicular volcanic glass, commonly of rhyolitic composition; vesicles are fine and uniform; glassy appearance (Harben and Bates, 1990). Fragments greater than 6.4 cm called lump pumice; 0.4 to 6.4 cm called pumice (Hoffer, 1991)

Pumicite--shattered pumice consisting of grains, flakes, threads and shard of glass less then 3 mm in diameter (also called volcanic ash, can have diverse chemistry) (Harben and Bates, 1990)

Scoria--mafic version of pumice, fragments from 0.25 mm and larger, highly vesicular, red to black pyroclastic material, usually andesitic to basaltic composition; vesicles are coarse and variable; stony appearance (Harben and Bates, 1990).

Volcanic cinder--fragments less than 0.25 mm, highly vesicular, red to black pyroclastic material usually andesitic to basaltic in composition; vesicles are coarse and variable; stony appearance (Harben and Bates, 1990). Fragments of comparable composition that are larger than 0.25 mm are called scoria (see above).

Scoria, cinder, pumice and pumicite

Background

Uses of scoria and volcanic cinder (or simply cinder in the discussion below) include those of aggregate, cinder block, concrete, horticulture and landscaping, abrasives, and railroad ballast. Key properties making scoria and pumice valuable in construction are: light weight, insulating ability, high fire resistance, and toughness (Harben and Bates, 1984; Mason, 1994). Pumice has somewhat more specialized uses than cinder. The most important uses of pumice and pumicite are shown in figure 3. A particularly interesting use is in stone washing laundries particularly of jeans in which lump pumice is used to abrade and soften denim (Scott, 1992, p. 35). Pumice and pumicite are used as an abrasive material for dressing wood or metal and in domestic and industrial cleaning of surfaces (Keith, 1986d). Uses included in "Other" in figure 3 are as an absorbent, dilutent, filter aids, roofing granules, in water treatment, and as a road metal (Bolen, 1994; Osburn, 1982)

Pumice and pumicite are primarily used in the fabrication of building bricks. Construction related uses of pumice and pumicite make up approximately 70 percent of the material consumed annually (Bolen, 1994). However, among materials produced and used as lightweight aggregate (17 to 20 million tons) in 1983 to 1989 in the US, pumice and pumicite accounted for only 2 or 3 percent of the total (350,000 to 500,000) according to Mason (1994) who used data from the former BOM. Materials used in lightweight aggregate are notable for having densities of 1.3 to 1.6 t/m^3 when loosely packed as compared to 2 t/m^3 and more for crushed stone, sand, gravel, or air-cooled slags. Pumice, pumicite, and scoria with densities between 1.4 to 1.8 t/m^3 can be used in lightweight concrete (Mason, 1994). Some pumice is pozzolan. When finely ground, it reacts chemically with lime to form a hydraulic cement at normal temperatures (Smith and Collis, 1993; Prentice, 1990). Pozzolan is sometimes used as

part of Portland cement to increase sulfate resistance and reduce alkali-aggregate reactions (White, 1991).

Lightweight aggregate must be tested for suitability before they can be used in construction. The dry loose weight should be between 0.881 to 1.12t/m^3 (Mason, 1994). Aggregate requirement for structural concrete is given ASTM C 330. Table 1 lists the grade requirements of this test as fine aggregate, coarse aggregate, or as a combination of the two (Mason 1994). Two other ASTM tests are also applicable, C331 for concrete masonry units (blocks) the grading requirement for which is given in Table 2, and C332 for insulating concrete, the grading requirement for which is given in Table 3 (Mason, 1994; Geitgey, 1994).

Organic or iron oxide contaminants in lightweight aggregate can cause undesirable discoloration in concrete and need to be kept to a minimum. Hydration can cause obsidian fragments to expand and damage cement (Geitgey, 1994). Other impurities may adversely effect product integrity. Clay lumps need to be less than 2 percent by dry weight; loss on ignition should be less than 5 percent except for cinders where loss on ignition should be less than 35 percent (Mason, 1994).

Arizona Department of Transportation (1990) standard specifications do not address lightweight aggregate, perhaps because these types of concretes are unsuitable in highway structures. The Arizona Department of Transportation (1990) does stipulate the Portland-pozzolan cement meet ASTM C 595, but no special test is identified in their specifications for the pozzolan material. Hoffer (1994) noted that pumice (either as raw or calcined nature pozzolan) used in Portland-pozzolan cement should conform to requirements of ASTM C 618-78 which considers compressive strength, water requirement for flow, shrinkage during drying, and effective reduction of alkali reactivity (U.S. Bureau of Mines, 1969; White, 1991). Schmidt (1956) as cited in Geitgey (1994) described using pumice in controlling landslides in highway right of way.

Horticulture and landscaping

Mason (1994, p. 808) describes that "finer granular pumice is used in potting soils and as a hydroponic growth medium." Pumice helps to increase drainage in soil. Color of the cinder or scoria dictates how it is likely to be used in landscaping. Dark reddish brown material is found in vent areas; it becomes brown to dark gray with iridescent surface coatings at intermediate distances and becomes very dark gray to black in the outer edges of volcanic cone (Osburn, 1982). Color changes are related to a decreasing ferric to total iron ratio varying from 95 percent in the vent area to 5 percent in the outer edges of the cone (Osburn, 1982).

Stone washing laundries

Pumice functions in two different ways in the preparation of stone washed fabrics--as an abrasive and as an acid-impregnated absorbent. Both soften the garment and give it a worn look (Hoffer, 1994). The three most important physical properties of pumice important in stone washing are absorption capacity, apparent density, and abrasion loss; other factors include moisture content, impregnation rate, surface fines, and coloration

(Hoffer, 1994). Pumice of different sizes gives different effects. Small fragments produce a more even worn look as compared to that produced by coarser fragments (Hoffer, 1994).

Pumice used as an abrasive is formed into solid blocks, granules, powders or bonded material. As pumice is brittle, wear produces a continuous new crop of fresh cutting edges during use (Mason, 1994). Examples of applications are: cleaning restaurant grills, cleaning tile, or for cosmetic skin removal. Pumice is also found in heavy-duty hand cleaners. (Mason, 1994). Suitability of pumice as a abrasive requires uniformly fine vesicular material several times smaller than the particle size of the surface to which it is applied (Geitgey, 1994). Nonpumice fragments, particularly those harder than the pumice, can cause undesirable scratches, and therefore, should be less than one percent. Less than 0.5 percent is better, as attributed by Geitgey (1994) to Hess (private commun., 1992). Preparation of pumice for abrasives is difficult and time-consuming; suitable deposits are uncommon and these and others factors make abrasive pumice prices up to 100 times higher than those of pumice used in aggregate (Geitgey, 1994).

Three properties which give pumice a great diversity of uses are low chemical reactivity, high surface area, and high porosity. This allows pumice to have many uses as an absorbent. It can be used as a carrier for pesticides, herbicides, and fungicides among others (Mason, 1994). Mason (1994, p. 808) also notes that "lumps of pumice about 5 cm in diameter are used in gas grills to absorb grease drippings and reduce flaming." Scoria has been substituted for pumice in this application.

Geology

Scoria, cinders, and pumice are all products of explosive volcanism. All involve the rapid loss of dissolved fluids from volcanic material on reaching the surface. The distinction between scoria and pumice is based chiefly on composition--mafic volcanic melts yield scoria while siliceous melts yield pumice. When pumice is less than 0.16 inches (0.4 cm) in diameter, it is called pumicite and can be carried great distances in the atmosphere (Peterson and Mason, 1983). When scoria is less than 1 inch (2.5 cm) in diameter it is called cinder (Harben and Bates, 1984).

In general, scoria and cinder are deposited near the source volcanic vent. Less dense, finer grained pumice is carried farther away. The extremely fine-grained pumicite can travel thousands of kilometers. Keith (1986d) noted that pumice is chemically comparable to rhyolite, quartz latite, and dacite. Deposits are commonly lenticular and are found interbedded with lava and tuff.

Known pits

Pozzolan, a highly siliceous pumice sand, is recognized at several sites (Appendix A), one of which supplied material for concrete for the Glen Canyon Dam in 1965 (MRDS No. 38) in eastern Peaks RD. About 200,000 short tons of materials was produced (Williams and Zinkl, 1965).

Definition of permissive areas
Wolfe, Ulrich, and Newhall (1987) and Wolfe, Ulrich, Holm, and others (1987) prepared geologic maps of the northwest part and central part of the field. Newhall and others (1987) mapped the southwest part. These maps all show a portion of the CNF.

A large number of cinder and scoria pits are particularly abundant in the Peaks RD; they also are present elsewhere in the CNF. This material has been, and will continue to be, produced. Cinder and scoria associated with volcanic cones are a resource readily identified if present. The better quality material is usually found in, or adjacent to, the youngest cones, which makes this material easy to discover. In addition, the geometry of unworked cinder cones can be one key to understanding its potential for cinder and scoria (see Improving the assessment of discovered cinder cones). Wind-fall material may not be identified so readily.

In the San Francisco volcanic field (Peaks RD, fig. 2), pumice is likely to occur in major eruptive centers with andesite, rhyolite, and dacite volcanics. Such eruptive centers include: Sitgreaves Mountain, Bill Williams Mountain, and Kendrick Peak. A portion of Kendrick Peak is in CNF; the other eruptive centers are in Kaibab NF. Pumice deposits recognized on the east flank of Bill Williams Mountain (in Kaibab NF) are poor quality as compared to 14 sources of pumice in the United States and the world (Scott, 1992). The high density and low porosity of this pumice makes it suitable only for landscaping and in road construction (Scott, 1992). Areas permissive for pumice are those with rocks of dacite and rhyolite composition.

Models
Models for making quantitative predictions about undiscovered cinder, scoria and pumice resources have not been developed; therefore an evaluation of undiscovered resources is not available. On the other hand, the CNF contains a considerable number of cones with identified cinder and scoria resources that will be exploited before less accessible deposits are considered. While estimates of volume of material in identified cinder cones are possible, models characterizing the chemical and physical properties of scoria, cinders, and pumice for appropriateness for their various uses have not been developed. A model for scoria, cinder and other unconsolidated basaltic material of durability in aggregate is available and described in aggregate section.

Resource estimate status
Osburn (1982) showed that the ratio of height to basal diameter, or the aspect ratio, is usually between 0.1-0.2 for cinder cones that can be mined. Cones with lower aspect ratios contain more flows. Cones with an aspect ratio greater than 0.2 contain agglutinate blocks which makes extraction difficult (Osburn, 1982). Measuring aspect ratio from topographic maps can help identify which cinder cones should be considered initially as a source of cinder.

Scott (1992) found that roughly half of the 200 or more cinder cones in the Chalendar and Williams Ranger District in the adjacent Kaibab NF have aspect ratios between 0.1 and 0.2. Scott (1992) also found that 75 percent of all pits are located on cones with aspect ratios between 0.1 and 0.2. No systematic relation was found by Scott (1992) between cinder cone composition type and the presence or absence of cinder quarries.

Most of the cinder and scoria in the CNF are associated with identified cinder cones. Some finer-grained material may be located beyond the cones, but represents a small amount of material in comparison with material in identified cones. Some complex cones may be difficult to assess. A portion of each cone can also be expected to contain some vesicular flows and agglutinate fragments that will make extraction difficult (Harben and Bates, 1984).

Basalt and related rocks

The main use of basalt and other dark, fine-grained igneous rocks is as crushed stone in concrete and aggregate. Harben and Bates, (1984, p. 63) notes that "basalt is * * * melted and cast into floor tiles and acid-resistant equipment for heavy industrial use." Basalt use as a dimension stone is dependent on fashion. In the past it was not used as dimension stone because it was thought to have a somber appearance (Keith, 1969a). However, dark colored stone has become fashionable and can demand a premium price. Quarrying basalt can be difficult due to its lack of joints and its tendency to blast into irregular sized and shaped blocks. Basalt and related rocks are the highest density material used as aggregate, which precludes shipping it great distances. On the other hand, basalt's high density makes it preferable for other uses where high density is needed, given other rock characteristics are acceptable.

Abundant Tertiary and Quaternary basalts are found in the San Francisco volcanic field, which was active during the Pliocene and Pleistocene (Newhall and others, 1987). Compositionally the material is basalt and basaltic andesite with lesser amounts of andesite, benmoreite, and dacite.

A model developed for assessing basalt and related rock types is found in the section on aggregate. The CNF contains considerable identified basalt and related rocks in accessible outcrops that will be exploited before less obvious resources are considered. Possible suitability of basalt and related rock types as dimension stone in the CNF needs to be addressed and appropriate sampling has to be made in future assessments.

Quaternary to Recent clays

High silica clay is found adjacent to and likely extends under Roger Lake, 14 km west-southwest of Flagstaff (MRDS No. 9). Lane (1992) described the clay as a montmorillonite-kaolinite with a high bloating factor possibly suitable in fabrication of lightweight aggregate. Analysis of some of the material is reported as possibly suitable in facia brick, or tile (Lane,

1992, table 1). An approximate endowment of the Roger Lake deposit is 18 million t (Lane, 1992).

All enclosed basins, with or without lakes, within the San Francisco volcanic field should considered as possible target areas for clay deposits, possibly comparable to the one recognized at Roger Lake. The volcanics in the Roger Lake area are predominantly Pliocene (?) and Miocene basalt flows and vent deposits (Wolfe and others, 1987). Perhaps other basins with the same type and age of adjacent rocks may be particularly suitable for the development of these clays.

Two sites with clay are noted southeast and south of the CNF in the Tonto NF. One is Chris Clay deposit (MRDS Nos. 7) and the other is for Florence Ceramics (MRDS No. 8) which contains kaolinitic clay.

Other industrial minerals

Additional investigation is needed about some industrial minerals. For example, some geologic environments may be present for several other industrial mineral deposit types that are not considered in this report. This includes lacustrine borates (Orris, 1992b) in the Verde Formation for which there is little direct evidence of mineralization. Extensive exploration for borates in 1870-1880s likely left few promising sites unexamined (G.J. Orris, verbal commun., 1995) although the exploration history of the Verde basin has not been documented. Water wells in the area should also have notable levels of B (perhaps in the 50-100 ppb) or Li (G.J. Orris, verbal commun., 1995) which may effect the suitability of using the water in agriculture. Twenter and Metzger (1963, p. 95) describe the "water from most wells and springs is generally of a chemical quality for use by plant and animals...[with a] dissolved-solids content * * * less than 500 ppm." Additional checking of spring and well water chemistry is needed, however. The Pliocene and Miocene ages of the Verde Formation, and the presence of contemporaneous volcanism as suggested by locally intertongued basaltic and dacitic pyroclastic deposits (Weir and others 1989) are both characteristics of basins with borates (Orris, 1992b). Given that borate minerals can be fine-grained and often recognizable only by analysis, undiscovered borate deposits cannot be completely discounted.

Aggregate

Background

Natural aggregate include both crushed stone and sand and gravel. Processing is commonly limited to crushing, washing and sizing (Langer, 1988). There is a fundamental division in the aggregate classification between that produced by crushing stone and that produced from unconsolidated surface material. Aggregate is subdivided based on grain size. Sand and gravel deposits should consist of at least 25 percent gravel-sized (4.76-76.2 mm) grains (Langer, 1988). Coarse aggregate include

grains predominantly greater than sieve No. 4 (4.76 mm); most fine aggregate particles are expected to pass a No. 4 sieve (0.187-in square opening, 4.76 mm), retained or passed on the intervening sieves, but with little material passing the No. 200 sieve (0.074 mm). A few particles may be included between the 3/8-in sieve (9.52 mm) and No. 4 sieve (4.76 mm) (Huhta, 1991).

These rules define aggregate at the level of a resource base (Harris, 1984) which includes identified (and perhaps undiscovered) material, suitable and unsuitable for extraction and without regard to economics. Cox and others (1986, p. 1) define a mineral deposit as "a mineral occurrence of sufficient size and grade that it might, under the most favorable of circumstances, be considered to have economic potential." For aggregate, the word "grade" may be replaced by "geotechnical characteristics." In some regional studies, available data may only allow description of aggregate in no greater detail than resource base. Perhaps a better general definition is possible if geotechnical details, important to extractors and users, are considered.

Geotechnical considerations

Use criteria for aggregate can vary from one governmental unit to the next, reflecting local geology, climate and local attitudes concerning aggregate suitability. The intended use for the aggregate is equally important. Suitable aggregate must behave in ways that meet minimum geotechnical criteria (percent fines, grain-size distribution, durability, reactivity) to insure roadways and structures constructed with these materials have acceptable longevity and are within acceptable safety limits. One way to measure aggregate usability is to test and use only aggregate that meet standards defined by ASTM, AASHTO, and by local and state governments. For example, see the Arizona Department of Transportation (ADOT) (1990) standard specifications for road and bridge construction.

Despite the large number of standards in use, some broad generalizations are possible. Review of studies by Zdunczyk (1991), Marek (1991) and Goldman (1994) suggest some general minimum specifications; ADOT standards are given as well if available and are as follows:

- **soundness** -- coarse aggregate should exhibit a reduction of particle sizes of less than 10 percent using ASTM Test C88. ADOT requirements for aggregate in concrete placed above 4,500 ft elevation are that they have a reduction of particle sizes of less than 10 percent using AASHTO T 104.
- **hardness and strength** -- Los Angeles abrasion (wear) test of coarse aggregate gives a loss of material passing the No. 12 sieve (1.68 mm) of less than 30 percent using ASTM Test C131. ADOT requirements are a loss of less than 40 percent using AASHTO T 96.
- **specific gravity** -- should be greater than 2.55 using ASTM Tests C127 and C128.
- **grading** -- fine aggregate should contain no more than 45 percent of material between two consecutive standard sieve sizes. ADOT requires coarse aggregate gradation to conform to specifications in

AASHTO T 43 when tested in accordance with the requirements of Arizona Test Method 201.

- **fines** -- no more than 5 percent of the material should be less than the No. 200 sieve (0.074 mm). ADOT requirements are the amount of material passing No. 200 sieve not to exceed 1.0 percent.
- **fineness modulus** -- a single number index used to report the degree of coarseness or fineness of fine aggregate and computation, as described by White (1991, p. 13-8), as " adding the total percentages, by weight, of an aggregate sample retained on each of a specified series of sieves, and dividing the sum by 100." Lower values indicates a finer material and higher values a coarser material. Fineness modules is important in mix design of portland and asphalt concretes, and should be between 2.3 and 3.1.
- **sand equivalent** -- a test as described by Marek (1991, p. 3-39) "to indicate the relative proportion of plastic fines and dust to sand size particles;" the ratio should be no less than 77 percent using ASTM Test D2419.
- **absorption**--Increase in particle weight should not exceed 3 percent using ASTM Test C127.

These specifications clearly restrict the definition of a sand and gravel deposit and some crushed rocks pits; therefore the size of the aggregate resource base is reduced. For geologists and others examining or assessing sand and gravel deposits for possible consideration as a source of aggregate without use of testing facilities, two general characteristics should be noted:

(1) **sand and gravel should make up at least 85 to 90 percent of the deposit.** Boulders and cobbles may also be included in this calculation if they can be readily crushed. These criteria are not as stringent as those outlined by Goldman (1994). This is because the aggregate industry currently processes material with 10 to 15 percent fines (Drake, 1995). Increased percentage of fines adds expense during extraction, dredging, hauling and disposal or stockpiling. The single problem shared by nearly all aggregate facilities is the production of unusable fines. Discovering a way to use these fines is one of the biggest challenges facing the aggregate industry.

(2) sand and gravel deposits should be well graded, not well sorted. One of the most commonly held ideas among geologists unfamiliar with the aggregate industry is that well-sorted sand and gravel deposits are best. Only one or two mesh sizes may be represented in a well-sorted deposit. Such deposits are not economical because construction companies need sand and gravel aggregate with a mix of grain sizes as defined by the ASTM and other agencies. These standards stipulate that the material must have an interval of particle sizes within certain tolerances. Therefore, aggregate suppliers seek poorly sorted deposits that have wide range of needed grain sizes in a continuous sequence. These are well-graded deposits. As the price of aggregate goes up and the number of

readily available suitable deposits decrease, many producers will become more tolerant of sand and gravel deposits which have more silt or are better sorted. These two criteria represent only a part of the specifications which define usable aggregate.

Aggregate for specific uses, particularly in building and road construction, may require detailed evaluations of the following: fragment geometries, external coatings, impurities, fragment mineralogy and textures, flakiness, amounts of soft/friable fragments, level of hydration, alkali-silica reactivity, other types of chemical reactions, susceptibility to leaching, thermal incompatibility, excess polish and excess shrinkage. Aggregate requirements change from place to place, reflecting different climates and other local conditions. All these factors will need to be considered for modeling given adequate data and expression of assessment needs.

Surficial alluvial aggregate

Introduction

Areas that may provide a future supply of surficial alluvial aggregate are identified using three broad criteria: compilation of sites used for past production, geology and geomorphology, and soil surveys.

The qualities of aggregate deposits important to end use has been established by organizations concerned with the durability and stability of roads and others engineering structures. For example, AASHO developed a rating system with seven classes (A-1 to A-7) where A-1 is assigned to soils with the highest bearing strength (i.e., best for subgrade) and A-7 is assigned to soils which have the lowest strength when wet. ASTM has developed a large number of different standards of geotechnical measures for aggregate. The grain size distribution must be well graded. This can be demonstrated using ASTM [standard] C-33 which gives the acceptable range of grain sizes retained by various sieve sizes for use as fine grained aggregate (ASTM, 1993); 13 grade requirements have been developed of coarse aggregate (ASTM, 1993, table 2). While some standards are established with possible national and international application, local ones can be devised as well. For example, Arizona Department of Transportation (1990) has a different size requirement for fine-grained aggregate than the one given by ASTM (table 3). One useful measure of material suitability for use is the plastic index (PI). It is the range of moisture content that gives a material plastic properties (Krynine and Judd, 1957) and is used to indicate the presence of undesirable minerals in alluvium. For example, ASTM D 3515 requires PI to be 4 or less for material used in asphalt concrete mixtures (White, 1991). Other important characteristics of surficial aggregate deposits include sufficient volume to justify extraction, proximity to market and transport, accessibility (spatially and legally), and minablity.

Verde Valley study

Cox (1995) reported on the sand and gravel resources in the Verde Valley along the southwest edge of the CNF. Six tracts with geologic units known to contain sand and gravel deposits were developed using a number of recently published large scale maps of Quaternary geology including House and Pearthree (1993), Pearthree (1993), and House (1994). The quality of sand and gravel is qualitatively described for each tract as well as for the active channels of the Verde River. Cox (1995, map 1) identified sand- and gravel-bearing units as thin (< 40 feet) or thick (> 40 ft); well or poorly sorted; with or without atypical clast-lithologies (for the area); and those with or without riparian vegetation. Cox (1995) found that the details were sufficient in the large scale maps used in the study to successfully distinguish among the various types of sand and gravel resources using depositional setting or geologic age. This level of mapping of Quaternary geology is not common in Arizona for areas away from major cities.

Soils

Wheeler and Williams (1974) reported the results of a soil survey in the Long Valley area (includes all of the Blue Ridge RD, Long Valley RD, and the southern half of Beaver Creek RD; see fig. 1). Three soil series were noted as possible sources of aggregate--the Arizo which was rated good for sand and fair to good for gravel (50 to 90 percent gravel), the Cowan series which was rated good for sand but unsuitable for gravel, and the Friana soil series which was rated fair for gravel (60-70 percent gravel) but unsuitable for sand. The Arizo soil series, likely with the best quality soil in terms of clast sizes in the Long Valley Area, is mapped as a part of the Cowan soil series. The Arizo and Cowan soil series were also rated good (A-1, A-2 respectively[2]) as a source of road fill. The Arizo is classified as very gravely coarse sand and sand[3] with 15-55 percent passing sieve No. 4, 10-55 percent passing sieve no. 10, 5-15 percent passing sieve no. 40, and 0-5 percent passing sieve no. 200; the Cowan is classified as a loamy fine sand, fine sand loam, and loamy sand with 100 percent passing sieve No. 4, 100 percent passing sieve no. 10, 50-75 percent passing sieve no. 40, and 15-30 percent passing sieve no. 200 (Wheeler and Williams, 1974, Table 9). Depth from surface is 0 to 60 inches; depth to bedrock is usually greater than 60 inches. The Friana soil series was rated good for fill (A-1) but only below a depth of 28 inches (Wheeler and Williams, 1974, Table 10).

The Arizo series develops on various types of materials in flood plain alluvium and is particularly prominent along the West Clear Creek and the Verde River. Soil surface tends to be irregular. Wheeler and Williams (1974) noted that the primary use of the soil is as a source of sand and

---

[2]AASHTO rating system with seven classes (A-1 to A-7) where A-1 is assigned to soils with the highest bearing strength (i.e., best for subgrade) and A-7 is assigned to soils which are the worst with the lowest strength when wet (i.e., clayey soils).

[3]U.S. Department of Agriculture standard texture classification.

gravel. Impurities include calcareous material throughout (pH of 8.4) and organic material in the upper part (as thick as 30 cm (12 in.)) The typical C horizon (up to 1.4 m thick) may contain up to 80 percent cobbles of which many have calcareous coatings (Wheeler and Williams, 1974). The Cowan series (in the which the Arizo is found) develops on flood plains and low terraces containing sandstone and limestone adjacent to the Verde River and West Clear Creek. Impurities included calcareous material throughout (pH of 8.4) and organic matter in the upper part (as thick as 51 cm (20 in.)) The two soil series are mapped together and these areas can have 1) one or the other soil, 2) soils adjacent to one another, and (3) one soil overlaying the other. The proportion of the two soils is highly variable and no estimate of percentages is provided by Wheeler and Williams (1974). Total area of the Cowan and Arzio soil series is 360 ha (890 acres). [Given an average thickness of 1.8 m (6 ft), the total volume of the two soils is on the order of 6.5 million m^3.] Perhaps about half the area (i.e., the Arizo series only) is appropriate (3.3 million m^3) if a source of both sand and gravel is sought. The overall thinness of the sand and gravel makes this soil less attractive. Thicker sections of sand and gravel within the soil might be sought.

The Friana series develops over very gravelly, cindery clay in old lake beds and depressions. These surfaces tend to be nearly level and are found as open parks and meadows in areas with basalts covered by pine trees. They develop from various types of material including volcanic ash, cinder, and basalt in horizons that are between 0.89 to 1.5 m (35 to 60 in.) thick. Gravel is found 0.70 m below the surface and to a depth of about 1.4 m which give an average gravel thickness of 0.7 m which in terms most sand and gravel deposits is too thin to be considered viable as a major supply. Total area of the Friana soil series is 460 ha (1140 acres). [Given an average thickness of 0.7 m (2.3 ft), the total volume of the two soils is on the order of 3.2 million m^3.]

A number of other soils are described and located in the report by Wheeler and Williams (1974) as good for road fill but **not** as a source of sand and gravel. They include the Anthony (good, A-2), Overgaard (good to 10 inches, A-2), the Sanchez (good to poor, A-2 and A-6), and the Tortugas (good, unrated using AASHTO code).

Sources of impurities

Thin layers of bituminous-rank coal have been reported in the upper Paleozoic rocks of Fossil Creek Canyon in the Fossil Springs Wilderness. This area extends south into Tonto National Forest. Coal can be a deleterious mineral to surficial aggregate, particularly for fine aggregate used in fabrication of concrete roof tiles and may result in either leaky or cracked tiles. However, coal is not a usually a problem in other types of concrete or in road construction (Prentice, 1990).

Alluvium characteristics inherited from bedrock sources

Background
Weathering and erosion of bedrock generates alluvium of varying quality. The summary that follows gives general characteristics of alluvium in basins developed along streams from various bedrock units as described by the Arizona Highway Department (1972) and Arizona Department of Transportation (1975). Geologic units are those used by Lane (1992) with some additions from Weir and others (1989) for age and lithology. Pennsylvanian and Permian rocks are particularly complex and have been variously subdivided and grouped (Wier and others, 1989). As many basins and watersheds contain a mix of bedrock lithologies, the alluvium will have a mixture of qualities, some of which are noted below for various rock types:

Basaltic volcanic rocks.
Nearly all rocks of this type weather to form clays. Streams draining the extensive outcrops of these rocks in the CNF contribute to the large areas where suitable aggregate is absent.

Silicic volcanic rocks.
Weathering and erosion of silicic volcanic rocks can generate good quality sand and some gravelly sand but gravel-rich deposits are rare. Steam basins in the Peaks RD, particularly on the flanks of the San Francisco Peaks are most likely to have this type of aggregate.

Verde Formation.
This Tertiary unit is fine grained and not a source of alluvial aggregate.

Moenkopi Formation
Parts of the Moenkopi include: siltstone, claystone, sandstones and minor conglomerate near the base (Kiersch, 1955; Weir and others, 1989), and some parts have been used as a source of dimension stone. The lithologies it contains do not make it a promising source of alluvial aggregate with the possible exception of the basal conglomerates.

Kaibab Formation
The Kaibab consists of interbedded sandy limestone, sandstone, and chert, and weathering generates a very friable mixture of material.

Toroweap Formation and Coconino Sandstone
The lower Permian Toroweap Formation (which has been variously divided and also can include the Coconino Sandstone and is sometimes included with the upper part of the Supai Formation) is a sandstone, siltstone, mudstone, and conglomerate, with some minor dolomitic limestone. The Coconino Sandstone of lower Permian age (Weir and others, 1989) weathers and erodes like the other units noted here to generate sand and silt of a quality not suited for aggregate. PI values have been found between 7 and 20.

Supai Formation
The Permian Supai Formation of thinly layered sandstone and lesser amounts of siltstones weathers and erodes to generate a silty sandy alluvium with friable fragments not suited for aggregate. PI values have been found between 7 and 20. The unit crops out extensively particularly in the Sedona RD (fig. 1).

Redwall and Martin Limestone.
Streams developing on these Mississippian and Devonian age units can contain good-quality sand and gravel deposits free of contaminates. Unfortunately the units crop out in relatively small areas in the CNF.

Tonto Group (Tapeats Sandstone only).
The lower part of the Cambrian age Tapeats Sandstone is a sandstone, both massive and crossbedded, with coarse sand and pebble lenses. It may be arkosic (Weir and others, 1989). The upper part is soft calcareous siltstone and mudstones. Weathered rocks from the lower part are free of clays and have a low plastic index (PI, a desirable property). Inspection of the geologic map by Lane (1992, plate 2) shows the Tapeats with two relatively limited outcrops along the Verde River, south of Camp Verde, in the Beaver Creek RD (fig. 1).

Precambrian Schist
Schist tends to generate soft fissile material of poor quality for use as aggregate. An outcrop of schist is noted along the Verde River south of Camp Verde (Lane, 1992) in the Beaver Creek RD (fig. 1).

Sources of crushed stone for construction and riprap

Introduction

Following is a summary of general characteristics of various geologic units (Arizona Highway Department, 1972; Arizona Department of Transportation, 1975) within the CNF and their likely suitability as sources of crushed stone. Geologic units are those used by Lane (1992) with some additions of Weir and others (1989) for age and lithology. In general, most sandstone units found in Arizona do not meet abrasion requirements and are not usable in asphalitic concrete (Langland, 1987). As noted in the section on alluvium, Pennsylvanian and Permian rocks have particularly complex stratigraphy and have been variously subdivided and grouped.

Basaltic volcanic rocks

As noted previously, basalts are abundant in the CNF. They cover more than three quarters of the forest lands, and are found in two major fields: the San Francisco volcanic field in the Peak RD and Mormon Lake RD (fig. 1), and the Mormon Mountain volcanic field found in Mormon

Lake, Blue Ridge, and Long Valley RDs, and eastern parts of Beaver Creek RD. The Mormon Mountain volcanic field is slightly older and is dominated by Pliocene (?) and Miocene basaltic volcanic rocks in flow units from about 6-12 m thick. Lessor amounts of andesite are found in domes, flows and pyroclastic deposits (Weir and others, 1989). Tertiary and Quaternary basalts are found in the San Francisco volcanic field which was active during the Pliocene and Pleistocene (Newhall and others, 1987). Compositionally the field is dominated by basalt and basaltic andesite with lesser amounts of andesite, benmoreite, and dacite. Basalts and related lithologies have been mapped and studied in numerous studies in and adjacent to the CNF, some of which are identified in the introduction.

A somewhat expanded discussion on basalt is included here because they are so prevalent in the CNF, and likely a continued important source of aggregate. Basalts found in the CNF have been used by ADOT in asphalt mix for road surfaces (Lane, 1992). A number of sites used as a source of aggregate and other construction material by ADOT are described in a material inventory of Coconino and Yavapai Counties (Arizona Department of Transportation, 1975; 1972). See figure 2 for the areas of each county within the CNF.

While basalts can be an excellent source of good quality aggregate as well as fair to excellent riprap (Kiersch, 1955), weathering produces clays, including montmorillonite, that can occur in seams which may not be apparent until quarrying is underway. Intrusive basaltic rocks are less uniform in composition and geotechnical properties and often crop out in ways that make them difficult to mine. As a general rule, younger basaltic volcanic rocks are better than older ones. Therefore, basalts found in the younger San Francisco volcanic field are likely to make better aggregate than those found in the older Mormon Mountain volcanic field.

Basalt and diabase (gabbro or basalt composition) are identified by stone producers as "trap" rocks when intrusive (Dunn, 1991). Composition and mineralogy of these rocks effect their use as aggregate. Glasses are frequently present in extrusive rocks, particularly those with more silica. These rocks then are highly reactive with the alkali in Portland cement. Basaltic and related rock types also can be mechanically weakened by the presence of the round grains of olivine, particularly if abundant. Olivine's rounded crystal form does not interlock well with other minerals or the matrix (Dunn (1991). Quartz (albeit a mineral not commonly found in basalt) is an example of a mineral which tightly interlocks with other crystals (Dunn, 1991; Herrick, 1994). Brattli (1992) found that mechanical strength also decreased as the amphibole to pyroxene ratio increased. Dunn (1991) suggest that amphiboles (actinolite, tremolite, anthophyllite) have more brittle crystals and this may account for some of the decrease in strength as reported by Brattli (1992).

Ferromagnesian minerals in basalts and related rock-types weather rapidly under humid climates, producing swelling clays (e.g., smectite) which destroy the mechanical integrity of the rock (Prentice, 1990). Surface weathering reduces both impact strength and abrasion strength (Haraldsson, 1984). Like weathering, hydrothermal alteration of igneous and other rock types can make them unsuitable for use as aggregate

(Dunn, 1991). Additional mechanically weakness may be due to deuteric alteration of the olivines (by late stage fluids associated with the magma) where the minerals formed may include clay and hydrous iron minerals (iddingsite) (B.B. Houser, written commun., 1997).

Brattli's (1992) study of basaltic igneous rocks suggests that strength increases as the mean grain size decreases and is particularly strong for mean grain sizes under 1 mm. This and possibly other geologic properties may be promising in predicting the mechanical properties (e.g., impact value, flakiness value, abrasion value, etc.) of basaltic rocks given absence of direct measurements.

Presence of cracks and flaws (e.g., holes) affect mechanical strength and are found both along grain boundaries and within the minerals. Most cracks have lengths "usually 1/10 the grain size" (Brattli, 1992, p. 37). Some dense gabbros and diabases can be nearly crack-free (Spunt and Brace, 1974). Rocks with smaller grains can also be expected to have shorter cracks which contributes to better mechanical strength.

The discussion to this point clearly shows that basalt and related rock types have both good and bad features when used as aggregate. Prentice (1990, fig. 3.5b) showed that most basalt can have the same low aggregate abrasion values (results of a UK test somewhat analogous to the Los Angeles abrasion test) as seen for granite. A preliminary model of the Los Angeles abrasion (wear) test (LAWT) results showed low aggregate abrasion values for Quaternary and Tertiary basaltic rocks (fig. 4) from 13 sites in Coconino and Yavapai Counties in and adjacent to the CNF plus 6 sites in basalts from New Mexico. All the sites have LAWT values less than 40 percent loss which is a common maximum in standards for material used as aggregate. These results, as a group, have a distribution of values which can be described using the normal distribution as a preliminary model (fig. 4). The test used to compare sample distributions of Los Angeles abrasion (wear) test values to normal distributions was Lilliefors' test, a special form of the Kolmogorov-Smironov test (Rock, 1988). Some values in models which follow are transformed into logarithms when the histograms for engineering characteristics were skewed. In the Lilliefors' test, the Kolmogorov-Smironov test statistic, d_{max}, is compared to a table of critical values based on the mean and standard deviation from the sample data, not the parent population. The normal or lognormal distribution were rejected as being inappropriate to describe the sample distribution at the 5-percent confidence level.

Herrick (1994) reports that the average LAWT for basalt commonly used for crushed stone is 14 percent and a little lower than the mean value of 21 percent in the preliminary model (fig. 4). On the other hand, unconsolidated cinders, clinkers and other unconsolidated basaltic materials are less suitable in terms of LAWT results with slightly less than half the sites exceeding the 40 percent maximum loss usually allowed for use as aggregate (fig. 5). These results, as a group, have a distribution of values which can be described using the normal distribution as a preliminary model (fig. 5). While cinders, clinker and other unconsolidated basaltic material are easier to mine, their quality is poor

and their low durability will make roads on which they are used subject to more frequent maintenance.

Data on basalts for sites beyond the study area as reported by others tend to have higher variability in aggregate abrasion values; about 15 percent of the samples have values greater (that is, of poor quality) than observed in granites (Prentice, 1990; fig. 3.5b). On the other hand, another UK test, the aggregate crushing test (percent fines produced when standard pressure applied to sample for 10 minutes) shows basalt to be clearly better (less fines) than granite, at least in the context of the test (Prentice, 1990; fig. 3.2b).

Silicic volcanic rocks

Rhyolites are much less abundant than basalts in the CNF. The closest lithology to rhyolites in the Mormon Mountain volcanic field is a rhyodacite dome on the south side of Mormon Mountain and a small dome south of Mormon Lake, both in the Mormon Lake RD (see Weir and others, 1989). Rhyolites are more common in the San Francisco volcanic field (Wolfe, Ulrich, Holm, and others (1987), particularly around the major eruptive centers both in or adjacent to the Peaks RD. Most outcrops are for domes although a few rhyolite flows are noted. An example of rhyolite domes outside of major eruptive centers is an outcrop six miles southwest of Flagstaff at vent 0614 (see sheet 1, Wolfe, Ulrich, Holm, and others (1987).

Three major eruptive centers in the San Francisco volcanic field and in the CNF are Kendrick Peak, O'Leary Peak and the extensive San Francisco Mountain complex. The Kendrick Peak center, in northwest Peaks RD, is partly in the CNF and partly in the Kaibab NF. Seven or eight rhyolite domes are recognized. A rhyolite dome is recognized at Robinson Crater, part of the O'Leary Peak eruptive center, northeast of San Francisco Mountain (Moore and Wolf, 1987). The San Francisco Mountain eruptive complex, north of Flagstaff, includes several rhyolite domes and a few flows of various sizes include ones seen at Core Ridge, Doyle Spring, Hochderffer Hills, Raspberry Springs, Sugarloaf Dome, and White Horse Hills (Wolfe, Ulrich, Holm, and others, 1987).

Rhyolites and related extrusive rocks can make good quality aggregate. As a rule of thumb, coarse-grained igneous rocks tend to have weaker interlocking grains than ones with fine to medium grain sizes. However, they are silica rich and are more likely to contain glass, which is highly reactive with the alkali in Portland cement (Dunn, 1991). Flow-banding may result in undesirable elongated fragments in crushing (Smith and Collis, 1993). Jointing is common and can make outcrops easier to work but may also generate oversized blocks requiring boulder blasting. Platy jointing can occur in smaller intrusive bodies and result in undesirable slabs during crushing.

A preliminary model of LAWT results is developed for rhyolites found in New Mexico (fig. 6) and may be applicable to similar, but less abundant, lithologies in the CNF. The rhyolitic model is problematic in that the highest value (39 percent loss) and lowest value (11.2 percent loss) were excluded from the data set. The distribution used to describe the

remaining data is logarithmic (log base 10) as the data are skewed. A variety of intermediate to silica-rich lithologies is included and improvement in the preliminary model is likely (and needed) given more data. In terms of LAWT results, this group of sites is very comparable to those given for basalts (fig. 4). Herrick (1994) reports that the average LAWT for felsite (includes andesite, dacite, rhyolite and trachyte) commonly used for crushed stone is 18 percent and comparable to the geometric mean of the preliminary model of 20 percent (fig. 6).

Verde Formation

Most of the unit is not sufficiently consolidated to be crushed; some of the limestone lenses may be crushable but would supply only a limited amount of materials.

Chinle Formation

The unit varies from siltstones and sandstones in the lower part, has increasing claystone in the middle, and alternating beds of siliceous limestones and siltstones near the top (Kiersch, 1955). The limestone stringers and lens are likely sources of aggregate of varying quality (Kiersch, 1955).

Moenkopi Formation

This includes an assemblage of siltstone, claystone, sandstone and minor conglomerate occurring near base (Kiersch, 1955; Weir and others, 1989). While used as source of dimension stone, its suitability for quality aggregate is not known. Some of the blocky sandstones in this formation are a fair quality riprap (Kiersch, 1955).

Toroweap Formation and Coconino Sandstone

The Toroweap Formation is predominantly a cross-bedded quartzose sandstone (Weir and others, 1989). No report on its use as aggregate or riprap was found.

The crushing strength of limestone in the Coconino is reported in Kiersch (1955) to be between 4,500 and 9,400 pounds per square inch (PSI) (320 and 1,200 kilograms per square centimeter (kg/cm^2)) based on tests of 4 fine-grained, freshly quarried blocks. The average crushing strength is about 6,700 PSI (470 kg/cm^2). These samples were collected in the Navajo-Hopi Indian Reservations and may not be representative of limestone in the Coconino Sandstone in the CNF.

Kaibab Formation

Langland (1987) noted that the Kaibab Formation has been considered a suitable source of limestone because it contains 70 percent or more calcium and magnesium carbonates. However, like other limestones, it

may be undesirable as a surfacing material due to poor frictional properties (Langland, 1987). Polishing of coarse aggregate in the wear surface of roadways is commonly due to uniform wearing of the aggregate microtextures, particularly those which are fine grain, like limestones. Use of limestone in the wear surface is usually considered suitable if the insolubles are 10 percent or greater (White, 1991). Kiersch (1955) reports that blocky limestone beds in this unit have provided good quality riprap.

A LAWT preliminary model of material taken from quarries and pits in the Kaibab Formation (fig. 7) in northern Arizona suggests that about a fourth of the sites have test results which are too large--exceeding the 40 percent loss limit--usually required for use in aggregate. The distribution used to describe the data is logarithmic (log base 10) as the data are skewed. Herrick (1994) reports that the average LAWT for limestone found elsewhere, outside this study, and commonly used for crushed stone is 26 percent which is lower than the geometric mean of 31 percent in the preliminary model (fig. 7).

Supai Formation.

The Permian Supai Formation consists of thinly layered sandstone and lesser amounts of siltstones. Elsewhere in the Colorado Plateau, limestone lenses have been located and used as fair quality, although small size, riprap (Kiersch, 1955). The unit crops out extensively, particularly in the Sedona RD (fig. 1).

Redwall Limestone

This Mississippian-aged unit commonly crops out as cliffs consisting of massive limestone, about half of which consists of dolomite. Chert and shale beds are also present and degrade the value of crushed stone produced if included. Mineability may be an issue, considering the nature of outcrops.

Three areas need to be checked as a location for possible production of crushed limestone within the Coconino NF as discussed previously.

Martin Limestone

This Devonian-aged unit consists mostly of dolomite that may be suitable as a crushed stone aggregate if not too reactive; particularly if the thin shale beds are avoided.

Tonto Group (Tapeats Sandstone only)

The lower part of the Cambrian age Tapeats Sandstone is both massive and crossbedded, with coarse sand and pebble lens but its suitability for crushing in unknown.

Precambrian schist

Most schist is fissile and not suitable for crushing.

Metals

Introduction

The CNF is notable for the absence of metallic deposits within its boundaries, but a number of formations which are in the CNF do host metallic deposits elsewhere. The three metallic deposit types discussed here lack deposit models: (1) strata-bound manganese, (2) replacement iron deposits, and (3) the base-metal-enriched remnant deposits of solution-collapse breccia pipe uranium deposits. Sediment-hosted Cu deposits, red-bed type, are recognized as permissible in the CNF based on tracts found in the mineral-resource assessment for undiscovered resources of gold, silver, copper, lead, and zinc in the conterminous United States conducted by the USGS from 1993 through 1995 (Ludington and Cox, 1996)).

Strata-bound manganese

Four manganese occurrences have been described in the CNF in the Long Valley district. The Long Valley Ranger and Blue Ridge RDs (fig. 1), are described in MRDS Nos. 2 (Dennison Group), and 5 (Shoup Group). Other nearby occurrences are described in MRDS Nos. 3 (Lost Apache claim) and 4 (Blue Ridge property) (fig. 2). Welty and others (1989) classified the Long Valley mineralization as strata-bound and (or) stratiform. Farnham and Stewart (1958) classified these occurrences as replacement and residual deposits. The Coconino Sandstone at Long Valley has manganese in thin beds and nodular masses, some of which are as large as 100 tons (Dorn, 1969). Farnham and others (1961) described manganese mineral in soil and gravel, which may be detrital.

Dorn (1969) also suggested that some manganese may be precipitated as manganese oxides from groundwater. Cox (1991) suggested that similar-type deposits in northwest Virginia were also transported by ground water. The Coconino Sandstone may provide a geochemical trap like those for residual manganese deposits described by Force (1991) for similar-type deposits in some lower Paleozoic rocks of Virginia. Lane (1992) describes the CNF sites as containing nodules of too little material to be viable as a resource.

Grade and tonnage models for these manganese deposit types are not available. The permissive tracts for these manganese deposit types are outcrops of Coconino Sandstone which hosts the known deposits.

Replacement iron deposits

Iron has been mined from a deposit in the Redwall Limestone for use as mineral pigment (Klemic, 1969). The Seligman iron district (MRDS Record No. M003329, **not** shown on fig. 2), 19 miles south of Seligman, Ariz., was classified by Welty and others (1989) as stratiform. Harrer (1964) described the deposit as a replacement along the contact between the limestone and an andesite porphyry sill. The deposits was worked for hematite (with grades between 55 and 68 percent Fe). This is the only known deposit of this type hosted by the Redwall Limestone in Arizona. Other replacement iron deposits in the western United States are usually found in "volcanic rocks, brecciated igneous rocks, and limestone" (Klemic and others, 1973; p 301). Most iron replacement deposits consist of siderite which can be weathered to hematite (Laznicka, 1985).

A grade and tonnage model for replacement iron deposits is not available. Laznicka (1985) suggests, world-wide, that past production plus known reserves from iron replacement deposits in carbonates are on the order of 130 million t . A model could be attempted, given data on a sufficient number of deposits, but the discussion in Laznicka (1985) also suggests that classification of these iron deposit types will be a problem.

Permissive tracts are the outcrop of the Redwall Limestone. The presence of an intrusive like that at Seligman would be necessary but may not be seen in outcrop. If other limestone-bearing formations are also permissive, outcrops of Kaibab Formation are also possibly permissive for replacement iron deposits as well. The likelihood of intrusives (including sills) is high in most parts of CNF with the possible exception of the Beaver Creek RD.

Remnants of solution-collapse breccia pipe uranium deposits

The assessment of solution-collapse breccia pipe uranium deposits is found in Bliss and Pierson (1994). However, when these deposits become exposed at the surface, they are depleted in uranium and enriched in copper by supergene processes (Finch and others, 1992). In effect, solution-collapse breccia pipe uranium deposits become copper deposits if weathering is extensive; otherwise a copper-enriched zone is present on a solution-collapse breccia pipe uranium deposit. Supergene mineralization, either partial or relatively complete, will be called **remnant deposits** in this discussion. In effect, the model by Finch and others (1992) is not applicable.

Currently recognized remnant deposits like Grandview and Copper Mountain are all from the Colorado Plateau and are, on average, two orders of magnitude smaller (~ 1,000 t) than solution-collapse breccia pipe uranium deposits, which have a median size of 230,000 t (Finch and others, 1992, fig. 21). The largest remnant deposit is 11,000 t. Remnant deposits historically have been worked primarily for copper; grades are usually between 3.2 and 33 percent; the median grade is 10 percent copper. Other base metals produced as by-products include lead in about half the deposits

and zinc in about a third. Lead grades are less than 0.6 percent and zinc grades are less than 0.8 percent. Silver is produced in nearly all the deposits with grades between 9 and 270 g/t; the median grade is 50 g/t. Gold is produced in about a third; the grades are quite low--usually less than 250 ppb. Remnant deposits are **not** reported as producing uranium.

All exposures of the Coconino Sandstone are permissive for these deposits. Forested areas or those covered by thin volcanic sequences are likely areas containing undiscovered deposits of this type.

Sediment-hosted Cu deposits, redbed type

In a mineral-resource assessment for undiscovered resources of gold, silver, copper, lead, and zinc in the conterminous United States (Ludington and Cox, 1996), small portions of two tracts found in the CNF are permissible for sediment-hosted Cu deposits, red-bed type. Tract CP01 was delineated using the presence of permeable sandstones in "the lower part of the Upper Triassic Chinle Formation (including the Shinarump and Agua Zarca Sandstone Member)" (Lindsey, 1996a, p. 72). The White Canyon deposit, Utah (530,000 t at 0.75 percent Cu) is an example of the sediment-hosted Cu deposits, red-bed type on the Colorado Plateau. The world red-bed model (Mosier and others, 1986) can be used to characterize the size and grade distributions of undiscovered deposits (Lindsey, 1996a). The total tract area is 36,300 km^2 including outcrops in Arizona, Colorado, New Mexico and Utah. The estimated number of undiscovered deposits for the full tract are at the following percentiles: 90th--0, 50th--0, 10th--1, 5th--2, and 1st--4.

Tract CP02 of the conterminous United States assessment was delineated using the presence of permeable sandstones in "Hermosa Group and Cutler Formation in Utah, and the Naco Formation in Arizona" (Lindsey, 1996b, p. 73). Examples of known sediment-hosted red-bed type Cu deposits in this tract are all smaller than the median red-bed tonnage of the world red-bed model (Mosier and others, 1986). Therefore, undiscovered deposits consistent with the size and grade distributions of the model are much more unlikely (Lindsey, 1996b). The total tract area is 17,800 km^2 including outcrops in Arizona, New Mexico and Utah and estimates of undiscovered deposits were made at the following percentiles: 90th--0, 50th--0, 10th--0, 5th--1, and 1st--3.

The low probabilities associated with the estimated numbers of undiscovered deposits of sediment-hosted Cu deposits, red-bed type, in the two tracts in the Colorado Plateau (Lindsey, 1996a, b) suggests the chance of undiscovered deposits of this deposit type are remote for the full tracts and will be even less for portions thereof within the CNF. The chance of an undiscovered deposit is slightly higher in areas of tract CP01 than for tract CP02 which may be a consideration in property exchange.

Other metallic deposit types

Tracts for porphyry copper deposits are also found in the resource assessment for undiscovered resources of gold, silver, copper, lead, and zinc in the conterminous United States (Ludington and Cox, 1996). One of the tracts in Arizona-- SB10--is mostly southwest of the CNF (Cox, 1994, 1996). Parts of the tract are defined by using a 10 km buffer zone around Laramide intrusives. Several intrusives suspected to be Laramide in age are found in the southern Black Hills (Luedke and Smith, 1978) about 15 km south of Camp Verde (fig. 1). Luedke and Smith (1978) described the intrusive rocks as being of uncertain assemblage and characteristics. The buffer zone around these intrusives includes rocks in the basement of the southeast end of the Verde Basin and in the CNF southeast of Camp Verde. The area covered with Verde Formation and younger sediments is permissible for an undiscovered porphyry copper deposit.

A number of other deposits types are associated with felsic intrusions into carbonates as well as into other rock types (Cox and others, 1986, table 1) which may be part of the unexposed or poorly exposed assemblage of rocks associated with volcanic centers in the CNF. This includes the base- and precious-metal skarns, veins, and replacement deposits of various types. Evidence of mineralization with a felsic intrusive are seen in workings, including a shaft at least 15 feet (4.6 m) deep and pits at Slate Mountain (Lockrem, 1983) located in the northwest corner of the Peaks RD (located approximately as "SL" on fig. 2). The workings are located in a contact metamorphic zone where rhyolite intrudes into the Martin Formation perhaps showing evidence for skarn-type mineralization. The zone is characterized by bleaching, brecciation, and magnetite and hematite mineralization occurring in concordant and discordant veins (Lockrem, 1983). Trace amounts of copper (300-3000 ppm), lead (1000-3000 ppm), and zinc (60-1200 ppm) were detected in four particularly well-mineralized samples (Lockrem, 1983). The description is too incomplete to classify the prospect by deposit type but the presence of the site is encouraging evidence that undiscovered deposits of types associated with felsic intrusions into carbonates may exist in the CNF.

References Cited

Appleyard, F.C., 1983, Gypsum and anhydite, *in* Lefond, S.J., ed., Industrial minerals and rocks: New York, Society of Mining Engineers, v. 2, p. 775-792.

Arizona Bureau of Mines [Arizona Geological Survey], 1958, Geologic map of Yavapai county, Arizona: Tucson, Arizona Bureau of Mines [Arizona Geological Survey], and University of Arizona, scale 1:375,000.

Arizona Department of Transportation, 1975, A materials inventory of Coconino County: Arizona Department of Transportation, Highway Division and Federal Highway Administration, 123 p.

Arizona Department of Transportation, 1990, Standard specifications for road and bridge construction: Arizona Department of Transportation, Highway Division, 800 p.

Arizona Highway Department, 1972, A materials inventory of Yavapai County: Arizona Highway Deparment and Federal Highway Administration, 65 p.

ASTM, 1993, Annual book of ASTM standards: American Society for Testing and Materials (ASTM), Section 4 construction, v. 04.02, p. 10-15.

Bliss, J. D., 1993, Mineral resource assesment of undiscovered mineral deposits for selected mineral deposit types in the Kaibab National Forest, Arizona, *with a section on* Mineral resource assessment of solution-collapse breccia pipe uranium deposits by J. D. Bliss and Charles T. Pierson: U.S. Geological Survey Open-File Report 93-329, 67 p.

Bliss, J.D., and Pierson, C.T., 1994, Mineral resource assessment of undiscovered solution-collapse breccia pipe uranium deposits in the Coconino National Forest, Arizona: U.S. Geological Survey Open-File Report 94-566, 16 p.

Bliss, J.D., ed., 1992, Developments in mineral deposits modeling: U.S. Geological Survey Bulletin 2004, 168 p.

Bolen, W.P., 1994, Pumice and pumicite, in Mineral commodity summareies in 1993: U.S. Bureau of Mines, p. 1-5.

Brattli, Bjørge, 1992, The influence of geological factors on the mechanical properties of basic igneous rocks used as road surface aggregates: Engineering Geology, v. 33, no. 1, p. 31-44.

Burchard, E.F., 1914, Stone, *in* Mineral resources of the United States, 1913: U.S. Geological Survey, pt. 2, p. 1285-1410.

Chaffee, M.A., King, H.D., Briggs, P.H., Fey, D.L., Knight, R.J., Motooka, J.M., and Roushey, B.H., 1996a, Analytical results for rock and stream-sediment samples, Coconino National Forest, Coconino, Gila, and Yavapai Counties, Arzona: U.S. Geological Survey Open-File Report 96-282-A, 160 p.

Chaffee, M.A., King, H.D., Briggs, P.H., Fey, D.L., Knight, R.J., Motooka, J.M., and Roushey, B.H., 1996b, Analytical results for rock and stream-sediment samples, Coconino National Forest, Coconino, Gila, and Yavapai Counties, Arzona: U.S. Geological Survey Open-File Report 96-282-B, Diskette.

Cox, D.P., 1986, Descriptive model of sediment-hosted Cu, *in* Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, p. 205.

Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, 239 p.

Cox, D.P., Barton, P.B., and Singer, D.A., 1986, Introduction, *in* Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, p. 1-10.

Cox, L.J., 1991, Manganese contents of some lower Paleozoic carbonate rocks of Virginia, *in* Manganese contents of some sedimentary rocks of Paleozoic age in Virginia: U.S. Geological Survey Bulletin 1916, p. B1-B16.

Cox, L.J., 1994, Porphyry copper deposits in Arizona--an example of resource evaluation fo rthe U.S. Geological Survey's National Mineral Assessment of copper, lead, zinc, gold, and silver, *in* Carter, L.M.H., Toth, M.I., and Day, W.C., eds.,USGS research on mineral resources--1994, part A--program and abstract: U.S. Geological Survey Circular 1103-A, p. 19-21.

Cox, L.J., 1995, An evaluation of sand and gravel resources in and near the Verde Valley of the Coconino National Forest, Arizona: U.S. Geological Survey Open-File Report 95-31, 1 sheet, scale 1:126,720, 20p.

Cox, L.J., 1996, SB10--porphyry Cu deposits, Arizona, *in* Ludington, Steve, and Cox, D.P., eds., Data base for a National mineral resource assessment of undiscovered deposits of gold, silver, copper, lead, and zinc in the conterminous United States: U.S. Geological Survey Open-File Report 96-96, CD ROM, p. 491-493.

Dorn, J.V.N.,II, 1969, Manganese, in U.S. Geological Survey, Arizona Bureau of Mines, and U.S. Bureau of Reclamation, Mineral and water resources of Arizona: United States, Senate, 90th Congress, 2d Session, p. 211-225.

Drake, Bob, 1995, Comment--finding answers to the fines problem: Rock Products, v. 98, no. 9, p. 25.

Dunn, J.R., 1991, Geology and exploration, *in* Barksdale, R.D., ed., The aggregate handbook: Washington, D.C., National Stone Association, p. 4-1 to 4-45.

Farnham, L.L., and Stewart, L.A., 1958, Manganese deposits of western Arizona: U.S. Bureau of Mines Information Circular 7843, 87 p.

Farnham, L.L., Stewart, L.A., and Delong, C.W., 1961, Manganese deposits of eastern Arizona: U.S. Bureau of Mines Information Circular 7990, 178 p.

Finch, W.I., Pierson, C.T., and Sutphin, H.B., 1992, grade and tonnage model of solution-collapse breccia pipe uranium deposits, *in* Bliss, J.D., ed., Developments in mineral deposit modeling: U.S. Geological Survey Bulletin 2004, p. 36-38.

Finch, W.I., Sutphin, H.B., Pierson, C.T., McCammon, R.B., and Wenrich, K.J., 1990, The 1987 estimate of undiscovered uranium endowment in solution-collapse breccia pipes in the Grand Canyon Region of northern Arizona and adjacent Utah: U.S. Geological Survey Circular 1051, 19 p.

Force, E.R., 1991, Manganese contents of some lower Paleozoic carbonate rocks of Virginia, *in* Manganese contents of some sedimentary rocks of Paleozoic age in Virginia: U.S. Geological Survey Bulletin 1916, p. A1-A9.

Funnell, J.E., and Wolfe, E.J., 1964, Compendium on nonmetallic minerals of Arizona: San Antonio, Texas, Southwest Research Institute Report, 335 p. [prepared for the Arizona Public Service Company, Phoenix, Arizona]

Geitgey, R.P., 1994, Pumice and volcanic cinder, *in* Carr, D.D., and others, eds., Industrial minerals and rocks: Littleton, Colo., Society for Mining Metallurgy, and Exploration, p. 803-813.

Goldman, H.B., 1994, Sand and Gravel, *in* Carr, D.D., ed., Industrial minerals and rocks (6th ed.): Littleton, Colo., Society for Mining, Metallurgy, and Exploration, Inc., p. 869-877.

Gunther, T.M., 1992, Quantitative assessment of future development of copper/silver resources in the Kootenai National Forest, Idaho/Montana: part II--ecomonic and policy analysis: Nonrenewable Resources, v. 1, no. 4, p. 267-280.

Haraldsson, H., 1984, Relation between petrology and the aggregate properties of Iclandic rocks: Bulletin of the International Association of Engineering Geologists, v. 30, p. 73-76.

Harben, P.W., and Bates, R.L., 1984, Geology of the nonmetallics: New York, Metal Bulletin Inc., 392 p.

Harben, P.W., and Bates, R.L., 1990, Industrial minerals geology and world deposits: New York, Metal Bulletin Inc., 312 p.

Harrer, C.M., 1964, Reconnaissance of iron resources in Arizona: U.S. Bureau of Mines Information Circular IC 8236, 204 p.

Harris, D.P., 1984, Mineral resource appraisal--mineral endowment, resources, and potential supply; concepts, methods, and cases. Oxford, Clarendon Press, 445 p.

Herrick, D.H., 1994, Stone, crushed, *in* Carr, D.D., ed., Industrial minerals and rocks (6th ed.): Littleton, Colo., Society for Mining, Metallurgy, and Exploration, Inc., p. 975-986.

Hoffer, J.M., 1991, Pumice and pumicite in Arizona: Arizona Department of Mines and Mineral Resources Open File Report 91-8, 67 p.

Hoffer, J.M., 1994, Pumice and pumicite in New Mexico: New Mexico Bureau of Mines and Mineral Resources Bulletin 140, 23 p.

Hopkins, R.L., 1990, Kaibab Formation, *in* Beus, S.S., and Morales, Michael, ed., Grand Canyon geology: New York, Oxford University Press, p. 225-245.

House, P.K, 1994, Surficial geology of the southern Verde Valley, Yavapai County, Arizona: Arizona Geological Survey Open-File Report 94-23, 20 p. 3 map sheets, scale 1: 24,000.

House, P.K, and Pearthree, P.A., 1993, Surficial geology of the nortthern Verde Valley, Yavapai County, Arizona: Arizona Geological Survey Open-File Report 93-16, 19 p. 4 map sheets, scale 1: 24,000.

Houser, B.B., 1992, Map of industrial mineral occurrences in the National Forests of Arizona: U.S. Geological Survey Open-File Report 92-687, scale 1:500,000, 1 sheet, 30 p.

Huhta, R.S., 1991. Introduction to the aggregate industry, *in* Barksdale, R.D. ed, The aggregate handbook: Washington, D.C., National Stone Association, p. 1-1 to 1-14.

Keith, S.B., 1969a, Basalt and related rocks, *in* U.S. Geological Survey, Arizona Bureau of Mines, and U.S. Bureau of Reclamation, Mineral and water resources of Arizona: United States, Senate, 90th Congress, 2d Session, p. 315-320.

Keith, S.B., 1969b, Gypsum and anhydrite, *in* U.S. Geological Survey, Arizona Bureau of Mines, and U.S. Bureau of Reclamation, Mineral and water resources of Arizona: United States, Senate, 90th Congress, 2d Session, p. 371-382.

Keith, S.B., 1969c, Limestone, dolomite, and marble, *in* U.S. Geological Survey, Arizona Bureau of Mines, and U.S. Bureau of Reclamation, Mineral and water resources of Arizona: United States, Senate, 90th Congress, 2d Session, p. 385-398.

Keith, S.B., 1969d, Pumice and Pumicite, *in* U.S. Geological Survey, Arizona Bureau of Mines, and U.S. Bureau of Reclamation, Mineral and water resources of Arizona: United States, Senate, 90th Congress, 2d Session, p. 407-412.

Keith, S.B., 1969e, Sandstone, *in* U.S. Geological Survey, Arizona Bureau of Mines, and U.S. Bureau of Reclamation, Mineral and water resources of Arizona: United States, Senate, 90th Congress, 2d Session, p. 441-448.

Kiersch, G.A., 1955, Construction materials: Tucson, University of Arizona Press, v. III, 81 p.

Klemic, Harry, 1969, Iron, *in* U.S. Geological Survey, Arizona Bureau of Mines, and U.S. Bureau of Reclamation, Mineral and water resources of Arizona: United States, Senate, 90th Congress, 2d Session, p. 168-182.

Klemic, Harry, James, H.L., and Eberlein, G.D., 1973, Iron, *in* Brobst, D.A., and Pratt, W.P., eds., United States Mineral Resources: U.S. Geological Survey Professional Paper 820, p. 291-306.

Krynine, D.P., and Judd, W.R., 1957, Principles of engineering geology and geotechnics: New York, McGray-Hill Book Co., 730 p.

Lane, M.E., 1992, Mineral appraisal of the Coconino National Forest, Arizona: U.S. Bureau of Mines Mineral Land Assessment Open File Report MLA 11-92, scale 1:126,720, 3 sheets, 93 p.

Langer, W. H.,, 1988, Natural aggregate of the Conterminous United States: U.S. Geological Survey Bulletin 1594, 33 p.

Langland, Leo, 1987, Locating, sampling, and evaluating potential aggregate deposits, *in* Peirce, H.W., ed., 21st forum on the geology of industrial minerals: Arizona Bureau of Geology and Mineral Technology Special Paper 4, p. 116-119.

Laznicka, Peter, 1985, Emperical metallogeny--depositional environment, lithologic associations, and metallic ores: New York, Elsevier, v. 1, Phanerozic environments, associations and deposits, pt. B, p. 1290.

Lefond, S.J., ed., 1983, Industrial minerals and rocks: New York, American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., v. 1, 722 p.

Lindsey, D.A., 1996a, CP01--sediment-hosted Cu deposits, red bed type, Utah, Arizona, Colorado, New Mexico, *in* Ludington, Steve, and Cox, D.P., eds., Data base for a National mineral resource assessment of undiscovered deposits of gold, silver, copper, lead, and zinc in the conterminous United States: U.S. Geological Survey Open-File Report 96-96, CD ROM, p. 72.

Lindsey, D.A., 1996b, CP02--sediment-hosted Cu deposits, red bed type, Utah, Arziona, New Mexico, *in* Ludington, Steve, and Cox, D.P., eds., Data base for a National mineral resource assessment of undiscovered deposits of gold, silver, copper, lead, and zinc in the conterminous United States: U.S. Geological Survey Open-File Report 96-96, CD ROM, p. 73.

Lockrem, T.M., 1983, Geology and emplacement of the Slate Mountain volcano-laccolith, Coconino County, Arizona: Flagstaff, Northern Arizona University Masters thesis, 103 p.

Ludington, Steve, and Cox, D.P., eds., 1996, Data base for a National mineral resource assessment of undiscovered deposits of gold, silver, copper, lead, and zinc in the conterminous United States: U.S. GeologicalSurvey Open-File Report 96-96, CD ROM.

Luedke, R.G., and Smith, R.L., 1978, Map showing distribution, composition, and age of late Cenozoic volcanic centers in Arizona and New Mexico: U.S. Geological Survey Miscellaneous Investigations Series Map I-1091-A, scale 1:1,000,000.

Marek, C.R., 1991, Basic properties of aggregate, *in* Barksdale, R.D., ed., The aggregate handbook: Washington, D.C., National Stone Association, p. 3-1 to 3-81.

Mason, B.H., 1994, Lightweight aggregate, *in* Carr, D.D., and others, eds., Industrial minerals and rocks: Littleton, Colo., Society for Mining Metallurgy, and Exploration, p. 343-350.

Moore, R.B., and Wolfe, E.W., 1987, Geologic map of the east part of the San Francisco volcanic field, north-central Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-1960, scale 1:50,000, 2 sheets, 46 p.

Moore, R.T., Wilson, E.D., and O'Haire, R.T., 1960, Geologic map of Coconino County, Arizona: Tucson, Arizona Bureau of Mines [Arizona Geological Survey] and University of Arizona, 1 sheet, scale 1:375,000.

Mosier, D.L., Singer, D.A., and Cox, D.P., 1986, Grade and tonnage model of sediment-hosted Cu, in Cox, D.P., and Singer, D.A., eds., 1986, Mineral deposit models: U.S. Geological Survey Bulletin 1693, p. 206-208.

Newhall, C.G., Ulrich, G.E., and Wolfe, E.W., 1987, Geologic map of the southwest part of the San Francisco volcanic field, north-central Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-1958, scale 1:50,000, 2 sheets, 58 p.

O'Driscoll, Mike, 1990, Minerals in the US south-west: Industrial Minerals, May, 1990, p. 53-87.

Orris, G.J., 1992a, Preliminary constituent models of sodium carbonate (sulfate, chloride) brine, *in* Orris, G.J., and Bliss, J.D., ed., Industrial mineral deposit models; grade and tonnage models: U.S. Geological Survey Open-File Report 92-437, p. 63-66.

Orris, G.J., 1992b, Preliminary descriptive model of lacustrine borates, *in* Industrial mineral deposit models--descriptive model for three lacustrine deposit types: U.S. Geological Survey Open-File Report 92-593, p. 2-6.

Orris, G.J., 1992c, Preliminary descriptive model of lacustrine gypsum, *in* Industrial mineral deposit models--descriptive model for three lacustrine deposit types: U.S. Geological Survey Open-File Report 92-593, p. 7-10.

Orris, G.J., 1992d, Preliminary descriptive model of lacustrine halite, *in* Industrial mineral deposit models--descriptive model for three lacustrine deposit types: U.S. Geological Survey Open-File Report 92-593, p. 11-13.

Orris, G.J., 1992e, Preliminary grade and tonnage models of marine bedded gypsum, *in* Orris, G.J., and Bliss, J.D., ed., Industrial mineral deposit models; grade and tonnage models: U.S. Geological Survey Open-File Report 92-437, p. 60-62.

Orris, G.J., and Bliss, J.D., 1989, Industrial-rock and mineral-resource-occurrence models, in Tooker, E.W., ed., Arizona's industrial rock and mineral resources of Arizona--workshop proceedings: U.S. Geological Survey Bulletin 1905, p 39-44.

Orris, G.J., and Bliss, J.D., eds., 1991, Industrial mineral deposit models--Descriptive deposit models: U.S. Geological Survey Open-File Report 91-11a, 78 p.

Orris, G.J., and Bliss, J.D., eds., 1992, Industrial mineral deposit models; grade and tonnage models: U.S. Geological Survey Open-File Report 92-437, 83 p.

Osburn, JoAnne, 1982, Scoria exploration and utilization in New Mexico, *in* Austin, G.S., ed., Industrial rocks and minerals of the Southwest: New Mexico Bureau Mines & Mineral Resources Circular 182, p. 57-59.

Pearthree, P.A., 1993, Geologic and geomorphic setting of the Verde River from Sullivan Lake to Horseshoe Reservoir: Arizona Geological Survey Open-File Report 93-4, 25 p. 5 map sheets, scale 1: 24,000.

Peterson, N.V., and Mason, R.S., 1983, Pumice, pumicite, and volcanic cinders, *in* Lefond, S.J., ed., Industrial minerals and rocks: New York, Society of Mining Engineers, v. 2, p. 1079-1084.

Phillips, K.A., 1987, Arizona industrial minerals: Phoenix, Arizona, Arizona Department of Mines and Mineral Resources Report 4, 2nd edition, 185 p.

Prentice, J.E., 1990, Geology of construction materals: New York, Chapman and Hall, 202 p.

Raup, O.B., 1991, Descriptive model of bedded gypsum; deposit subtype; marine evaporite gypsum (model 35ae), *in* Orris, G.J., and Bliss, J.D., eds.,Industrial mineral deposit models--descriptive deposit models: U.S. Geological Survey Open-File Report 91-11a, p. 34-35.

Rock, N.M.S., 1988, Numerical geology--a source guide, glossary and selective bibliography to geological uses of computers and statistics: New York, Springer, 427 p.

Root, D.H., Menzie, W.D., and Scott, W.A., 1992, Computer Monte Carlo simulation in quantitative resource estimation: Nonrenewable Resources, v. 1, no. 2, p. 125-138.

Schmidt, F.S., 1956, Technology of pumice, pumicite, and volcanic cinders, *in* Chesterman, C.W., ed., Pumice, pumicite, and volcanic cinders in California: California Divsion of Mines Bulletin 174, p. 99-117.

Scott, D.C., 1992, Mineral appraisal of the Kaibab National Forest, Arizona: U.S. Bureau of Mines Mineral Land Assessment Open File Report MLA 6-92, 128 p.

Shenk, J.D., 1992, Lacustrine diatomite, *in* Industrial mineral deposit models--descriptive model for three lacustrine deposit types: U.S. Geological Survey Open-File Report 92-593, p. 23-25.

Singer, D.A., and Cox, D.P., 1988, Application of mineral deposit models to resource assessments: U.S. Geological Survey Year book, Fiscal Year 1987, p. 55-57.

Singer, D.A., and Ovenshine, A.T., 1979, Assessing metallic mineral resources in Alaska: American Scientist, v. 67, no. 5, p. 582-589.

Smith, M.R., and Collis, L., 1993, eds., Aggregates; sand, gravel, and crushed rock aggregates for construction purposes: Bath, United Kingdom, Geological Society Special Publication 9, 539 p.

Spanski, G.T., 1992, Quantitative assessment of future development of copper/silver resources in the Kootenai National Forest, Idaho/Montana; part 1--estimation of the copper and silver endowments: Nonrenewable Resources, v. 1., no. 2, p. 163-183.

Spunt, E.S., and Brace, W.F., 1974, Direct observation of microcavities in crystalline rock [abs.]: International Journal of Rock Mechanics, v. 11, p. 139-150.

Stein, P.H., 1993, From courthouse to restroom; the Flagstaff sandstone industry: Journal of the West, v. 32, p. 53-61.

Twenter, F.R., and Metzger, D.G., 1963, Geology and ground water in Verde Valley--the Mogollon Rim Region, Arizona: U.S. Geological Survey Bulletin 1177, 129 p.

U.S. Bureau of Mines, 1969, Pozzolanic raw material resources in central and western United States: U.S. Bureau of Mines Information Circular 8421, 117 p.

U.S. Bureau of Mines, 1992, Economic analysis of the mineral potential of the East Mojave National Scenic Area, California: U.S. Bureau of Mines Open-File Report OFR 56-92, 78 p.

Ulrich, G.E., and Bailey, N.G., 1987, Geologica map of the SP Mountain part of the San Francisco volcanic field, north-central Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-1956, 2 sheets, scale 1:50,000.

Ulrich, G.E., and Bielski, A.M., 1983, Mineral resource potential map of the West Clear Creek Roadless Area, Yavapai and Coconino Counties, Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-1555-A, scale 1:24,000.

Ulrich, G.E., Billingsley, G.H., Hereford, Richard, Wolfe, E.W., Nealey, L.D., and Sutton, R.L., 1984, Map showing geology, struture, and uranium deposits of the Flagstaff 1° by 2° quadrangle, Arizona: U.S. Geological Survey Miscellaneous Investigations Map I-1446, scale 1:250,000, 2 sheets.

Van Gosen, B.S., and Wenrich, K.J., 1989, Ground magnetometer surveys on known and suspected breccia pipes on the Coconino Plateau, northwestern Arizona: U.S. Geological Survey Bulletin 1683-C, 31 p.

Weir, G.W., and Beard, L.S., 1984, Geologic map of the Fossil Springs Roadless Area, Yavapai, Gila, and Coconino Counties, Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-1568-C, scale 1:24,000.

Weir, G.W., Beard, L.S., and Ellis, C.E., 1983, Mineral resource potential map of the Fossil Springs Roadless Area, Yavapai, Gila, and Coconino Counties, Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-1568-A, scale 1:24,000.

Weir, G.W., Ulrich, G.E., and Nealey, L.D., 1989, Geologic map of the Sedona 30' X 60' quadrangle, Yavapai and Coconino Counties, Arizona: U.S. Geological Survey Miscellaneous Investigations Map I-1896, scale 1:100,00

Weisman, W.I., and McIlveen, Sid, Jr., 1983, Sodium sulfate deposits, *in* , Lefond, S.J., ed., Indusrial Minerals and Rocks (Nonmetallics other than Fuels): New York, American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., vol. 2, p. 1207-1223.

Welty, J.W., Reynolds, S.J., and Spencer, J.E., 1989, AZMIN, a digital database compilation for Arizona's metallic mineral districts: Arizona Geological Survey Open-File Report 89-8, pagination varies.

Wenrich, K.J., 1985, Mineralization of breccia pipes in Northern Arizona: Economic Geology, v. 80, no. 6, p. 1722-1735.

Wenrich, K.J., Billingsley, G.H., and Huntoon, P.W., 1986, Breccia pipe and geologic map of the northeastern Hualapai Indian Reservation and vicinity, Arizona: U.S. Geological Survey Open-File Report 86-458-A, 29 p., 2 plates, scale 1:48,000.

Wenrich, K.J., Billingsley, G.H., and Van Gosen, B.S., 1989, The potential of breccia pipes in the National Tank Area, Hualapai Indian Reservation, Arizona: U.S. Geological Survey Bulletin 1683-B, 34 p.

Wenrich, K.J., Van Gosen, B.S., Balcer, R.A., Scott, J.H., Mascarenas, J.F., Beginger, G.M., and Burmaster, Betsi, 1988, A mineralized breccia pipe in Mohawk Canyon, Arizona--lithologic and geophysical logs: U.S. Geological Survey Bulletin 1683-A, 66p.

Wheeler, L.D., Jr., and Williams, J.A., 1974, Soil survey of Long Valley area, Arizona: U.S. Forest Service and Soil Conservation Service in cooperation with Arizona Agricultural Experiment Station, 78 p., 36 sheets, scale 1:31,680, 1 map, scale 1:253,440.

White, T.D., 1991, Aggregate as a component of portland cement and asphalt concrete, *in* Barksdale, R.D., ed., The aggregate handbook: Washington, D.C., National Stone Association, p. 13-1 to 13-69.

Williams, F.E., and Zinkl, A.V., 1965, Arizona firm mines 200,000 tons of pozzolan for Glen Canyon dam: Rock Products, v. 68, no. 3, p. 97-98.

Wolfe, E.W., and Hahn, D.A., 1982, Geology and geochemistry of the Strawberry Crater roadless areas, Coconino county, Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-1394-A, scale 1:24,000, 1 sheet.

Wolfe, E.W., and Hoover, D.B., 1982, Mineral resource potential map of the Strawberry Crater roadless areas, Coconino county, Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-1394-C, scale 1:24,000, 1 sheet, 6 p.

Wolfe, E.W., and Light, T.D., 1987, Geophysical map of the Strawberry Crater roadless areas, Coconino county, Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-1957, scale 1:50,000, 2 sheets, 85 p.

Wolfe, E.W., Ulrich, G.E., and Newhall, C.G., 1987, Geologic map of the northwest part of the San Francisco volcanic field, north-central Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-1957, scale 1:50,000, 2 sheets, 85 p.

Wolfe, E.W., Ulrich, G.E., Holm, R.F., Moore, R.B., and Newhall, C.G., 1987, Geologic map of the central part of the San Francisco volcanic field, north-central Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-1959, scale 1:50,000, 2 sheets.

Zdunczyk, M.J., 1991, Importing construction aggregate to the continental United States, *in* Darkapoulos, Yolanda, ed., Proceedings of an international symposium, Caribbean industrial minerals; new frontiers for investment: Kingston, Jamaica, Symposium, Nov. 13-17, 1989, Journal of the Geological Society of Jamaica, Special Issue No. 11, p., 99-103.

Table 1. Grade requirements for lighweight aggregate for structural concrete, in percent (ASTM C 330).
[Percent is by weight passing sieves having square openings.]

Size Designation	25.0 mm	19.0 mm	12.5 mm	9.5 mm	4.75 mm	2.36 mm	1.18 mm	0.29 mm	0.149 mm
Fine aggregate									
(4.75 to 0 mm)	-----	-----	-----	100	100-85	-----	80-40	35-10	25-5
Coarse aggregate									
(25.0 to 4.75 mm)	100-95	-----	60-25	-----	10-0	-----	-----	-----	-----
(19.0 to 4.75 mm)	100	100-90	-----	50-10	15-0	-----	-----	-----	-----
(12.5 to 4.75 mm)	-----	100	100-90	80-40	20-0	10-0	-----	-----	-----
(9.5 to 2.36 mm)	-----	-----	100	100-80	40-5	20-0	10-0	-----	-----
Combined fine and coarse aggregate									
(12.5 to 4.75 mm)	-----	100	100-95	-----	80-50	-----	-----	20-5	15-2
(9.5 to 2.36 mm)	-----	-----	100	100-90	90-65	65-35	-----	25-10	15-5

Table 2. Grade requirements for lighweight aggregate for concrete masonry units, in percent (ASTM C 331).
[Percent is by weight passing sieves having square openings.]

Size Designation	25.0 mm	19.0 mm	12.5 mm	9.5 mm	4.75 mm	2.36 mm	1.18 mm	0.29 mm	0.149 mm
Fine aggregate									
(4.75 to 0 mm)	-----	-----	-----	100	100-85	-----	80-40	35-10	25-5
Coarse aggregate									
(12.5 to 4.75 mm)	-----	100	100-90	80-40	20-0	10-0	-----	-----	-----
(9.5 to 2.36 mm)	-----	-----	100	100-80	40-5	20-0	10-0	-----	-----
Combined fine and coarse aggregate									
(12.5 to 4.75 mm)	-----	100	100-95	-----	80-50	-----	-----	20-5	15-2
(9.5 to 2.36 mm)	-----	-----	100	100-90	90-65	65-35	-----	25-10	15-5

Table 3. Grade requirements for lighweight aggregate for insulating concrete, in percent (ASTM C 332).
[Applicable to group II, non-ultra-lightweights; percent is by weight passing sieves having square openings.]

Size Designation	19.0 mm	12.5 mm	9.5 mm	4.75 mm	2.36 mm	1.18 mm	600 µm	300 µm	150 µm
Fine aggregate									
(4.75 to 0 mm)	-----	-----	100	100-85	-----	80-40	-----	35-10	25-5
Coarse aggregate									
(12.5 to 4.75 mm)	100	100-90	80-40	20-0	10-0	-----	-----	-----	-----
(9.5 to 2.36 mm)	-----	100	100-80	40-5	20-0	-----	-----	-----	-----
Combined fine and coarse aggregate									
(12.5 to 0 mm)	100	100-95	-----	80-50	-----	-----	-----	20-5	15-2
(9.5 to 0 mm)	100	100-90	90-65	65-35	-----	-----	25-10	15-5	-----

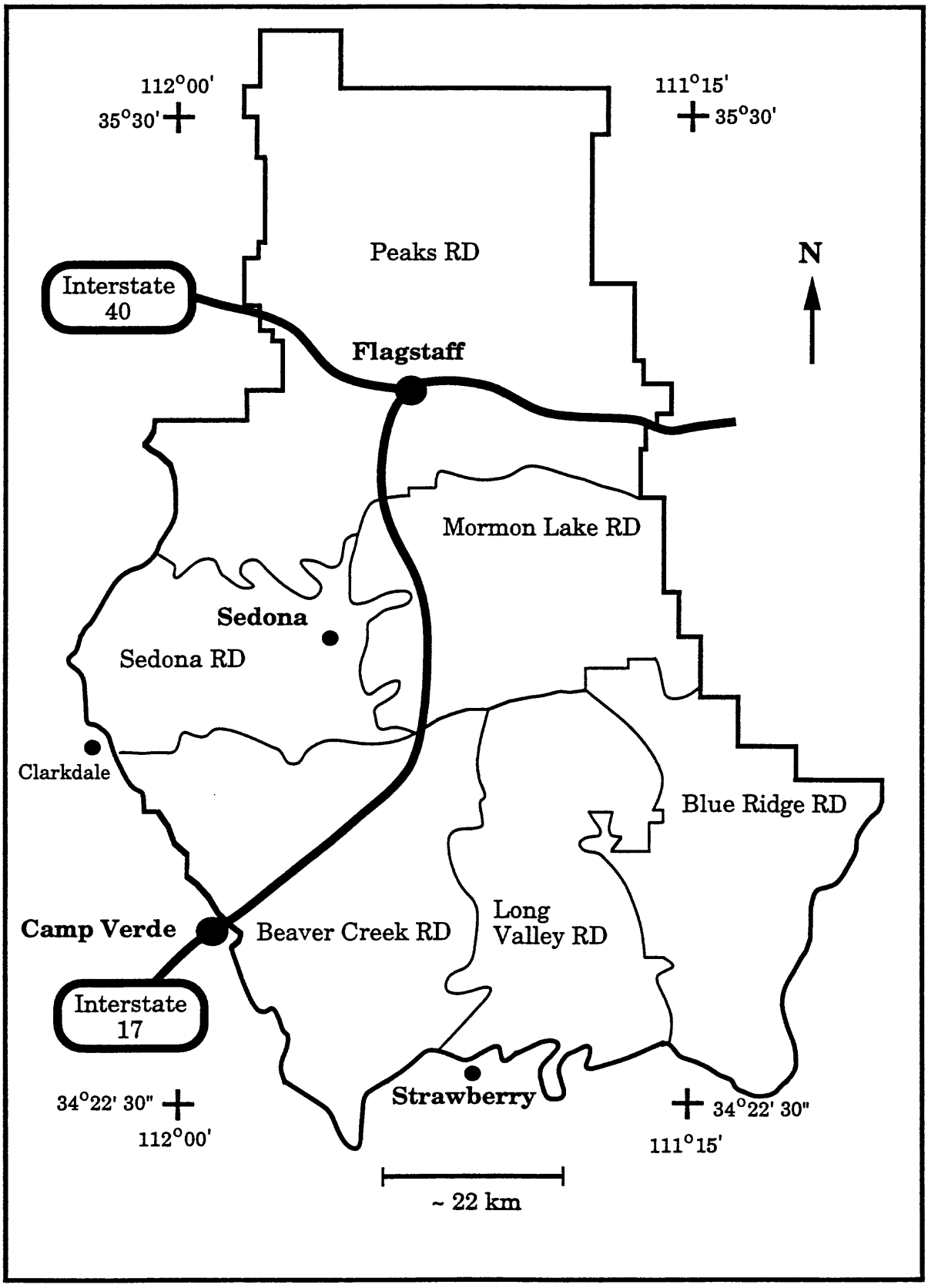

Fig. 1. Location of the six ranger districts of the Coconino National Forest, Arizona.

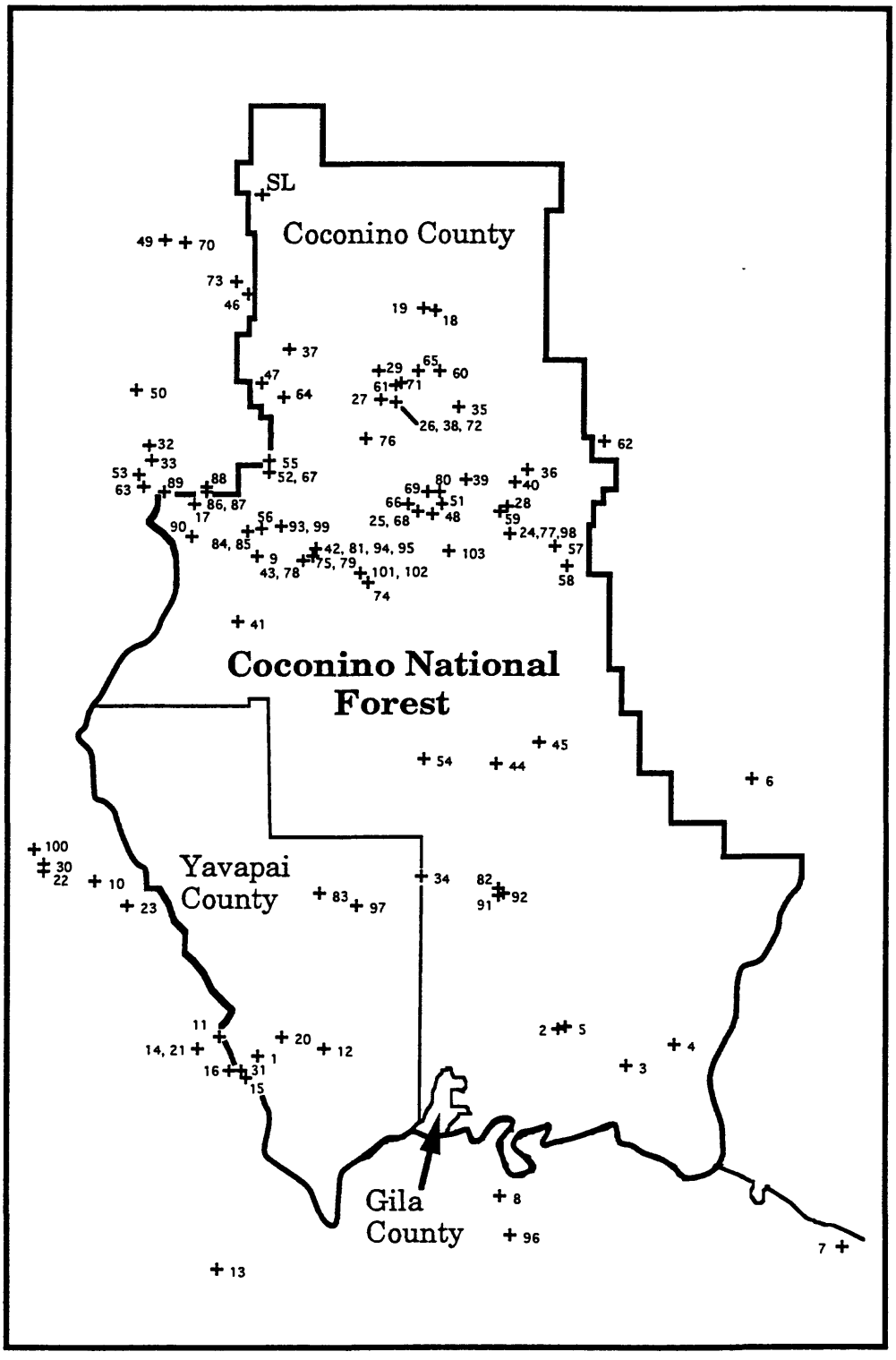

Fig. 2. Location of selected mineral deposits, prospects, and occurrences recorded in MRDS as of May 22, 1995. SL--Slate Mountains, see discussion in text.

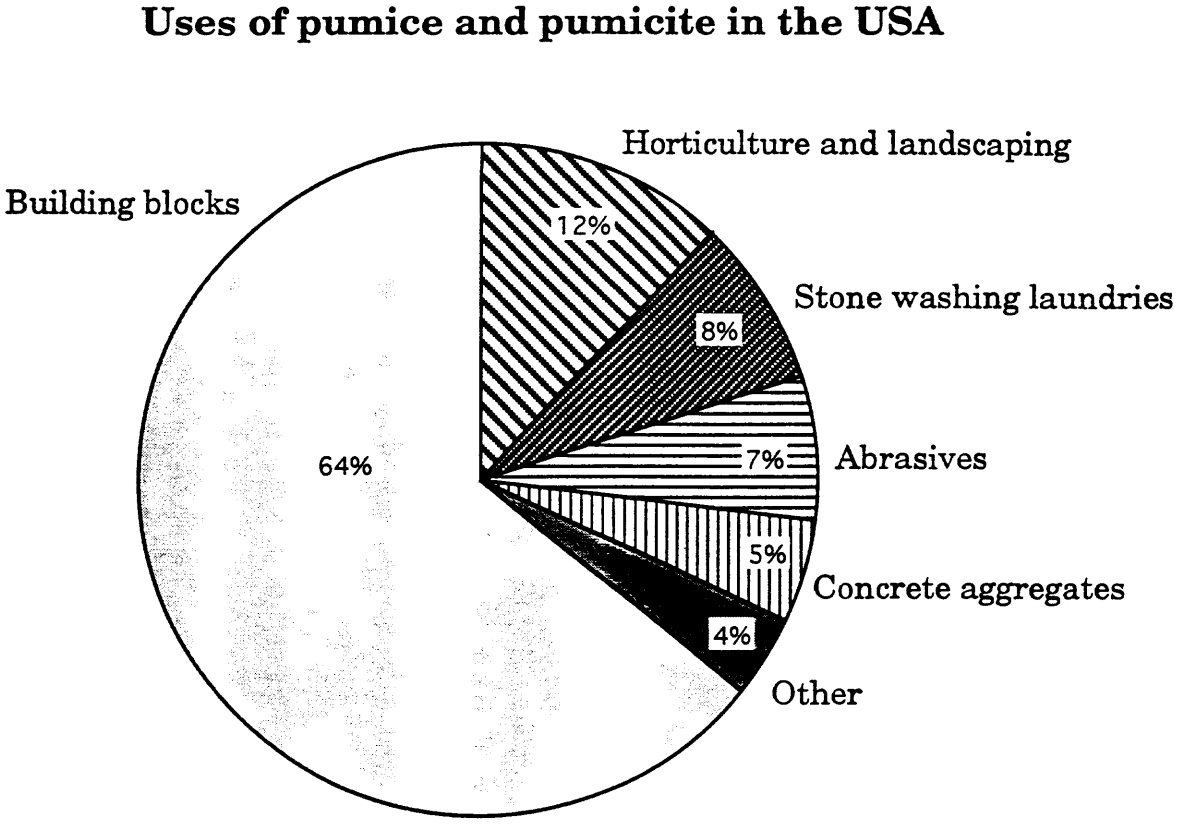

Figure 3. Distribution of uses of pumice and pumicite in the United States in 1993. Class designeated as "Other" includes uses as absorbent, diluents, filter aids, roofing granules, water treatment, and other unspecified uses. Based on data in Bolen (1994).

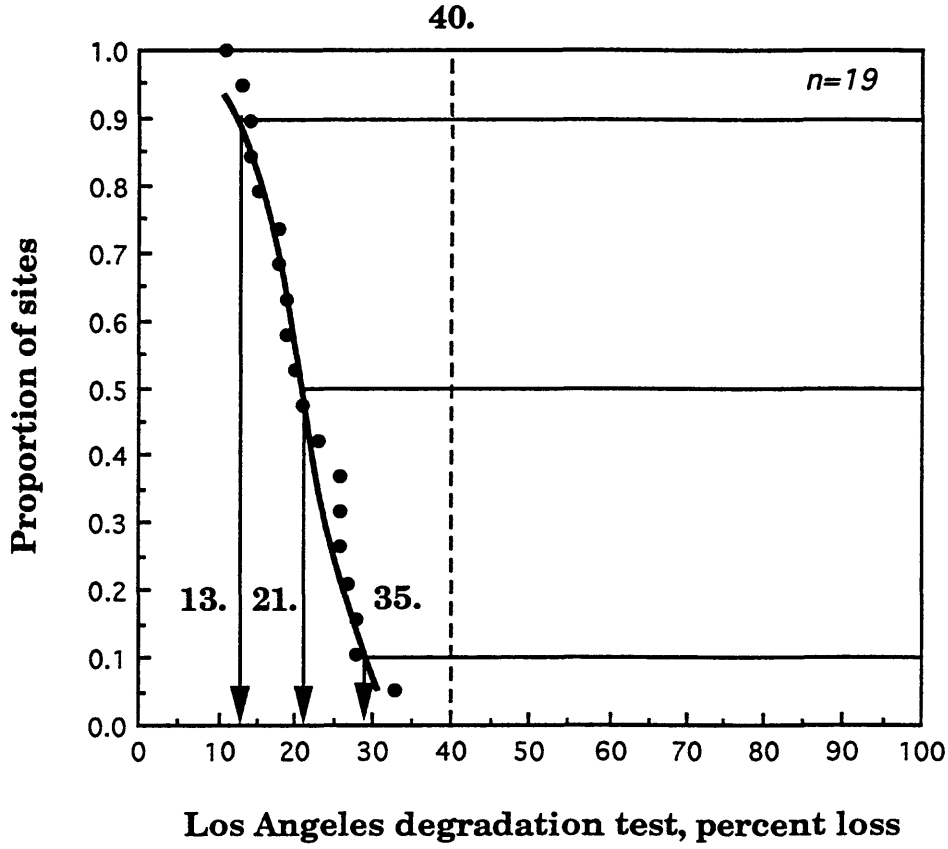

Figure 4. Degradation of Quaternary and Tertiary basaltic rocks extracted from quarries in Coconino and Yavapai Counties, Arizona (N=13), and New Mexico (N=6) as measured by the Los Angeles wear test (500 rotations). Dash line for 40 percent loss which is a common maximum in several ASTM and AASHTO standards for several different uses of aggregates in construction of roads.

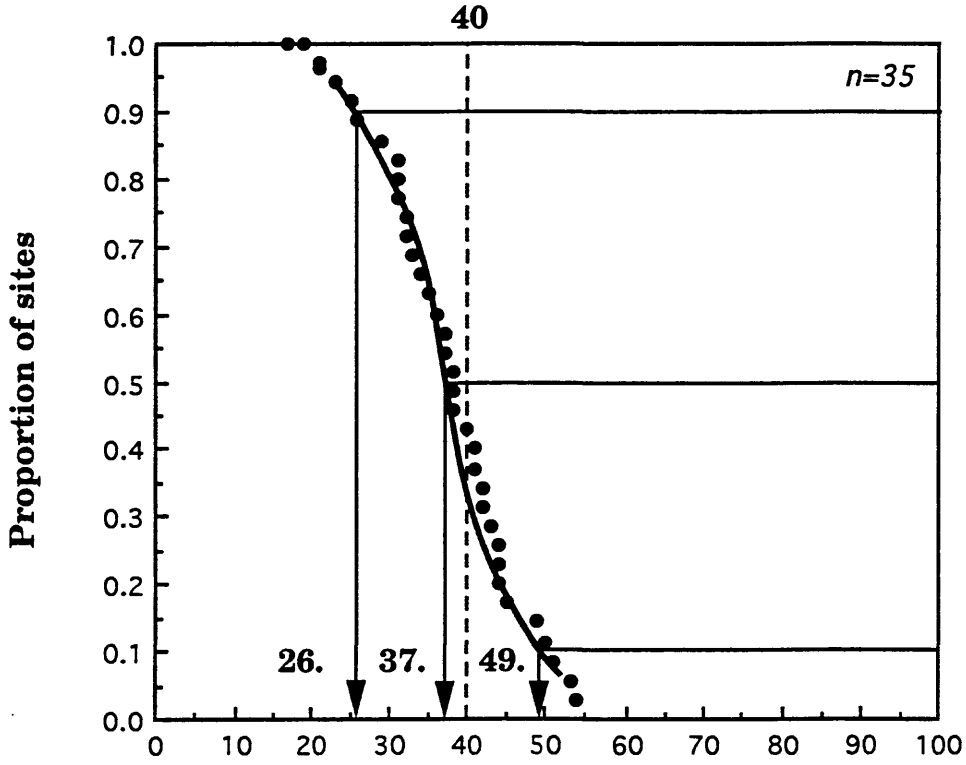

Figure 5. Degradation of unconsolidated cinders, clinkers, and other Quaternary and Tertiary basaltic material extracted from pits in Northern Arizona as measured by the Los Angeles degradation test (500 rotations). Dash line for 40 percent loss which is a common maximum allowed in several ASTM and AASHTO standards for aggregates used in construction of roads.

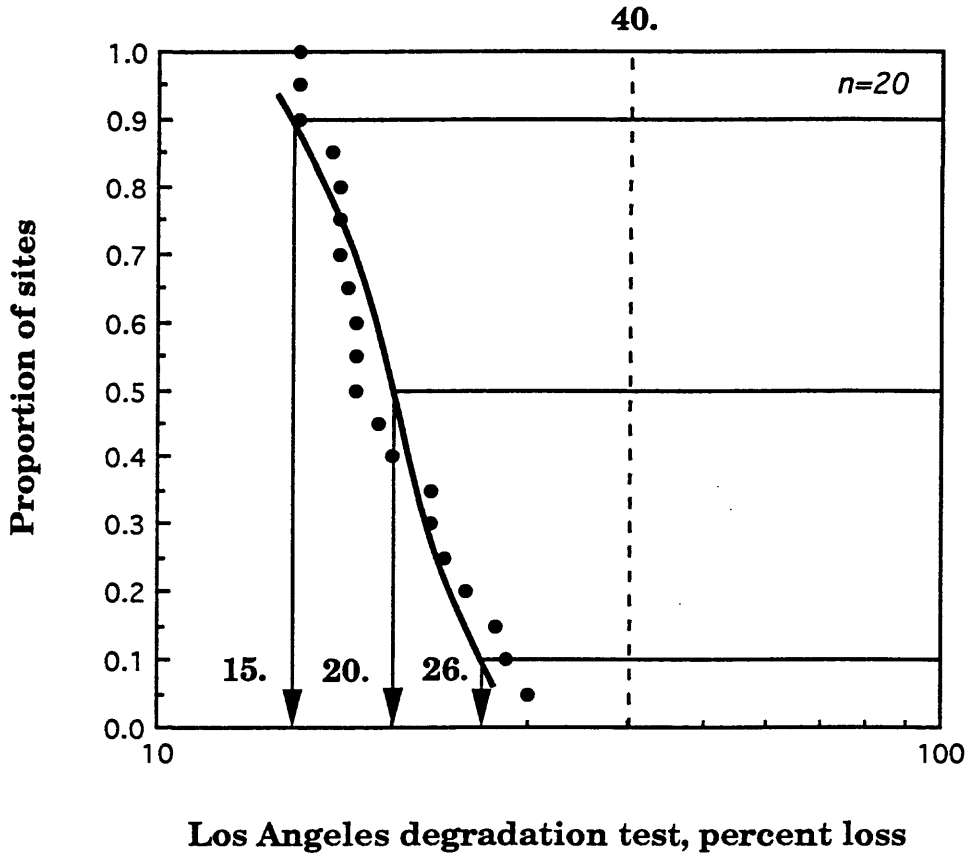

Figure 6. Probable resistance of rhyolitic rocks in CNF to degradation by abrasion and impact as measured by the Los Angeles degradation test. Based on rhyolites found in New Mexico. Highest and lowest values (not shown) excluded from model (see text). Dash line for 40 percent loss which is a common maximum in several ASTM and ASSHTO standards for several different uses of aggregates in construction of roads.

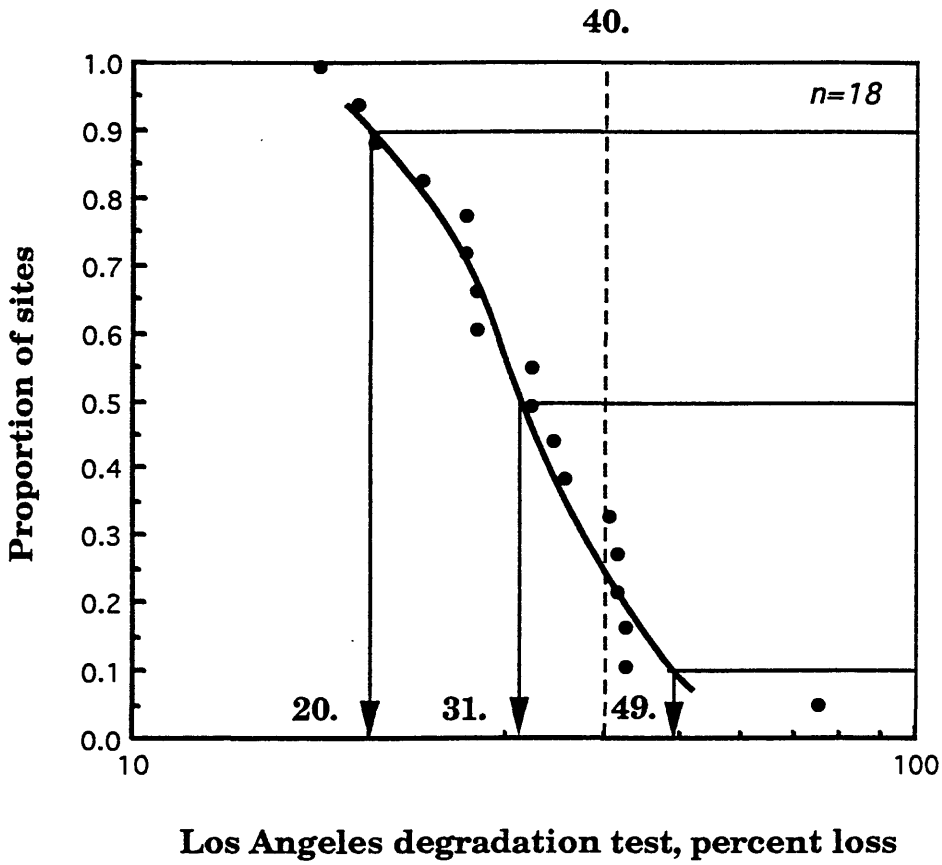

Figure 7. Probable resistance of rocks from 18 quarries and pits in the Kiabab Formation in, or adjacent to, the CNF. Degradation measured by abrasion and impact in the Los Angeles degradation test (500 rotations). Based on sites in northern Arizona. Dash line for 40 percent loss which is a common maximum in several ASTM and AASHTO standards for several different uses of aggregates in construction of roads.

Appendix A

List of MRDS records found in appendix B (which follows) sorted by commodities or byproduct commodities including MRDS sequence numbers. Some records are listed under several different commodities.

Commodity	MRDS sequence numbers
ash, pumiceous	26
basalt	96
bentonite	1
brine	11, 31
cement rock (natural)	30
cinders	17-19, 24, 25, 32-37, 39, 40-59, 61-64, 66-75, 77-79, 81-95, 97-99
clay	1, 7-9, 16, 22, 23
clay, brick	22
diamond	6
diatomite	16
graphite	6
gypsum	1, 14-16, 20, 21
halite	11, 21, 31
kaolin/kaolinitic clay	8
limestone	30, 76, 100-103
marble	13, 76
Mn	2-5
obsidian	72
perlite	72
pumice	12, 18, 26-28, 38, 60, 65
pumice sand	65
pumice, block	26, 27, 29
pumice, pozzolonic	26, 29, 38
pumice, stonewashing	26, 29
sand and gravel	10, 80
scoria	83, 97
shale	22
sodium sulfates	11, 21, 31
stone, crushed/broken	25

Appendix B

Descriptions of deposits, prospects, and occurrences of selected minerals found in and adjacent to the CNF and as reported in the Mineral Resources Data System (MRDS) as of May 22, 1995. Sites listed here are also located by sequence number (in upper right-hand corner of each record) on figure 2. MRDS records are listed here in the same order.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 1 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 1 of 103

Record Number	TC10150	*User Field*	*U93/8
Record Type	Site	*File Link ID*	IMS, CIMRI
Reporter	BOLM, KAREN S.		
Reporter Affiliation	USGS	*Report Date*	89 08
Updater	ORRIS, GRETA J.		
Updater Affiliation	USGS	*Update Date*	93 04
Site Name	LARSON QUARRY		
Synonym Name	ARIZONA GYPSUM, VERDE GYPSUM, CAMP VERDE GYPSUM		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	YAVAPAI		
Physiographic Prov	11		
Drainage Area	15		
Quad 250k	HOLBROOK		
Quad 24k	CAMP VERDE		
Latitude	34-32-10N	*Decimal Lat*	34.53611
Longitude	111-46-57W	*Decimal Long*	-111.7825
Accuracy	ACC		
UTM Northing	3821683.	*UTM Easting*	428192.5
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
11		013N	005E	GILA AND SALT RIVER

Location Comments ON EAST SIDE OF VERDE VALLEY, 4.5 MILES SE OF CAMP VERDE.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	GYP CLY1
Major	GYP
Minor	CLY1
Ore Materials	GYPSUM, BENTONITE
Commod Subtypes	BENTONITE USED FOR IRON ORE PELLETIZING AND CANAL-RESERVOIR SEALER.
Analytical Data	90% OR MORE GYPSUM, PURE, WHITE, MASSIVE, MICROCRYSTALLINE AND GRANULAR

-- Geology --

Age Mineralization	CEN
Host Rock Type	MUDSTONE, VOLCANIC ASH
Host Rock Age	CEN TERT?

Host Rock Type Name	Age	Host Rock Unit Name	Age

VERDE FORMATION CEN

-- Deposit Description --

Deposit Size Large

--Individual Ore Bodies--

USGS Model Name LACUSTRINE GYPSUM *Model Number* 35B.4

Deposit Type LACUSTRINE EVAPORITE, SEDIMENTARY

Thickness 100 *Units* FT

Deposit Desc Comm PROBABLY COVERS SEVERAL SCUARE MILES. THE GYPSIFEROUS SEQUENCE, AS MUCH AS 100 FT THICK, CONTAINS A SERIES OF NEARLY PURE, FLAT-LYING GYPSUM BEDS INTERBEDDED WITH MUDSTONE AND VOLCANIC ASH.

-- Exploration and Development --

Production Size Yes

Developent Status Intermittent Producer

-- Description of Workings --

Desc Workings Surface

-- Reference --

Reference KEITH, S.B., 1969, GYPSUM, IN USGS, AZ BUREAU OF MINES, AND U.S. BUREAU OF RECLAMATION, 1969, MINERAL AND WATER RESOURCES OF ARIZONA: ARIZONA BUREAU OF MINES BULLETIN 180, 638 P.

Reference PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERALS CARD FILE.

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Reference ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES, 1989, DIRECTORY OF ACTIVE MINES IN ARIZONA, INCORPORATING SAND AND GRAVEL OPERATIONS1989-90: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES DIRECTORY, 14 P.

Info Source 12

Rsv/Rso Src Info AZ BUREAU OF MINES BULLETIN 180, P. 375.

Resv/Reso Comm RESERVED AND RESOURCES ESTIMATED IN MILLIONS OF TONS

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 2 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 2 of 103

Record Number	M002911	*User Field*	*U95/05
Record Type	Site	*File Link ID*	CIMRI
Reporter	BRIGHT, DANIEL (CREASEY, S.C.)		
Reporter Affiliation	USGS	*Report Date*	79 06

Editor Name	Type	Affiliation	Date	Comments
BRIGHT, DANIEL (CREASEY, S.C.)	R	USGS	6/1/79	
ORRIS, GRETA J.	U	USGS	5/22/95	

Site Name DENISON GROUP
Synonym Name BLACK DIAMOND, MCCLOSKEY CLAIM, LINESBA CLAIM

-- Location Information --

District Name	LONG VALLEY DISTRICT		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11		
Drainage Area	15060203		
Quad 250k	HOLBROOK		
Quad 24k	LONG VALLEY (1965)		
Elevation	6860 FT		
Latitude	34-34-13N	*Decimal Lat*	34.57027
Longitude	111-20-05W	*Decimal Long*	-111.33472
Accuracy	EST		
UTM Northing	3825260	*UTM Easting*	469300
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
30		014N	010E	GILA AND SALT RIVER

Position 1.5 MILES NORTHWEST OF CLINTS WELL.
Location Comments INFO FROM LAND.ST :01, 41?

-- Commodity Information --

Commodity Type	Metallic
Commodities	MN
Major	MN
Ore Materials	PSILOMELANE, PYROLUSITE
Non-Ore Materials	GANGUE CONSISTS OF SOFT SANDY LIMESTONE AND IRON OXIDES

-- Geology --

Record Number M002911 *(....Continued)*

Ore Control MAJORITY OF DEPOSITS CONFORM TO STRIKE AND DIP OF ENCLOSING LIMESTONE

Host Rock Type Name	Age	Host Rock Unit Name	Age
LIMESTONE	PERM	KAIBAB LIMESTONE	PERM

-- Deposit Description --

Deposit Size Small

--Individual Ore Bodies--

Deposit Type BEDDED REPLACEMENT

Deposit Form SEAMS, LENSES

Length	10	*Units*	FT
Width	3	*Units*	FT
Thickness	8	*Units*	FT

-- Exploration and Development --

Production Size Small

Developent Status Developed Producer, Inactive

-- Description of Workings --

Desc Workings Surface and Underground

--Individual Workings--

Depth Below Surf	25	*Units*	FT
Overall Length	200	*Units*	FT
Overall Width	100	*Units*	FT
Overall Area	20000	*Units*	SQ FT

Workings Comments THESE ARE THE DIMENSIONS OF THE LARGEST AND MOST PRODUCTIVE OF THE ACCESSIBLE OPEN PIT WORKINGS ON THE DENISON PROPERTY.

General Comm DENISON PROPERTY COMPRISES NINE PATENTED CLAIMS. ; INFO.SRC : 1 PUB LIT

-- Reference --

Reference FARNHAM, L.L., AND STEWART, L.A., 1958, MANGANESE DEPOSITS IN WESTERN ARIZ.: USBM, INFORMATION CIRCULAR 7843, P. 7-10.

Reference JONES, E.L., JR., 1920, DEPOSITS OF MANGANESE ORE IN ARIZ.: USGS BULL. 710-D, P. 125-128.

-- Annual Production --

Item	Acc	Amount	Th Units	Year	Grade
ORE	EST	0.20000	TONS	1940	40 % MN
ORE	EST	0.35000	TONS	1952	

-- Cumulative Production --

Item	Acc	Amount	Th Units	Years	Grade
ORE	EST	0.21500	TONS	1927 - 1929	45 - 48 % MN
ORE	EST	2.20000	TONS	1940 - 1950	

Record Number M002911 *(....Continued)*

ORE - CON	EST	3.70000	TONS	1927 - 1954	40 % MN

Prod Source Info USBM IC 7843

Prod Comments ITEM 10 : TOTAL PRODUCTION OF DENISON PROPERTY FROM 1927 - 1954 .

Mineral Resources Data System (MRDS)

Report Title
Issue Date Monday, March 9, 1992 *Number* 3 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 3 of 103

Record Number	M002930	*User Field*	
Record Type	Site	*File Link ID*	
Reporter Affiliation	USGS	*Report Date*	
Updater	BRIGHT, DANIEL; CREASEY, S. C.		
Updater Affiliation		*Update Date*	79 06
Site Name	LOST APACHE CLAIM		

-- Location Information --

District Name	LONG VALLEY DISTRICT		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11		
Drainage Area	15020008		
Land Status	41		
Quadrangle	BLUE RIDGE RESERVOIR (1965)	*Scale*	24000
Quad 250k	Holbrook		
Elevation	7040 FT		
Latitude	34-31-31N	*Decimal Lat*	34.52527
Longitude	111-13-49W	*Decimal Long*	-111.23027
UTM Northing	3820230	*UTM Easting*	478870
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
07		013N	011E	G & SR

Position	3.9 MILES SOUTHWEST OF BLUE RIDGE SPILLWAY
Location Comments	UTM EST

-- Commodity Information --

Commodity Type	Metallic
Commodities	MN
Major	MN
Ore Materials	PSILOMELANE

-- Geology --

Host Rock Type	RESIDUAL SOIL FROM CLAYEY, DECOMPOSED LIMESTONE
Host Rock Age	PERM

-- Deposit Description --

Deposit Size	Small

--Individual Ore Bodies--

B-6

Record Number	M002930	*(....Continued)*

Deposit Type SURFACE FLOAT

Deposit Form FRAGMENTS AND NODULES

Deposit Desc Comm REFERENCE STATES THAT MANGANESE DEPOSITS OCCURRED TO DEPTHS OF SEVERAL FEET WITHIN SOIL.

-- Exploration and Development --

Production Size Small

Developent Status Developed Producer, Inactive

-- Description of Workings --

Desc Workings Surface

--Individual Workings--

Workings Comments EXPLORATORY OPENINGS CONSISTED OF SHALLOW PITS AND TRENCHES.

-- Reference --

Reference FARNHAM, L. L. AND STEWART, L. A., 1958 , MANGANESE DEPOSITS IN WESTERN ARIZ.: USBM, I.C. #7843 , P. 11 .

Info Source 1

-- Cumulative Production --

Item	Acc	Amount	Th Units	Years	Grade
ORE	EST	0.00200	TONS	1949	

Prod Source Info USBM IC #7843

Prod Comments ITEM #8 : REFERENCE STATES THAT PRODUCTION HAS AGGREGATED A "FEW" TONS OF ORE SINCE FIRST EXPLORED IN 1949 .

Mineral Resources Data System (MRDS)

Report Title
Issue Date Monday, March 9, 1992 *Number* 4 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 4 of 103

Record Number	M002931	*User Field*	
Record Type	Site	*File Link ID*	
Reporter Affiliation	USGS	*Report Date*	
Updater	BRIGHT, DANIEL; CREASEY, S. C.		
Updater Affiliation		*Update Date*	79 06
Site Name	BLUE RIDGE PROPERTY		

-- Location Information --

District Name	LONG VALLEY DISTRICT		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11		
Drainage Area	15020008		
Land Status	41		
Quadrangle	BLUE RIDGE RESERVOIR (1965)	*Scale*	24000
Quad 250k	Holbrook		
Elevation	6560 FT		
Latitude	34-33-02N	*Decimal Lat*	34.55055
Longitude	111-09-26W	*Decimal Long*	-111.15722
UTM Northing	3823020	*UTM Easting*	485580
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
35		014N	011E	G & SR

Position 1.4 MILES EAST OF BLUE RIDGE RESERVOIR
Location Comments UTM EST

-- Commodity Information --

Commodity Type	Metallic
Commodities	MN
Major	MN
Ore Materials	PSILOMELANE

-- Geology --

Host Rock Type	RESIDUAL SOIL FROM SANDY, DECOMPOSED LIMESTONE
Host Rock Age	PERM
Geology Comm	MANGANESE FLOAT WAS FOUND OVER AN AREA OF MORE THAN A SQUARE MILE.

-- Deposit Description --

Deposit Size Small

B-8

--Individual Ore Bodies--

Deposit Type	REPLACEMENT/SURFACE FLOAT		
Deposit Form	LENSES AND POCKETS		
Length	4	*Units*	FT
Thickness	8	*Units*	IN
Depth to Top	3	*Units*	FT

Deposit Desc Comm PSILOMELANE REPLACES SOIL AND OVERBURDEN.

-- Exploration and Development --

Production Size Small

Developent Status Developed Producer, Inactive

-- Description of Workings --

Desc Workings Surface

--Individual Workings--

Overall Length	10	*Units*	FT
Overall Width	6	*Units*	FT
Overall Area	60	*Units*	SQ FT

Workings Comments PROSPECTED BY OPEN CUTS, WITH A MAXIMUM DEPTH OF 5 FT.

General Comm BLUE RIDGE PROPERTY CONSISTS OF 2 UNPATENTED CLAIMS.

-- Reference --

Reference FARNHAM, L. L. AND STEWART, L. A., 1958 , MANGANESE DEPOSITS IN WESTERN ARIZ.: USBM, IC #7843 P. 11 .

Reference USBM CARD FILE.

Info Source 1 2

-- Annual Production --

Item	Acc	Amount	Th Units	Year	Grade
ORE	EST	0.00200	TONS	1942	

Prod Source Info USBM IC 7843

Prod Comments ITEM #1 : REFERENCE STATES; "A FEW TONS OF SORTED ORE WAS PRODUCED DURING 1942".

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 5 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 5 of 103

Record Number	M002985	*User Fieid*	*U95/05
Record Type	Site	*File Link ID*	CIMRI
Reporter	BRIGHT, DANIEL (CREASEY, S.C.)		
Reporter Affiliation	USGS	*Report Date*	79 06

Editor Name	Type	Affiliation	Date	Comments
BRIGHT, DANIEL (CREASEY, S.C.)	R	USGS	6/1/79	
ORRIS, GRETA J.	U	USGS	5/22/95	

Site Name SHOUP GROUP

-- Location Information --

District Name	LONG VALLEY DISTRICT		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physicgraphic Prov	11 COLORADO PLATEAU		
Drainage Area	15060203		
Quad 250k	HOLBROOK		
Quad 24k	LONG VALLEY (1965)		
Elevation	6880 FT		
Latitude	34-34-30N	*Decimal Lat*	34.575
Longitude	111-19-28W	*Decimal Long*	-111.32444
Accuracy	EST		
UTM Northing	3825780	*UTM Easting*	470240
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
30 29 20 19		014N 014N	010E 010E	GILA AND SALT RIVER

Position 1.6 MILES NORTHWEST OF CLINTS WELL.
Location Comments INFO FROM LAND.ST :01, 41

-- Commodity Information --

Commodity Type	Metallic
Commodities	MN
Major	MN
Ore Materials	PSILOMELANE, PYROLUSITE
Non-Ore Materials	GANGUE CONSISTS OF SOFT SANDY LIMESTONE AND IRON OXIDES

-- Geology --

Ore Control MAJORITY OF DEPOSITS CONFORM TO STRIKE AND DIP OF ENCLOSING LIMESTONE

R-10

Record Number M002985 *(....Continued)*

Host Rock Type Name	Age	Host Rock Unit Name	Age
LIMESTONE	PERM	KAIBAB LIMESTONE	PERM

-- Deposit Description --

Deposit Size Small

--Individual Ore Bodies--

Deposit Type BEDDED/REPLACEMENT

Deposit Form SEAMS, LENSES

Thickness 8 *Units* FT

Depth to Top 50 *Units* FT

-- Exploration and Development --

Production Size Small

Developent Status Developed Producer, Inactive

-- Description of Workings --

Desc Workings Surface and Underground

--Individual Workings--

Depth Below Surf 70 *Units* FT

Overall Length 500 *Units* FT

Overall Width 50 *Units* FT

Overall Area 25000 *Units* FT

Workings Comments SURFACE WORKINGS: TRENCHING BOTTOMED IN DETRITAL MATERIAL, REMOVING ONLY VARYING AMOUNTS OF MANGANESE FRAGMENTS. TRENCH NOT EXCEEDING 20 FT. IN DEPTH.

General Comm SHOUP PROPERTY COMPRISES 14 LODE CLAIMS, 4 OF WHICH ARE PATENTED. ; INFO.SRC : 1 PUB LIT

-- Reference --

Reference FARNHAM, L.L., AND STEWART, L.A., 1958, MANGANESE DEPOSITS IN WESTERN ARIZ.: USBM, INFORMATION CIRCULAR 7843, P. 10-11.

-- Cumulative Production --

Item	Acc	Amount	Th Units	Years	Grade
ORE	EST	0.60000	TONS	1939 - 1945	

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 6 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 6 of 103

Record Number	TC00275	*User Field*	*93/4
Record Type	Site	*File Link ID*	IMS, CIMRI
Reporter	WELLS, T.M., (ORRIS, G.J.)		
Reporter Affiliation	USGS	*Report Date*	92 07
Site Name	DIAMOND OCCURRENCES		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11		
Land Status	00		
Quad 250k	HOLBROOK		
Quad 24k	CHAVEZ MTN NE		
Other Quad Name	CHAVEZ MTN EAST	*Scale*	24000
Latitude	34-53-00N	*Decimal Lat*	34.88333
Longitude	111-02-30W	*Decimal Long*	-111.04166
Accuracy	EST		
UTM Northing	3859908.	*UTM Easting*	496192.3
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
		17N	12.5E	GILA AND SALT RIVER

Location Comments NEAR DOG VALLEY. LAT-LONG TAKEN FROM SECS. 2, 11. IN CANYON DIABLO.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	DIA GRF
Occurring	DIA GRF
Ore Materials	DIAMONDS, GRAPHITE
Commod Comments	SMALL BLACK DIAMONDS AND GRAPHITE AS SMALL NODULES.

-- Geology --

-- Deposit Description --

Deposit Desc Comm IN 1891 A 40 LB MASS OF THE CANYON DIABLO METEORITE WAS FOUND TO CONTAIN TINY BLACK DIAMONDS. SUBSEQUENTLY, SMALL DIAMONDS EMBEDDED IN GRAPHITE HAVE BEEN FOUND IN OTHER FRAGMENTS FROM THE SAME FALL. SMALL GRAPHITE NODULES ARE ALSO CONTAINED IN THE DIABLO CANYON METEORITE FRAGMENTS.

-- Exploration and Development --

Record Number	**TC00275**	*(....Continued)*
Production Size	U	
Developent Status	Prospect, Inactive	
	-- Description of Workings --	
	-- Reference --	
Reference	MINERALOGY OF ARIZONA, 1977, P. 94.	
Reference	PEIRCE, H.W., 1990, ARIZONA GECLOGICAL SURVEY INDUSTRIAL MINERALS CARD FILE.	
Info Source	1	

Mineral Resources Data System (MRDS)

Record Number	TC38875	*User Field*	*93/9
Record Type	Site	*File Link ID*	IMS, CIMRI
Reporter	ORRIS, GRETA G.		
Reporter Affiliation	USGS	*Report Date*	93 09
Site Name	CHRIS CLAY DEPOSIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
Quad 250k	HOLBROOK		
Latitude	34-17-45N	*Decimal Lat*	34.29583
Longitude	110-54-20W	*Decimal Long*	-110.90555
UTM Northing	3794766.	*UTM Easting*	508691.5
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
				GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	CLY
Major	CLY

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type	SEDIMENTARY?

-- Exploration and Development --

Production Size	No
Developent Status	Occurrence

-- Description of Workings --

-- Reference --

B-14

Mineral Resources Data System (MRDS)

Record Number	TC38873	*User Field*	*93/9
Record Type	Site	*File Link ID*	IMS, CIMRI
Reporter	ORRIS, GRETA G.		
Reporter Affiliation	USGS	*Report Date*	93 09
Site Name	FLORENCE CERAMICS		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
Quad 250k	HOLBROOK		
Latitude	34-21-38N	*Decimal Lat*	34.36055
Longitude	111-25-10W	*Decimal Long*	-111.41944
UTM Northing	3802018.	*UTM Easting*	461428.6
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
				GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	CLY3
Major	CLY3

-- Geology --

-- Deposit Description --

-- Exploration and Development --

Production Size	Small
Developent Status	Little Developed Producer, Inactive

-- Description of Workings --

Desc Workings	Surface

-- Reference --

Mineral Resources Data System (MRDS)

Record Number	TC00253	*User Field*	*U93/8
Record Type	Site	*File Link ID*	IMS, CIMRI
Reporter	WELLS, T.M. (ORRIS, G.J.)		
Reporter Affiliation	USGS	*Report Date*	92 06
Updater	ORRIS, GRETA J.		
Updater Affiliation	USGS	*Update Date*	93 04
Site Name	ROGERS LAKE		
	-- Location Information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 62.5k	BELLEMONT		
Quad 24k	BELLEMONT		
Latitude	35-09-55N	*Decimal Lat*	35.16527
Longitude	111-47-20W	*Decimal Long*	-111.78888
Accuracy	ESTIMATED LOCATION, WITHIN 1 MILE.		
UTM Northing	3891458.	*UTM Easting*	428155.1
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
31, 32		021N	006E	GILA AND SALT RIVER

Location Comments ALONG PERIPHERY OF ROGERS LAKE.

	-- Commodity Information --
Commodity Type	Non-metallic
Commodities	CLY
Major	CLY
Ore Materials	CLAY
	-- Geology --
Host Rock Type	ANDESITE, BASALT
	-- Deposit Description --
	--Individual Ore Bodies--
Deposit Type	RESIDUAL

B-16

Record Number	TC00253 *(....Continued)*
Deposit Desc Comm	HIGH-SILICA CLAY DERIVED FROM DECOMPOSED ANDESITE AND BASALT.
	-- Exploration and Development --
Production Size	No
Developent Status	Occurrence
	-- Description of Workings --
	-- Reference --
Reference	ELEVATORSKI, E.A., 1978, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 2.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERALS CARD FILE.
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.
Info Source	1
Prod Comments	NO PRODUCTION REPORTED.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 11 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 11 of 103

Record Number	TC10162	*User Field*	*92/12
Record Type	Site	*File Link ID*	IMS
Reporter	PEIRCE, H. WESLEY		
Reporter Affiliation	AZGS	*Report Date*	89 09
Updater	BOLM, KAREN S.		
Updater Affiliation		*Update Date*	89 09

Editor Name	Type	Affiliation	Date	Comments
PEIRCE, H. WESLEY	R	AZGS	9/1/89	
BOLM, KAREN S.	U		9/1/89	

Site Name SALINE WATER WELL NEAR CAMP VERDE

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	YAVAPAI		
Physiographic Prov	12 BASIN AND RANGE		
Drainage Area	15		
Quad 250k	HOLBROOK		
Quad 24k	CAMP VERDE		
Latitude	34-33-45N	*Decimal Lat*	34.5625
Longitude	111-50-42W	*Decimal Long*	-111.845
Accuracy	WITHIN 1/2 MILE.		
UTM Northing	3824655.	*UTM Easting*	422481.4
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
32		14N	005E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	HAL BRI NA ?
Major	HAL BRI
Occurring	NA ?
Ore Materials	BRINE, HALITE?, SODIUM SULFATES
Analytical Data	BRINE CONTAINS 176,893 PPM DISSOLVED SOLIDS, LARGELY SULFATE AND CHLORIDE.

-- Geology --

Tectonic Setting BASIN AND RANGE

Host Rock Type Name	Age	Host Rock Unit Name	Age
LACUSTRINE SEDIMENTS, EVAPORITES	CEN	VERDE FORMATION	CEN

Record Number	**TC10162**	*(....Continued)*		
Geology Comm	BRINES ASSOCIATED WITH SODIUM DEPOSITS IN THE VERDE FORMATION			
	-- Deposit Description --			
Deposit Size	Small			
	--Individual Ore Bodies--			
Deposit Type	LACUSTRINE BRINE, EVAPORITE			
Deposit Desc Comm	BRINES ASSOCIATED WITH SODIUM DEPOSITS OF THE VERDE FORMATION.			
	-- Exploration and Development --			
Production Size	No			
Developent Status	Occurrence			
Development M$		*Mill M$*	HYDROLOGOIC UNIT CO	
	-- Description of Workings --			
General Comm	INFO.SRC : 1 PUB LIT; 2 UNPUB REPT			
	-- Reference --			
Reference	USGS, AZ BUREAU OF MINES, AND U.S. BUREAU OF RECLAMATION, 1969, MINERAL AND WATER RESOURCES OF ARIZONA: ARIZONA BUREAU OF MINES BULLETIN 180, 638 P.			
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERALS CARD FILE.			

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 12 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 12 of 103

Record Number	TC35380	*User Field*	*93/02
Record Type	Site	*File Link ID*	CIMRI
Reporter	CARBONARO, MARGUERITE M.		
Reporter Affiliation	USGS	*Report Date*	92 10
Site Name	WHITE HORSE HILLS		
	-- Location Information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	YAVAPAI		
Physiographic Prov	COLORADO PLATEAU		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	HOLBROOK		
Quad 100k	SEDONA		
Quad 24k	WALKER MTN. (1969)		
Latitude	34-32-48N	*Decimal Lat*	34.54666
Longitude	111-41-07W	*Decimal Long*	-111.68527
Accuracy	EST LOCATION, +/- 0.5 MI		
UTM Northing	3822789.	*UTM Easting*	437122.3
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
2		13N	06E	GILA AND SALT RIVER

Location Comments LAT-LONG IS FOR CENTER OF SEC. 2.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	PUM
Major	PUM
Ore Materials	CINDER

-- Geology --

Host Rock Type	CINDER CONE

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type	CINDER CONE

-- Exploration and Development --

Production Size	U

Record Number	**TC35380**	*(....Continued)*
Developent Status	Occurrence	

-- Description of Workings --

-- Reference --

Reference PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL FILES.

Reference ELEVATORSKI, E.A., 1978, ARIZONA INDUSTRIAL MINERALS, MINERAL REPORT NO. 2, ARIZONA DMR.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 13 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 13 of 103

Record Number	TC35471	*User Field*	*93/02
Record Type	Site	*File Link ID*	CIMRI
Reporter	CARBONARO, MARGUERITE M.		
Reporter Affiliation	USGS	*Report Date*	93 01
Site Name	WHITE CASTLE		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	YAVAPAI		
Physiographic Prov	COLORADO PLATEAU		
Administrative Area	PRESCOTT NATIONAL FOREST		
Quad 250k	HOLBROOK		
Quad 100k	PAYSON		
Quad 24k	TULE MESA (1967)		
Latitude	34-16-06N	*Decimal Lat*	34.26833
Longitude	111-50-42W	*Decimal Long*	-111.845
Accuracy	EST		
UTM Northing	3792036.	*UTM Easting*	422209.5
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
4 ,5, 8, 9, 17		10N	05E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	MBL
Major	MBL
Ore Materials	MARBLE

-- Geology --

Host Rock Type	LIMESTONE
Host Rock Age	DEV

Host Rock Type Name	Age	Host Rock Unit Name	Age
		MARTIN LIMESTONE	DEV

-- Deposit Description --

-- Exploration and Development --

Production Size	Yes
Developent Status	Little Developed Producer, Inactive

B-24

-- Description of Workings --

-- Reference --

Reference PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL FILES.

Prod Comments PAST PRODUCER.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 14 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 14 of 103

Record Number	TC10149	*User Field*	*U92/11
Record Type	Site	*File Link ID*	IMS, CIMRI
Reporter	BOLM, KAREN S.		
Reporter Affiliation	USGS	*Report Date*	89 08
Site Name	UNNAMED OCCURRENCE		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	YAVAPAI		
Physiographic Prov	11		
Drainage Area	15		
Land Status	41		
Quadrangle	CAMP VERDE	*Scale*	24000
Quadrangle 2	MIDDLE VERDE	*Scale*	24000
Quad 250k	HOLBROOK		
Latitude	34-32-47N	*Decimal Lat*	34.54638
Longitude	111-52-32W	*Decimal Long*	-111.87555
Accuracy	EST		
UTM Northing	3822893.	*UTM Easting*	419662.7
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
1, 12, 13		13N	4E	GILA AND SALT RIVER

Location Comments SEC. 1 - CAMP VERDE SALT MINE, GRAHAM-WING-FIELD SULPHATE SEC. 12 - GYPSUM BEDS

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	GYP
Major	GYP
Ore Materials	GYPSUM

-- Geology --

Host Rock Type	LAKE SEDIMENTS
Host Rock Age	CEN

Host Rock Type Name	Age	Host Rock Unit Name	Age
		VERDE FORMATION	CEN

-- Deposit Description --

Deposit Size	Small

--Individual Ore Bodies--

B-26

Record Number	TC10149 *(....Continued)*		
USGS Model Name	LACUSTRINE GYPSUM	*Model Number*	35B. 4
Deposit Type	LACUSTRINE SEDIMENTARY, EVAPORITE		
	-- Exploration and Development --		
Developent Status	Occurrence		
	-- Description of Workings --		
	-- Reference --		
Reference	ELEVATORSKI, E.A., 1978, ARIZONA INDUSTRIAL MINERALS: DEPARTMENT OF MINERAL RESOURCES MINERAL REPORT NO. 2, 70 P.		
Reference	PEIRCE, H.W., 1990, AZGS INDUSTRIAL MINERALS CARD FILE.		
Info Source	12		

Mineral Resources Data System (MRDS)

Record Number	TC10151	*User Field*	*U92/11
Record Type	Site	*File Link ID*	IMS
Reporter	BOLM, KAREN S.		
Reporter Affiliation	USGS	*Report Date*	89 08
Site Name	WINGFIELD-MCLEDD DEPOSIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	YAVAPAI		
Physiographic Prov	11		
Drainage Area	15		
Quadrangle	CAMP VERDE	*Scale*	24000
Quad 250k	HOLBROOK		
Latitude	34-30-30N	*Decimal Lat*	34.50833
Longitude	111-48-12W	*Decimal Long*	-111.80333
Accuracy	WITHIN 1/2 MILE		
UTM Northing	3818618.	*UTM Easting*	426256.1
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
22		13N	5E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	GYP
Major	GYP
Ore Materials	GYPSUM

-- Geology --

Host Rock Age CEN

Host Rock Type Name	Age	Host Rock Unit Name	Age
		VERDE FORMATION	CEN

-- Deposit Description --

Deposit Size Small

--Individual Ore Bodies--

USGS Model Name	LACUSTRINE GYPSUM	*Model Number*	35B. 4
Deposit Type	LACUSTRINE SEDIMENTARY, EVAPORITE		

B-28

-- Exploration and Development --

Production Size Yes

Developent Status Developed Producer, Inactive

Economic Comments PAST PRODUCTION FOR AGRICULTURAL USE

-- Description of Workings --

-- Reference --

Reference ELEVATORSKI, E.A., 1978, ARIZONA INDUSTRIAL MINERALS: DEPARTMENT OF MINERAL RESOURCES MINERAL REPORT NO. 2, 70 P.

Reference PIERCE, H.W., 1990, AZGS INDUSTRIAL MINERALS CARD FILE.

Info Source 12

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 16 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 16 of 103

Record Number	TC10214	*User Field*	*U93/8
Record Type	Site	*File Link ID*	IMS
Reporter	BOLM, KAREN S.		
Reporter Affiliation	USGS	*Report Date*	89 06
Updater	ORRIS, GRETA J.		
Updater Affiliation	USGS	*Update Date*	90 05; 93 04
Site Name	VERDE RIVER DEPOSIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	YAVAPAI		
Physiographic Prov	12 BASIN AND RANGE		
Drainage Area	15 LOWER COLORADO RIVER REGION		
Quad 250k	HOLBROOK		
Quad 24k	CAMP VERDE		
Latitude	34-31-05N	*Decimal Lat*	34.51805
Longitude	111-49-40W	*Decimal Long*	-111.82777
Accuracy	ESTIMATED, WITHIN 0.5 MILES.		
UTM Northing	3819714.	*UTM Easting*	424021.0
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
16		013N	005E	GILA AND SALT RIVER

Location Comments DEPOSIT IS SOUTH OF CAMP VERDE IN THE VERDE VALLEY.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	DIT GYP CLY
Major	DIT
Occurring	GYP CLY
Ore Materials	DIATOMITE, GYPSUM, CLAY
Non-Ore Materials	CALCITE

-- Geology --

Tectonic Setting	BASIN AND RANGE
Age Mineralization	MIO-PLIO
Host Rock Type	LACUSTRINE SEDIMENTS INCLUDING GYPSUM, CLAY, AND LIMESTONE
Host Rock Age	MIO-PLIO

Host Rock Type Name	Age	Host Rock Unit Name	Age
		VERDE FM	MIO-PLIO

-- Deposit Description --
--Individual Ore Bodies--

USGS Model Name	LACUSTRINE DIATOMITE	*Model Number*	31S
Deposit Type	LACUSTRINE BIOGENIC, SEDIMENTARY		
Depth to Top	0	*Units*	FT

Deposit Desc Comm DIATOMITE IS INTERBEDDED WITH GYPSUM, CLAY, AND LIMESTONE.

-- Exploration and Development --

Production Size No
Developent Status Prospect, inactive

-- Description of Workings --

-- Reference --

Reference PEIRCE, H.W., 1989. ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERALS CARD FILES.
Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.
Reference PEIRCE, H.W., 1969, DIATOMITE, IN MINERAL AND WATER RESOURCES OF ARIZONA: WASHINGTON, U.S. GOVERNMENT PRINTING OFFICE, P. 337-342.
Info Source 1

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 17 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 17 of 103

Record Number	TC35321	*User Field*	*U93/6
Record Type	Site	*File Link ID*	IMS, CIMRI
Reporter	WELLS, TINA M.		
Reporter Affiliation	USGS	*Report Date*	92 10
Site Name	VOLUNTEER MOUNTAIN		
	-- Location Information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Administrative Area	NAVAJO ARMY DEPOT/KAIBAB NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 24k	BELLEMONT		
Latitude	35-13-52N	*Decimal Lat*	35.23111
Longitude	111-53-10W	*Decimal Long*	-111.88611
Accuracy	ACC +/- 1 MIN		
UTM Northing	3898834.	*UTM Easting*	419365.9
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
5, 6, 7, 8		021N	005E	GILA AND SALT RIVER

Location Comments LOCATION IS FOR CENTER OF SECTION 5.

	-- Commodity Information --
Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDERS
	-- Geology --
Host Rock Type	CINDER CONE
	-- Deposit Description --
Deposit Size	Small
	--Individual Ore Bodies--
Deposit Type	VOLCANIC
	-- Exploration and Development --
Production Size	No
Developent Status	Occurrence

-- Description of Workings --

Desc Workings Surface

-- Reference --

Reference ELEVATORSKI, E.A., 1978, ARIZONA INDUSTRIAL MINERALS, MINERAL REPORT NO. 2, ARIZONA DMR.

Reference PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL FILES.

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Mineral Resources Data System (MRDS)

Record Number	TC35324	*User Field*	*U95/05
Record Type	Site	*File Link ID*	IMS, CIMRI
Reporter	WELLS, TINA M.		
Reporter Affiliation	USGS	*Report Date*	92 10

Editor Name	Type	Affiliation	Date	Comments
WELLS, TINA M.	R	USGS	10/1/92	

Site Name DEADMAN WASH AREA

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	O'LEARY PEAK		
Latitude	35-28-30N	*Decimal Lat*	35.475
Longitude	111-31-22W	*Decimal Long*	-111.52277
Accuracy	ACC +/- 4 MI		

Section	Section Fraction	Township	Range	Meridian
2,3,11,12		024N	008E	GILA AND SALT RIVER

Location Comments ON CEDAR RIDGE.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	PUMICE, CINDERS

-- Geology --

Host Rock Type Name	Age	Host Rock Unit Name	Age
CINDER CONE	CEN		

-- Deposit Description --

Deposit Size Small

--Individual Ore Bodies--

Deposit Type VOLCANIC

B-34

-- Exploration and Development --

Production Size Yes

Developent Status Developed Producer, Inactive

Development M$* *Mill M$ HYDROLCGOIC UNIT CO

-- Description of Workings --

Desc Workings Surface

-- Reference --

Reference ELEVATORSKI, E.A., 1978, ARIZONA INDUSTRIAL MINERALS, MINERAL REPORT NO. 2, ARIZONA DMR.

Reference PEIRCE, H.W., 1990, ARIZONA GECLOGICAL SURVEY INDUSTRIAL MINERAL FILES.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 19 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 19 of 103

Record Number	TC35325	*User Field*	*U93/6
Record Type	Site	*File Link ID*	IMS, CIMRI
Reporter	WELLS, TINA M.		
Reporter Affiliation	USGS	*Report Date*	92 10
Site Name	CEDAR RIDGE		
	-- Location Information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	O'LEARY PEAK		
Latitude	35-28-42N	*Decimal Lat*	35.47833
Longitude	111-32-30W	*Decimal Long*	-111.54166
Accuracy	ACC +/- 2 MI		
UTM Northing	3926026.	*UTM Easting*	450859.9
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
9, 10		024N	008E	GILA AND SALT RIVER

	-- Commodity Information --
Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDERS
Commod Comments	CINDERS ARE RED IN COLOR.
	-- Geology --
Host Rock Type	CINDER CONE
	-- Deposit Description --
Deposit Size	Small
	--Individual Ore Bodies--
Deposit Type	VOLCANIC
	-- Exploration and Development --
Production Size	U

Record Number	**TC35325** *(....Continued)*
Developent Status	Prospect, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GECLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 20 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 20 of 103

Record Number	I001090	*User Field*	*U95/05
Record Type	Site	*File Link ID*	IMS, CIMRI
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	91 10

Editor Name	Type	Affiliation	Date	Comments
ORRIS, GRETA J.	R	USGS	00/00/00	
ORRIS, GRETA J.	U	USGS	5/1/95	

Site Name CAMP VERDE GYPSUM
ID Comments POSSIBLY DUPLICATE IN PART OR WHOLLY WITH LARSON QUARRY.

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	YAVAPAI		
Quad 250k	HOLBROOK		
Quad 24k	WALKER MTN. (?)		
Latitude	34-33-42N	*Decimal Lat*	34.56166
Longitude	111-44-50W	*Decimal Long*	-111.74722
Accuracy	ESTIMATED LOCATION, PROBABLY WITHIN 2 MINUTES.		

Section	Section Fraction	Township	Range	Meridian
		014N	006E	GILA AND SALT RIVER

Position 5.5 MILES E OF CAMP VERDE ON STATE HIGHWAY 260.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	GYP
Major	GYP
Ore Materials	GYPSUM
Commod Subtypes	SUPPLIES GYPSUM TO PHOENIX CEMENT COMPANY PLANT AT CLARKDALE. ALSO USED FOR AGRICULTURE, IMPERVIOUS SEALING USES.

-- Geology --

Age Mineralization CEN

Host Rock Type Name	Age	Host Rock Unit Name	Age
LACUSTRINE SEDIMENTS	CEN	VERDE FM	CEN

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type LACUSTRINE SEDIMENTARY, EVAPORITE

-- Exploration and Development --

Production Size	Small
Developent Status	Developed Producer, Active
Owner	SUPERICR COMPANIES (1994)
Operator	SUPERICR COMPANIES (1994)
Development MS	*Mill MS* HYDROLOGOIC UNIT CO

-- Description of Workings --

Desc Workings Surface

-- Reference --

Reference KEITH, S.B., 1969, GYPSUM, IN U.S. GEOLOGICAL SURVEY, ARIZONA BUREAU OF MINES, AND U.S. BUREAU OF RECLAMATION, MINERAL AND WATER RESOURCES OF ARIZONA: ARIZONA BUREAU OF MINES BULLETIN 180, 638 P.

Reference ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES, 1994, DIRECTORY OF ACTIVE MINES IN ARIZONA, INCORPORATING SAND & GRAVEL OPERATIONS -- 1994: ARIZONA DEPARTMENT MINES AND MINERAL RESOURCES DIRECTORY 42, 24 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 21 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 21 of 103

Record Number	TC35800	*User Field*	*U94/11
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 03

Editor Name	Type	Affiliation	Date	Comments
ORRIS, GRETA J.	R	USGS	3/1/93	
ORRIS, GRETA J.	U	USGS	9/19/94	

Site Name CAMP VERDE SALT MINE
Synonym Name GRAHAM WINGFIELD SULPHATE

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	YAVAPAI		
Administrative Area	PRESCOTT NATIONAL FOREST		
Quad 250k	HOLBROOK		
Quad 100k	SEDONA		
Quad 24k	CAMP VERDE (1969)		
Latitude	34-32-42N	*Decimal Lat*	34.545
Longitude	111-52-26W	*Decimal Long*	-111.87388

Section	Section Fraction	Township	Range	Meridian
01		013N	004E	GILA AND SALT RIVER

Position ABOUT 1.5 MI SW OF CAMP VERDE.

-- Commodity Information --

Commodity Type Non-metallic
Commodities HAL NA ? GYP CLY
Major HAL NA ?
Occurring GYP CLY
Ore Materials HALITE, THENARDITE, MIRABILITE, GLAUBERITE, GYPSUM, CLAY
Commod Subtypes SALT FOR CATTLE FEED.

-- Geology --

Regional Trends VERDE FAULT ZONE
Age Mineralization MIO?

Host Rock Type Name	Age	Host Rock Unit Name	Age
LACUSTRINE SEDIMENTS, EVAPORITES	MIO?	VERDE FM	CEN

Geology Comm THE VERDE FM CONSISTS OF AT LEAST 1600 FT OF SEDIMENTS THAT ACCUMULATED IN A BASIN FORMED DURING THE OLIGOCENE, POSSIBLY AS A RESULT OF MOVEMENT ALONG THE VERDE FAULT

ZONE. DURING THE MIOCENE, THE DRAINAGE THROUGH THE SOUTH END OF THE BASIN WAS BLOCKED BY VOLCANICS RESULTING IN A CLOSED BASIN WHERE A SALINE-ALKALINE LAKE FORMED. THE EVAPORITES WERE EXPOSED WHEN THE VERDE RIVER BREACHED THE VOLCANICS DURING THE PLEISTOCENE.

-- Deposit Description --

--Individual Ore Bodies--

Deposit Type LACUSTRINE EVAPORITE

Thickness 46. *Units* FT

Deposit Desc Comm THE EVAPORITE SEQUENCE WHICH CONSISTS OF HALITE, MIRABILITE AND GLAUBERITE IS AS MUCH AS 46 FT THICK AT THIS SITE. THE SEQUENCE GRADES INTO GYPSUM AND HALITE IN THE DEEPER PART OF THE BASIN SOUTHEAST OF CAMP VERDE.

-- Exploration and Development --

Production Size Small

Year 1st Production PRE-COLUMBIAN *Year Last Production*

Production Years PRE-COLUMBIAN, 1920'S-1933

Developent Status Developed Producer, Inactive

Expl/Devl Comments THIS DEPOSIT HAS BEEN KNOWN FOR 2000 YEARS AND MAY BE THE OLDEST MINE IN ARIZONA. EVIDENCE OF PRE-COLUMBIAN ACTIVITY, INCLUDING ARTIFACTS AND THE REMAINS OF A MINER, WERE DISCOVERED WHEN THE MINE WAS OPERATED DURING THE 1920'S. THE MINE IS BELIEVED TO HAVE BEEN VISITED BY EXPLORERS ANTONIO DE ESPEJO IN 1583 AND MARCOS FARFAN DE LOS GODOS IN 1598. WESTERN CHEMICAL CO. BEGAN SURFACE MINING OPERATIONS DURING THE 1920'S AND WAS ACQUIRED BY THE ARIZONA CHEMICAL CORPORATION IN THE 1930'S. EXPLORATION BY STAUFFER CHEMICAL CO IN THE 1960'S.

Development M$* *Mill M$ HYDROLOGOIC UNIT CO

-- Description of Workings --

Desc Workings Surface and Underground

Workings Comments WORK IN THE 1920'S WAS BY SURFACE METHODS. IN THE 1930'S, AMERICAN CHEMICAL CORPORATION BEGAN MINING BY ROOM AND PILLAR.

General Comm THIS RECORD CONTAINS DATA FROM DUPLICATE RECORD TC38872 WHICH HAS BEEN DELETED FROM MRDS.

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.

Reference EYDE, TED, WILKINSON, P.A.K., AND WEILAND, E.F., 1986, FIELD TRIP TO SELECTED INDUSTRIAL MINERAL DEPOSITS OF ARIZONA, IN BEATTY, BARBARA, AND WILKINSON, P.A.K., EDS., FRONTIERS IN GEOLOGY AND ORE DEPOSITS OF ARIZONA AND THE SOUTHWEST: ARIZONA GEOLOGICAL SOCIETY DIGEST, V. XVI, P. 312-318.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 22 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 22 of 103

Record Number	TC10262	*User Field*	*U93/11
Record Type	Site	*File Link ID*	IMS, CIMRI
Reporter	CARBONARO, MARGUERITE		
Reporter Affiliation	USGS	*Report Date*	91 09
Updater	ORRIS, GRETA J.		
Updater Affiliation	USGS	*Update Date*	93 04
Site Name	CLARKDALE CLAY QUARRY		
Synonym Name	LAKEBED		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	YAVAPAI		
Quad 250k	PRESCOTT		
Quad 62.5k	CLARKDALE		
Latitude	34-46-10N	*Decimal Lat*	34.76944
Longitude	112-06-30W	*Decimal Long*	-112.10833
Accuracy	EST		
UTM Northing	3847838.	*UTM Easting*	398575.3
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
18		016N	003E	GILA AND SALT RIVER

Position NORTH OF CLARKDALE, AZ.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	CLY7 SHL
Major	CLY7 SHL
Ore Materials	CLAY SHALE
Commod Subtypes	CLAY USED IN PORTLAND CEMENT AND BRICK PRODUCTION.

-- Geology --

Host Rock Type	SHALE
Host Rock Age	CEN

Host Rock Type Name	Age	Host Rock Unit Name	Age
SHALE	CEN	VERDE FORMATION	CEN

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type SEDIMENTARY

B-42

Record Number	TC10262	*(....Continued)*
Deposit Form	BEDDED	
	-- Exploration and Development --	
Production Size	Yes	
Developent Status	Developed Producer, Active	
Operator	PHOENIX CEMENT CO.	
	-- Description of Workings --	
Desc Workings	Surface	
	-- Reference --	
Reference	PATTERSON, S.H., 1969, "CLAY", IN ABM BULLETIN 180, USGS BULLETIN 871, P. 332.	
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERALS CARD FILE.	
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4. 185 P.	

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 23 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 23 of 103

Record Number	TC38868	*User Field*	*93/9
Record Type	Site	*File Link ID*	IMS, CIMRI
Reporter	ORRIS, GRETA G.		
Reporter Affiliation	USGS	*Report Date*	93 09
Site Name	MCCARTHY CLAY		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
Quad 250k	HOLBROOK		
Latitude	34-43-30N	*Decimal Lat*	34.725
Longitude	111-58-55W	*Decimal Long*	-111.98194
UTM Northing	3842789.	*UTM Easting*	410093.5
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
				GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	CLY
Major	CLY

-- Geology --

-- Deposit Description --

-- Exploration and Development --

Production Size	U
Developent Status	Occurrence

-- Description of Workings --

-- Reference --

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 24 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 24 of 103

Record Number	TC35793	*User Field*	*U94/11
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 03

Editor Name	Type	Affiliation	Date	Comments
ORRIS, GRETA J.	R	USGS	3/1/93	

Site Name CINDER PIT

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	WINONA (1974)		
Latitude	35-11-40N	*Decimal Lat*	35.19444
Longitude	111-24-26W	*Decimal Long*	-111.40722

Section	Section Fraction	Township	Range	Meridian
23; 14	NW OF NE; SW OF SE	021N	009E	GILA AND SALT RIVER

Location Comments LAT-LONG IS FOR THE SOUTHERNMOST PIT.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Small

Record Number	**TC35793**	*(....Continued)*	
Developent Status	Little Developed Producer, Inactive		
Development M$		*Mill M$*	HYDROLOGOIC UNIT CO

-- Description of Workings --

Desc Workings Surface

General Comm THIS RECORD CONTAINS DATA FROM DUPLICATE RECORD TC35784 WHICH HAS BEEN DELETED FROM MRDS.

-- Reference --

Reference WINONA 7.5 MINUTE TOPOGRAPHIC QUADRANGLE.

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Reference PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERALS CARD FILES.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 25 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 25 of 103

Record Number	TC35416	*User Field*	*U94/11
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	92 10

Editor Name	Type	Affiliation	Date	Comments
ORRIS, GRETA J.	R	USGS	10/1/92	

Site Name WILDCAT HILL PIT

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	FLAGSTAFF EAST		
Latitude	35-13-19N	*Decimal Lat*	35.22194
Longitude	111-32-52W	*Decimal Long*	-111.54777
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
9, 4		021N	008E	GILA AND SALT RIVER

Location Comments PEIRCE GIVES LOCATION AS SECTION 7.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL STN1
Major	VOL STN1
Ore Materials	VOLCANIC CINDER
Commod Subtypes	USED FOR AGGREGATE

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

Record Number	TC35416	*(....Continued)*		
	-- Exploration and Development --			
Production Size	Yes			
Developent Status	Developed Producer, Active			
Owner	FLAGSTAFF CINDER SALES INC.			
Development M$			*Mill M$*	HYDROLOGOIC UNIT CO
	-- Description of Workings --			
Desc Workings	Surface			
General Comm	THIS RECORD CONTAINS DATA FROM DUPLICATE RECORD TC35323 WHICH HAS BEEN DELETED FROM MRDS.			
	-- Reference --			
Reference	ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES, 1989, DIRECTORY OF ACTIVE MINES IN ARIZONA, INCORPORATING SAND AND GRAVEL OPERATIONS--1989-1990: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES DIRECTORY, 14 P.			
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERALS CARD FILE.			
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.			

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 26 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 26 of 103

Record Number	TC35415	*User Field*	*U93/5
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	92 10
Site Name	WHITE VULCAN		
Synonym Name	SUNSET CRATER PUMICE, BONNER POZZOLAN		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	SUNSET CRATER WEST		
Latitude	35-21-35N	*Decimal Lat*	35.35972
Longitude	111-34-57W	*Decimal Long*	-111.5825
Accuracy	EST		
UTM Northing	3912893.	*UTM Easting*	447078.0
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
19		023N	008E	GILA AND SALT RIVER

Location Comments THERE ARE AT LEAST 3 PUMICE PITS IN THIS SECTION.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	PUM VOL
Major	PUM VOL
Ore Materials	PUMICE, PUMICEOUS VOLCANIC ASH
Commod Subtypes	FOR POZZOLONIC PUMICE AND LIGHTWEIGHT REDIMIX; ALSO BLOCK PUMICE FOR STONEWASHING.

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

Record Number	**TC35415** *(....Continued)*
	-- Exploration and Development --
Production Size	Yes
Developent Status	Intermittent Producer
Owner	ARIZONA TUFFLITE INC.
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES, 1989, DIRECTORY OF ACTIVE MINES IN ARIZONA, INCORPORATING SAND AND GRAVEL OPERATIONS-1989-1990: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES DIRECTORY, 14 P.
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 27 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 27 of 103

Record Number	TC35412	*User Field*	*U93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	92 10
Site Name	MORE SAND AND MOON SAND		
	-- Location Information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	SUNSET CRATER WEST		
Latitude	35-21-44N	*Decimal Lat*	35.36222
Longitude	111-36-19W	*Decimal Long*	-111.60527
Accuracy	EST. UNKNOWN. USED A CENTRAL LOCATION ON E. SIDE OF SUGARLOAF PEAK.		
UTM Northing	3913182.	*UTM Easting*	445010.2
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
13, 14, 23, 24		023N	007E	GILA AND SALT RIVER

	-- Commodity Information --
Commodity Type	Non-metallic
Commodities	PUM VOL
Major	PUM VOL
Ore Materials	PUMICE, PUMICEOUS VOLCANIC ASH
Commod Subtypes	POZZOLON: BLOCK PUMICE
	-- Geology --
Age Mineralization	MIO-PLIO
Host Rock Type	RHYOLITE ASH
Host Rock Age	MIO-PLIO
	-- Deposit Description --
	--Individual Ore Bodies--
Deposit Type	VOLCANIC
Thickness	200. *Units* FT

Deposit Desc Comm	PUMICE FRAGMENTS ARE COARSE TO FINE, ANGULAR TO ROUNDED, BEDDED OR UNSORTED, AND LOOSELY CONSOLIDATED. THE DEPOSITS ARE UP TO 200 FT THICK.
	-- Exploration and Development --
Production Size	Yes
Developent Status	Intermittent Producer
Owner	ARIZONA TUFFLITE CO.
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES, 1989, DIRECTORY OF ACTIVE MINES IN ARIZONA, INCORPORATING SAND AND GRAVEL OPERATIONS-1989-1990: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES DIRECTORY, 14 P.
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERALS CARD FILE.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 28 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 28 of 103

Record Number	TC35408	*User Field*	*U95/05
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	92 10

Editor Name	Type	Affiliation	Date	Comments
ORRIS, GRETA J.	R	USGS	10/1/92	
ORRIS, GRETA J.	U	USGS	5/1/95	

Site Name DARLING CINDER PIT

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGGSTAFF		
Quad 24k	WINONA (1974)		
Latitude	35-13-35N	*Decimal Lat*	35.22638
Longitude	111-24-34W	*Decimal Long*	-111.40944
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
02, 11		021N	009E	GILA AND SALT RIVER

Position E OF FLAGSTAFF ON CINDER MOUNTAIN.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	VOLCANIC CINDERS
Commod Subtypes	USED TO MAKE BUILDING BLOCKS, AGGREGATE, BALAST.

-- Geology --

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANIC ROCKS			

-- Deposit Description --
--Individual Ore Bodies--

Record Number	TC35408	*(....Continued)*	
Deposit Type	VOLCANIC		
	-- Exploration and Development --		
Production Size	Yes		
Developent Status	Intermittent Producer		
Owner	SUPERLITE BLOCK COMPANY (1994)		
Operator	SUPERLITE BLOCK COMPANY (1994)		
Development M$		*Mill M$*	HYDROLOGOIC UNIT CO
Economic Comments	BLOCK PLANTS IN PHOENIX AND TEMPE.		
	-- Description of Workings --		
Desc Workings	Surface		
General Comm	THIS RECORD CONTAINS DATA FROM DUPLICATE RECORD TC35322 WHICH HAS BEEN DELETED FROM MRDS.		
	-- Reference --		
Reference	ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES, 1989, DIRECTORY OF ACTIVE MINES IN ARIZONA, INCORPORATING SAND AND GRAVEL OPERATIONS-1989-1990: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES DIRECTORY, 14 P.		
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.		
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.		
Reference	ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES, 1994, DIRECTORY OF ACTIVE MINES IN ARIZONA, INCORPORATING SAND & GRAVEL OPERATIONS -- 1994: ARIZONA DEPARTMENT MINES AND MINERAL RESOURCES DIRECTORY 42, 24 P.		

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 29 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 29 of 103

Record Number	TC35407	*User Field*	*U95/05
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	92 10
Site Name	CROWN CLAIMS		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	O'LEARY PEAK (1983)		
Latitude	35-23-58N	*Decimal Lat*	35.39944
Longitude	111-35-33W	*Decimal Long*	-111.60916
Accuracy	EST, MAY BE 6 MILES OFF.		

Section	Section Fraction	Township	Range	Meridian
01?		023N	007E	GILA AND SALT RIVER

Position ABOUT 12 MILES N OF FLAGSTAFF.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	PUM
Major	PUM
Ore Materials	PUMICE
Commod Subtypes	POZZOLANIC PUMICE FOR LIGHTWEIGHT REDIMIX; BLOCK MATERIAL FOR "STONE WASHING".

-- Geology --

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS, PUMICE			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Record Number	**TC35407** *(....Continued)*		
Production Size	Yes		
Developent Status	Intermittent Producer		
Owner	TUFFLITE INC. (1994)		
Operator	TUFFLITE INC. (1994)		
Development M$		*Mill M$*	HYDROLOGOIC UNIT CO
Economic Comments	MARKETED WITHIN AND OUTSIDE OF ARIZONA.		

-- Description of Workings --

Desc Workings Surface

-- Reference --

Reference ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES, 1989, DIRECTORY OF ACTIVE MINES IN ARIZONA, INCORPORATING SAND AND GRAVEL OPERATIONS-1989-1990: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES DIRECTORY, 14 P.

Reference ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES, 1994, DIRECTORY OF ACTIVE MINES IN ARIZONA, INCORPORATING SAND & GRAVEL OPERATIONS -- 1994: ARIZONA DEPARTMENT MINES AND MINERAL RESOURCES DIRECTORY 42, 24 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 30 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 30 of 103

Record Number	TC10356	*User Field*	*U94/3
Record Type	Site	*File Link ID*	IMS, CIMRI
Reporter	BOLM, KAREN S., AND WELLS, T.M. (ORRIS, G.J.)		
Reporter Affiliation	USGS	*Report Date*	92 06
Updater	CARBONARO, MARGUERITE M.		
Updater Affiliation	USGS	*Update Date*	93 04
Site Name	CLARKDALE CEMENT PLANT LIMESTONE QUARRY		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	YAVAPAI		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	PRESCOTT NATIONAL FOREST		
Quad 250k	PRESCOTT		
Quad 100k	PRESCOTT		
Quad 62.5k	CLARKDALE		
Quad 24k	CLARKDALE		
Latitude	34-46-38N	*Decimal Lat*	34.77722
Longitude	112-06-30W	*Decimal Long*	-112.10833
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
11	SW	016N	002E	GILA AND SALT RIVER

Location Comments CEMENT PLANT AT T16N, R3E, NW/4 SEC. 19. LAT-LONG GIVEN ABOVE IS FOR CENTER OF A LARGE QUARRY IN SW/4 OF SEC. 11.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	CER LST
Major	CER LST
Ore Materials	CEMENT ROCK, LIMESTONE
Commod Subtypes	CEMENT, SUGAR REFINING, OTHER

-- Geology --

Tectonic Setting	TRANSITION ZONE
Age Mineralization	MISS DEV
Host Rock Type	LIMESTONE
Host Rock Age	MISS DEV

B-5

Record Number TC10356 *(....Continued)*

Host Rock Type Name	Age	Host Rock Unit Name	Age
LIMESTONE	MISS	REDWALL LIMESTONE	MISS
LIMESTONE	DEV	MARTIN FM	DEV

-- Deposit Description --

--Individual Ore Bodies--

Deposit Type SEDIMENTARY

Deposit Desc Comm THE LIMESTONE IS MASSIVELY BEDDED, OFTEN CHERY, GRAY AND COARSELY CRYSTALLINE ROCK WITH FEW IMPURITIES.

-- Exploration and Development --

Production Size Yes

Developent Status Developed Producer, Active

Operator PHOENIX CEMENT CO. (A GIFFORD-HILL COMPANY)

Expansion M$ *Mill Capacity* 630,000 TPA.

Economic Comments FOR CLARKDALE CEMENT PLANT, USE IN SUGAR REFINING, BUILDING INDUSTRY; MARKETED IN ARIZONA, NEW MEXICO, AND UTAH; 107 EMPLOYEES. MILL CAPACITY 630,000 TPA.

-- Description of Workings --

Desc Workings Surface

Workings Comments ACTIVE QUARRY

General Comm THIS RECORD CONTAINS DATA FROM DUPLICATE RECORD TC10700 OF K.S. BOLM WHICH HAS BEEN DELETED FROM MAIN MRDS.

-- Reference --

Reference ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES, 1988, DIRECTORY OF ACTIVE MINES IN ARIZONA; INCORPORATING SAND AND GRAVEL OPERATIONS: DEPARTMENT OF MINES AND MINERAL RESOURCES, 13 P.

Reference PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERALS CARD FILE.

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Reference KUPFERMAN, S.A., 1987, THE GEOLOGY OF CEMENT RAW MATERIALS: PACIFIC SOUTHWEST, IN PEIRCE, H.W., ED., PROCEEDINGS OF THE 21ST FORUM ON THE GEOLOGY OF INDUSTRIAL MINERALS: ARIZONA BUREAU OF GEOLOGY AND MINERAL TECHNOLOGY GEOLOGICAL SURVEY BRANCH SPECIAL PAPER 4, P. 37-43.

Info Source 12

-- Annual Production --

Item	Acc	Amount	Th Units	Year	Grade
CEMENT		550	TON		

Prod Comments ANNUAL CAPACITY OF 0.55 MILLION TONS OF CEMENT.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 31 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 31 of 103

Record Number	I001572	*User Field*	*U93/5
Record Type	Site	*File Link ID*	CIMRI IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	92 11
Updater	CARBONARO, MARGUERITE M.		
Updater Affiliation	USGS	*Update Date*	93 04

Editor Name	Type	Affiliation	Date	Comments
ORRIS, GRETA J.	R	USGS	11/1/92	
CARBONARO, MARGUERITE M.	U	USGS	4/1/93	

Site Name SALINE WELL NEAR CAMP VERDE

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	YAVAPAI		
Physiographic Prov	12 BASIN AND RANGE		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	HOLBROOK		
Quad 100k	SEDONA		
Quad 24k	CAMP VERDE		
Latitude	34-31-05N	*Decimal Lat*	34.51805
Longitude	111-48-36W	*Decimal Long*	-111.81
Accuracy	ACC -/- 1 MILE		
UTM Northing	3819701.	*UTM Easting*	425652.8
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
15		013N	005E	GILA AND SALT RIVER

Location Comments LAT-LONG IS FOR CENTER OF SEC. 15.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	BRI HAL NA ?
Major	BRI HAL
Occurring	NA ?
Ore Materials	BRINE, SODIUM SULFATES
Analytical Data	BRINE CONTAINS 90,300 PPM DISSOLVED SOLIDS, LARGELY SODIUM AND CHLORIDE.

Record Number **1001572** *(....Continued)*

-- Geology --

Tectonic Setting BASIN AND RANGE

Host Rock Type Name	Age	Host Rock Unit Name	Age
LACUSTRINE SEDIMENTS, EVAPORITES	CEN	VERDE FM	CEN

-- Deposit Description --

Deposit Size Small

--Individual Ore Bodies--

Deposit Type LACUSTRINE BRINE, EVAPORITE

Deposit Desc Comm SODIUM CHLORIDE BRINES ASSOCIATED WITH SODIUM SULFATE DEPOSITS OF THE VERDE FM.

-- Exploration and Development --

Production Size No

Developent Status Occurrence

Development M$* *Mill M$ HYDROLOGOIC UNIT CO

-- Description of Workings --

-- Reference --

Reference USGS, ARIZONA BUREAU OF MINES, AND U.S. BUREAU OF RECLAMATION, 1969, MINERAL AND WATER RESOURCES OF ARIZONA: ARIZONA BUREAU OF MINES BULLETIN 180, 638 P.

Reference PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERALS CARD FILE.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 32 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 32 of 103

Record Number	TC38480	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	WRIGHT HILL CINDER PIT		
	-- Location Information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	KAIBAB NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	PARKS (1980)		
Elevation	7300 FT		
Latitude	35-18-09N	*Decimal Lat*	35.3025
Longitude	111-57-18W	*Decimal Long*	-111.955
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
10	SW OF NE	22N	004E	GILA AND SALT RIVER

Position	ABOUT 3 MI N OF PARKS.
Location Comments	PIT IS AT THE NE BASE OF WRIGHT HILL.
	-- Commodity Information --
Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER
	-- Geology --
	-- Deposit Description --
	--Individual Ore Bodies--
Deposit Type	VOLCANIC
	-- Exploration and Development --

Record Number	**TC38480**	*(....Continued)*
Production Size	Small	
Developent Status	Little Developed Producer, Inactive	
	-- Description of Workings --	
Desc Workings	Surface	
	-- Reference --	
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.	
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.	

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 33 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 33 of 103

Record Number	TC36496	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	NORTH OF PARKS		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	KAIBAB NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	PARKS (1980)		
Elevation	7350 FT		
Latitude	35-17-05N	*Decimal Lat*	35.28472
Longitude	111-57-04W	*Decimal Long*	-111.95111
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
15	SE OF SE	22N	004E	GILA AND SALT RIVER

Position 1.5 MI N OF PARKS.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Small

B-63

Record Number	TC36496 *(....Continued)*
Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.

B-64

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 34 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 34 of 103

Record Number	TC38481	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	STONEMAN LAKE NO. 1 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physicgraphic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	HOLBROOK		
Quad 100k	SEDONA		
Quad 24k	STONEMAN LAKE (1965)		
Elevation	6460 FT		
Latitude	34-45-49N	*Decimal Lat*	34.76361
Longitude	111-32-27W	*Decimal Long*	-111.54083
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
19	NW OF NE	16N	008E	GILA AND SALT RIVER

Position ABOUT 1.5 MI SW OF STONEMAN LAKE.
Location Comments ABOUT 0.6 MI E OF COCONINO/YAVAPAI COUNTY BOUNDARY.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--
Deposit Type VOLCANIC

-- Exploration and Development --

Record Number	**TC38481**	*(....Continued)*
Production Size	Small	
Developent Status	Little Developed Producer, Inactive	
	-- Description of Workings --	
Desc Workings	Surface	
	-- Reference --	
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.	
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.	

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 35 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 35 of 103

Record Number	TC38482	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	SUNSET CRATER EAST NO. 4 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	SUNSET CRATER EAST (1969)		
Elevation	6970 FT		
Latitude	35-21-13N	*Decimal Lat*	35.35361
Longitude	111-29-05W	*Decimal Long*	-111.48472
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
30	NW OF NW	23N	009E	GILA AND SALT RIVER

Position ABOUT 1 MI SE OF SUNSET CRATER.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Small

Record Number	**TC38482** *(....Continued)*
Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 36 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 36 of 103

Record Number	TC38483	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	SUNSET CRATER EAST NO. 3 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	SUNSET CRATER EAST (1969)		
Elevation	6375 FT		
Latitude	35-16-29N	*Decimal Lat*	35.27472
Longitude	111-22-45W	*Decimal Long*	-111.37916
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
19	SW OF SW	22N	010E	GILA AND SALT RIVER

Position	ABOUT 5 MI SE OF SUNSET CRATER.
Location Comments	NEAR THE SOUTHERN BASE OF COCHRANE HILL.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type	VOLCANIC

-- Exploration and Development --

Record Number	**TC38483** *(....Continued)*
Production Size	Small
Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 37 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 37 of 103

Record Number	TC36499	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	WHITE HORSE HILLS NO. 1 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	WHITE HORSE HILLS (1974)		
Elevation	8060 FT		
Latitude	35-25-39N	*Decimal Lat*	35.4275
Longitude	111-44-40W	*Decimal Long*	-111.74444
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
27	S2 OF S2	24N	006E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type	VOLCANIC

-- Exploration and Development --

Production Size	Small
Developent Status	Little Developed Producer, Inactive

-- Description of Workings --

Desc Workings Surface

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.

Reference PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 38 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 38 of 103

Record Number	TC36500	*User Field*	*U94/11
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04

Editor Name	Type	Affiliation	Date	Comments
ORRIS, GRETA J.	R	USGS	4/1/93	

Site Name SUGARLOAF PEAK

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	40		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	SUNSET CRATER WEST (1983)		
Latitude	35-21-35N	*Decimal Lat*	35.35972
Longitude	111-34-57W	*Decimal Long*	-111.5825
Accuracy	ACC +/- 0.5 MI		

Section	Section Fraction	Township	Range	Meridian
19		23N	008E	GILA AND SALT RIVER

Position ABOUT 4.5 MI W OF SUNSET CRATER.
Location Comments THERE ARE 3 PUMICE PITS IN SEC. 19. LAT-LONG IS FOR PIT IN SW/4 OF SE/4.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	PUM
Major	PUM
Ore Materials	PUMICE
Commod Subtypes	USED FOR POZZOLAN IN THE CONSTRUCTION OF THE GLEN CANYON DAM.

-- Geology --

Age Mineralization MIO-PLIO

Host Rock Type Name	Age	Host Rock Unit Name	Age
RHYOLITIC PUMICE	MIO-PLIO		

Record Number	TC36500	*(....Continued)*		
	-- Deposit Description --			
	--Individual Ore Bodies--			
Deposit Type	VOLCANIC			
Thickness	200.		*Units*	FT
Deposit Desc Comm	PUMICE FRAGMENTS ARE COARSE TO FINE, ANGULAR TO ROUNDED, BEDDED OR UNSORTED, AND LOOSELY CONSOLIDATED. THE DEPOSITS ARE UP TO 200 FT THICK.			
	-- Exploration and Development --			
Production Size	Small			
Developent Status	Developed Producer, Inactive			
Development MS			*Mill MS*	HYDROLOGOIC UNIT CO
	-- Description of Workings --			
Desc Workings	Surface			
General Comm	THIS RECORD INCLUDES DATA FROM DUPLICATE RECORD TC35342 WHICH HAS BEEN DELETED FROM MRDS.			
	-- Reference --			
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.			
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.			

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 39 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 39 of 103

Record Number	TC38484	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	SUNSET CRATER EAST NO. 2 CINDER PIT		
	-- Location Information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	SUNSET CRATER EAST (1969)		
Elevation	6550 FT		
Latitude	35-15-40N	*Decimal Lat*	35.26111
Longitude	111-28-29W	*Decimal Long*	-111.47472
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
29	SW OF NW	22N	009E	GILA AND SALT RIVER

Position	ABOUT 7 MI S OF SUNSET CRATER.
Location Comments	ABOUT 0.5 MI NW OF O'NEILL CRATER.
	-- Commodity Information --
Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER
	-- Geology --
	-- Deposit Description --
	--Individual Ore Bodies--
Deposit Type	VOLCANIC
	-- Exploration and Development --

Production Size	Small
Developent Status	Little Develcped Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 40 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 40 of 103

Record Number	TC38485	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	SUNSET CRATER EAST NO. 1 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	SUNSET CRATER EAST (1969)		
Elevation	6240 FT		
Latitude	35-15-26N	*Decimal Lat*	35.25722
Longitude	111-23-53W	*Decimal Long*	-111.39805
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
25	W2 OF SW	22N	009E	GILA AND SALT RIVER

Position ABOUT 10.5 MI SE OF SUNSET CRATER.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Small

Record Number	**TC38485** *(....Continued)*
Developent Status	Little Develcped Producer, Inactive
	-- Description cf Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GECLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 41 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 41 of 103

Record Number	TC38486	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	DUTTON HILL NO. 1 CINDER PIT		
	-- Location Information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	DUTTON HILL (1980)		
Elevation	7260 FT		
Latitude	35-05-05N	*Decimal Lat*	35.08472
Longitude	111-49-08W	*Decimal Long*	-111.81888
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
25	NE OF SW	20N	005E	GILA AND SALT RIVER

Position ABOUT 2 MI S OF DUTTON HILL.

-- Commodity Information --

Commodity Type Non-metallic
Commodities VOL
Major VOL
Ore Materials CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--
Deposit Type VOLCANIC

-- Exploration and Development --
Production Size Small

Record Number	TC38486	*(....Continued)*
Developent Status	Little Developed Producer, Inactive	
	-- Description of Workings --	
Desc Workings	Surface	
	-- Reference --	
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.	
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.	

B-80

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 42 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 42 of 103

Record Number	TC38487	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	FLAGSTAFF WEST NO. 2 CINDER PIT		
	-- Location Information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	FLAGSTAFF WEST (1983)		
Elevation	7120 FT		
Latitude	35-10-18N	*Decimal Lat*	35.17166
Longitude	111-41-58W	*Decimal Long*	-111.69944
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
30	NW OF SW	21N	007E	GILA AND SALT RIVER

Position ABOUT 2.5 MI SW OF FLAGSTAFF.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Small

Record Number	TC38487 *(....Continued)*
Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILE.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 43 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 43 of 103

Record Number	TC38488	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	FLAGSTAFF WEST NO. 1 CINDER PIT		
	-- Location information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	FLAGSTAFF WEST (1983)		
Elevation	7180 FT		
Latitude	35-09-42N	*Decimal Lat*	35.16166
Longitude	111-43-15W	*Decimal Long*	-111.72083
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
35	SE OF NE	21N	006E	GILA AND SALT RIVER

Position ABOUT 3.75 MI SW OF FLAGSTAFF.

-- Commodity information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Small

Record Number	**TC38488**	*(....Continued)*

Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILE.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 44 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 44 of 103

Record Number	TC36889	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	SEDGE SPRING CINDER PIT		
	-- Location Information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	HOLBROOK		
Quad 100k	SEDONA		
Quad 24k	MORMON LAKE (1974)		
Elevation	7240 FT		
Latitude	34-54-13N	*Decimal Lat*	34.90361
Longitude	111-25-37W	*Decimal Long*	-111.42694
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
34	NW OF NE	18N	009E	GILA AND SALT RIVER

Position ABOUT 2 MI SSE OF MORMON LAKE, AZ.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Small

B-84

Record Number	**TC36889** *(....Continued)*
Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILE.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 45 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 45 of 103

Record Number	TC36890	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	KINNIKINICK LAKE		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	HOLBROOK		
Quad 100k	SEDONA		
Quad 24k	KINNIKINICK LAKE (1970)		
Elevation	7490 FT		
Latitude	34-55-58N	*Decimal Lat*	34.93277
Longitude	111-21-43W	*Decimal Long*	-111.36194
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
20	NW OF NW	18N	010E	GILA AND SALT RIVER

Location Comments NEAR PEAK ON S SIDE OF PINE HILL.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Small

Record Number	**TC36890** *(....Continued)*
Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILE.

Mineral Resources Data System (MRDS)

Record Number	TC36891	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	KENDRICK PEAK NO. 2 CINDER PIT		
	-- Location Information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	KENDRICK PEAK (1966)		
Elevation	7320 FT		
Latitude	35-29-45N	*Decimal Lat*	35.49583
Longitude	111-48-27W	*Decimal Long*	-111.8075
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
6	NW OF NW	24N	006E	GILA AND SALT RIVER

Location Comments 2 MI E OF THE PEAK OF SLATE MOUNTAIN. ON SW FLANK OF A SMALL HILL.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Small

Record Number	**TC36891**	*(....Continued)*
Developent Status	Little Developed Producer, Inactive	
	-- Description of Workings --	
Desc Workings	Surface	
	-- Reference --	
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.	
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILE.	

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 47 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 47 of 103

Record Number	TC36892	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	KENDRICK PEAK NO. 1 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	KENDRICK PEAK (1966)		
Elevation	8040 FT		
Latitude	35-22-56N	*Decimal Lat*	35.38222
Longitude	111-47-04W	*Decimal Long*	-111.78444
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
17	N2 OF N2	23N	006E	GILA AND SALT RIVER

Location Comments ABOUT 4 MI ESE OF KENDRICK PEAK.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Small

Record Number	**TC36892** *(....Continued)*
Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILE.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 48 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 48 of 103

Record Number	TC38493	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	FLAGSTAFF EAST NO. 5 CINDER PIT		
	-- Location Information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	FLAGSTAFF EAST (1983)		
Elevation	6810 FT		
Latitude	35-13-11N	*Decimal Lat*	35.21972
Longitude	111-31-32W	*Decimal Long*	-111.52555
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
10	SE OF NE	21N	008E	GILA AND SALT RIVER

Position	ABOUT 4 MI E OF FLAGSTAFF.
Location Comments	AT SW BASE OF TURKEY HILLS.
	-- Commodity Information --
Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER
	-- Geology --
	-- Deposit Description --
	--Individual Ore Bodies--
Deposit Type	VOLCANIC
	-- Exploration and Development --

B-92

Record Number	**TC38493**	*(....Continued)*
Production Size	Small	
Developent Status	Little Developed Producer, Inactive	
	-- Description of Workings --	
Desc Workings	Surface	
	-- Reference --	
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.	
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILE.	

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 49 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 49 of 103

Record Number	TC38494	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	EBERT MOUNTAIN CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	KAIBAB NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	CAMERON		
Quad 62.5k	EBERT MOUNTAIN		
Quad 24k	EBERT MOUNTAIN (1989)		
Elevation	6800 FT		
Latitude	35-33-44N	*Decimal Lat*	35.56222
Longitude	111-55-59W	*Decimal Long*	-111.93305
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
11	CENTER	25N	004E	GILA AND SALT RIVER

Location Comments ON NE FLANK OF EBERT MOUNTAIN.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Record Number	TC38494 *(....Continued)*
Production Size	Small
Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILE.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 50 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 50 of 103

Record Number	TC38495	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	SECTION 16 HILL CINDER PIT		
	-- Location Information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	KAIBAB NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	PARKS (1980)		
Elevation	7300 FT		
Latitude	35-22-24N	*Decimal Lat*	35.37333
Longitude	111-58-22W	*Decimal Long*	-111.97277
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
16	NW OF SE	23N	004E	GILA AND SALT RIVER

Position ABOUT 8 MI N OF PARKS.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Small

B-96

Record Number	TC38495 *(....Continued)*
Developent Status	Little Develcped Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GECLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 51 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 51 of 103

Record Number	TC38496	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	TURKEY HILLS CINDER PIT		
	-- Location Information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	FLAGSTAFF EAST (1983)		
Elevation	7420 FT		
Latitude	35-13-47N	*Decimal Lat*	35.22972
Longitude	111-30-42W	*Decimal Long*	-111.51166
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
2	NW OF SE	21N	008E	GILA AND SALT RIVER

Position ABOUT 5 MI ENE OF FLAGSTAFF.
Location Comments ON SE PEAK OF TURKEY HILLS.

-- Commodity Information --

Commodity Type Non-metallic
Commodities VOL
Major VOL
Ore Materials CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--
Deposit Type VOLCANIC

-- Exploration and Development --

B-98

Record Number	TC38496 *(....Continued)*
Production Size	Small
Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILE.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 52 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 52 of 103

Record Number	TC36898	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	STAR NO. 28 CINDER PIT		
	-- Location Information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	WING MOUNTAIN (1974)		
Elevation	7580 FT		
Latitude	35-16-18N	*Decimal Lat*	35.27166
Longitude	111-46-18W	*Decimal Long*	-111.77166
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
20	NE OF SW	22N	006E	GILA AND SALT RIVER

Location Comments ON EASTERN FLANK OF WING MOUNTAIN.

	-- Commodity Information --
Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER
	-- Geology --
	-- Deposit Description --
	--Individual Ore Bodies--
Deposit Type	VOLCANIC
	-- Exploration and Development --
Production Size	Small

B-100

Record Number	TC36898 *(....Continued)*
Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT NO. 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 53 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 53 of 103

Record Number	TC38499	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	SPITZ SPRING CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	KAIBAB NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	PARKS (1980)		
Elevation	7100 FT		
Latitude	35-15-57N	*Decimal Lat*	35.26583
Longitude	111-58-10W	*Decimal Long*	-111.96944
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
21	S2 OF SE	22N	004E	GILA AND SALT RIVER

Position ABOUT 1.25 MI WNW OF PARKS.
Location Comments ABOUT 0.4 MI NNE OF SPITZ SPRING.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--
Deposit Type VOLCANIC

-- Exploration and Development --

B-10

Record Number	TC38499 *(....Continued)*
Production Size	Small
Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 54 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 54 of 103

Record Number	TC38500	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	MORMON MTN. NO. 1 CINDER PIT		
	-- Location Information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	HOLBROOK		
Quad 100k	SEDONA		
Quad 24k	MORMON MTN. (1974)		
Elevation	7470 FT		
Latitude	34-54-38N	*Decimal Lat*	34.91055
Longitude	111-32-10W	*Decimal Long*	-111.53611
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
27	NE OF SW	16N	008E	GILA AND SALT RIVER

Location Comments ABOUT 1 MI SSE OF BURT LEE PARK.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Small

B104

Record Number	TC38500 *(....Continued)*
Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILE.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 55 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 55 of 103

Record Number	TC38469	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	LARRY'S STORE		
	-- Location Information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	WING MOUNTAIN (1974)		
Elevation	7630 FT		
Latitude	35-17-10N	*Decimal Lat*	35.28611
Longitude	111-46-21W	*Decimal Long*	-111.7725
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
17	SE OF SE	22N	006E	GILA AND SALT RIVER

Location Comments ON THE NE FLANK OF WING MOUNTAIN. THERE ARE TWO CINDER PITS IN THE SE/4 OF THE SE/4 OF SEC. 17. THE LAT-LONG IS FOR THE NORTHERNMOST PIT. THE SECOND PIT IS ABOUT 0.15 MI SSW OF THE FIRST.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

B-106

Record Number	TC38469 *(....Continued)*
	-- Exploration and Development --
Production Size	Small
Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 56 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 56 of 103

Record Number	TC38471	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	BELLEMONT NO. 2 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41 50		
Administrative Area	COCONINO NATIONAL FOREST, NAVAJO ARMY DEPOT		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	BELLLEMONT (1980)		
Elevation	7260 FT		
Latitude	35-12-04N	*Decimal Lat*	35.20111
Longitude	111-47-03W	*Decimal Long*	-111.78416
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
17	NE OF SW	21N	006E	GILA AND SALT RIVER

Position ABOUT 3.75 MI SE OF BELLEMONT AND 3 MI N OF ROGERS LAKE.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Small

B-108

Record Number	TC38471	*(....Continued)*

Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 57 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 57 of 103

Record Number	TC38472	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	ANGELL NO. 2 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	ANGELL (1983)		
Elevation	6090 FT		
Latitude	35-10-49N	*Decimal Lat*	35.18027
Longitude	111-20-20W	*Decimal Long*	-111.33888
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
28	SE OF NW	21N	010E	GILA AND SALT RIVER

Position ABOUT 2.2 MI WSW OF ANGELL.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Small

B-110

Record Number	TC38472 *(....Continued)*
Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 58 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 58 of 103

Record Number	TC38473	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	ANGELL NO. 1 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	ANGELL (1983)		
Elevation	6100 FT		
Latitude	35-09-20N	*Decimal Lat*	35.15555
Longitude	111-19-20W	*Decimal Long*	-111.32222
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
3	NW OF NE	20N	010E	GILA AND SALT RIVER

Position ABOUT 2.5 MI S OF ANGELL.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Small

B-112

Record Number	TC38473 *(....Continued)*
Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 59 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 59 of 103

Record Number	TC38475	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	BAKER PIT		
	-- Location Information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	WINONA (1974)		
Elevation	6425 FT		
Latitude	35-13-16N	*Decimal Lat*	35.22111
Longitude	111-25-18W	*Decimal Long*	-111.42166
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
10	NE OF NE	21N	009E	GILA AND SALT RIVER

Position	ABOUT 1.5 MI NW OF WINONA.
Location Comments	ABOUT 1 MI W OF CINDER MOUNTAIN.
	-- Commodity Information --
Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER
	-- Geology --
	-- Deposit Description --
	--Individual Ore Bodies--
Deposit Type	VOLCANIC
	-- Exploration and Development --

Record Number	**TC38475** *(....Continued)*
Production Size	Small
Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 60 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 60 of 103

Record Number	TC35340	*User Field*	*U94/1
Record Type	Site	*File Link ID*	IMS, CIMRI
Reporter	WELLS, TINA M.		
Reporter Affiliation	USGS	*Report Date*	93 05
Site Name	O'LEARY PEAK		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Quad 250k	FLAGSTAFF		
Quad 24k	O'LEARY PEAK		
Latitude	35-24- N	*Decimal Lat*	35.4
Longitude	111-31- W	*Decimal Long*	-111.51666
Accuracy	EST		
UTM Northing	3917326.	*UTM Easting*	453082.5
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
10		023N	008E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	PUM
Major	PUM
Ore Materials	PUMICE

-- Geology --

Host Rock Type RHYOLITIC VOLCANIC ROCKS

Host Rock Type Name	Age	Host Rock Unit Name	Age
RHYOLITIC VOLCANIC ROCKS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

Deposit Desc Comm PUMICE IS RHYOLITIC.

-- Exploration and Development --

Production Size	No
Developent Status	Occurrence

B-116

-- Description of Workings --

Desc Workings Surface

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Reference PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERALS CARD FILE.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 62 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 62 of 103

Record Number	TC36493	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	NORTH AND SOUTH SHEBA CRATERS		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	30		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	MERRIAM CRATER (1969)		
Latitude	35-18-33N	*Decimal Lat*	35.30915
Longitude	111-15-48W	*Decimal Long*	-111.26333
Accuracy	ACC +/- 1 MI		

Section	Section Fraction	Township	Range	Meridian
7,8,17,18		22N	011E	GILA AND SALT RIVER

Location Comments LAT-LONG IS FOR A POINT BETWEEN THE NORTH AND SOUTH SHEBA CRATERS. THIS POINT LIES IN THE CENTER OF SECTION 7.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

Deposit Desc Comm CINDER CONES

-- Exploration and Development --

Production Size No

B-118

Record Number	**TC36493**	*(....Continued)*

Developent Status Occurrence

-- Description of Workings --

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 63 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 63 of 103

Record Number	TC36494	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	PARKS		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	KAIBAB NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	PARKS (1980)		
Elevation	7050 FT		
Latitude	35-15-05N	*Decimal Lat*	35.25138
Longitude	111-57-47W	*Decimal Long*	-111.96305
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
27	SW OF SW	22N	004E	GILA AND SALT RIVER

Position ABOUT 1 MI SW OF PARKS.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Small

B-120

Record Number	**TC36494**	*(....Continued)*
Developent Status	Little Developed Producer, Inactive	
	-- Description of Workings --	
Desc Workings	Surface	
	-- Reference --	
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.	
Reference	PEIRCE, H.W., 1990, ARIZONA GECLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.	

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 64 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 64 of 103

Record Number	TC36911	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	HUMPHREYS PEAK NO. 1 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	HUMPHREYS PEAK (1983)		
Elevation	8560 FT		
Latitude	35-21-56N	*Decimal Lat*	35.36555
Longitude	111-44-54W	*Decimal Long*	-111.74833
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
22	S2 OF N2	23N	006E	GILA AND SALT RIVER

Location Comments THERE ARE 2 CINDER PITS IN N/2 OF SECTION. LAT-LONG IS FOR WESTERNMOST PIT.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Small

B-122

Record Number	**TC36911**	*(....Continued)*
Developent Status	Little Developed Producer, Inactive	
	-- Description of Workings --	
Desc Workings	Surface	
	-- Reference --	
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT NO. 4, 185 P.	
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.	

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 65 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 65 of 103

Record Number	TC35343	*User Field*	*U94/1
Record Type	Site	*File Link ID*	IMS, CIMRI
Reporter	WELLS, TINA M.		
Reporter Affiliation	USGS	*Report Date*	93 05
Site Name	ROBINSON CRATER AREA		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Quad 250k	FLAGSTAFF		
Quad 24k	O'LEARY PEAK		
Latitude	35-24- N	*Decimal Lat*	35.4
Longitude	111-33- W	*Decimal Long*	-111.55
Accuracy	EST		
UTM Northing	3917343.	*UTM Easting*	450055.6
UTM Zone	+12		

Section	Section Fraction	Township	Range	Meridian
4, 9, 10		023N	008E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	PUM
Major	PUM
Ore Materials	PUMICE SAND

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type	VOLCANIC?
Deposit Desc Comm	PUMICE SAND.

-- Exploration and Development --

Production Size	U
Developent Status	Prospect, Inactive

-- Description of Workings --

B-124

Record Number	**TC35343**	*(....Continued)*

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Reference PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERALS CARD FILE.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 66 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 66 of 103

Record Number	TC36913	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	SHEEP HILL		

-- Location information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	FLAGSTAFF EAST (1983)		
Elevation	6920 FT		
Latitude	35-13-55N	*Decimal Lat*	35.23194
Longitude	111-33-48W	*Decimal Long*	-111.56333
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
5	NE OF SE	21N	008E	GILA AND SALT RIVER

Position ABOUT 3 MI NE OF FLAGSTAFF.
Location Comments AT SOUTHERN BASE OF SHEEP HILL. THERE ARE FOUR OTHER CINDER PITS IN SECTION.

-- Commodity Information --

Commodity Type Non-metallic
Commodities VOL
Major VOL
Ore Materials CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--
Deposit Type VOLCANIC

-- Exploration and Development --

B-126

Record Number	**TC36913**	*(....Continued)*
Production Size	Small	
Developent Status	Little Developed Producer, Inactive	
	-- Description of Workings --	
Desc Workings	Surface	
	-- Reference --	
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.	
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILE.	

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 67 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 67 of 103

Record Number	TC36917	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	STAR NO. 29 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	WING MOUNTAIN (1974)		
Elevation	7560 FT		
Latitude	35-16-26N	*Decimal Lat*	35.27388
Longitude	111-46-07W	*Decimal Long*	-111.76861
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
21	NW OF SW	22N	006E	GILA AND SALT RIVER

Location Comments AT EASTERN BASE OF WING MOUNTAIN.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Small

B-128

Record Number	TC36917	*(....Continued)*

Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT NO. 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 68 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 68 of 103

Record Number	TC36918	*User Field*	*U95/05
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04

Editor Name	Type	Affiliation	Date	Comments
ORRIS, GRETA J.	R	USGS	4/1/93	

Site Name RED HILL PIT

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	FLATSTAFF EAST (1983)		
Elevation	6880 FT		
Latitude	35-13-20N	*Decimal Lat*	35.22222
Longitude	111-32-52W	*Decimal Long*	-111.54777
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
9	NW OF NE	021N	008E	GILA AND SALT RIVER

Position ABOUT 3 MI E OF FLAGSTAFF.
Location Comments ON THE SE FLANK OF WILDCAT HILL.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER
Commod Subtypes	USED FOR TREATMENT OF ICY HIGHWAYS, ROAD BEDS, AND LANDSCAPING.

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Record Number	**TC36918**	*(....Continued)*		
Deposit Type	VOLCANIC			
	-- Exploration and Development --			
Production Size	Yes			
Developent Status	Developed Producer, Inactive			
Development M$		*Mill M$*	HYDROLOGOIC UNIT CO	
	-- Description of Workings --			
Desc Workings	Surface			
	-- Reference --			
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.			
Reference	PEIRCE, H.W., 1990, ARIZONA GECLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILE.			

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 69 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 69 of 103

Record Number	TC36919	*User Field*	*U95/05
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04

Editor Name	Type	Affiliation	Date	Comments
ORRIS, GRETA J.	R	USGS	4/1/30	

Site Name SHEEP PIT

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	FLAGSTAFF WEST (1983)		
Latitude	35-14-50N	*Decimal Lat*	35.24722
Longitude	111-32-00W	*Decimal Long*	-111.53333
Accuracy	ACC +/- 1 MILE		

Section	Section Fraction	Township	Range	Meridian
34		022N	008E	GILA AND SALT RIVER

Position ABOUT 6 MI ENE OF FLAGSTAFF.
Location Comments NO CINDER PIT IN SECTION. LAT-LONG IS FOR CENTER OF SECTION 34.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER
Commod Subtypes	USED FOR TREATMENT OF ICY HIGHWAYS.

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--
Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Yes

Developent Status Intermittent Producer

Development M$* *Mill M$ HYDROLOGOIC UNIT CO

-- Description of Workings --

Desc Workings Surface

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.

Reference PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILE.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 70 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 70 of 103

Record Number	TC36920	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	HORSE TANK CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	KAIBAB NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	CAMERON		
Quad 62.5k	EBERT MOUNTAIN		
Quad 24k	EBERT MOUNTAIN (1989)		
Elevation	6710 FT		
Latitude	35-33-35N	*Decimal Lat*	35.55972
Longitude	111-54-07W	*Decimal Long*	-111.90194
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
7	S2 OF S2	25N	005E	GILA AND SALT RIVER

Location Comments ABOUT 2 MI E OF EBERT MOUNTAIN.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

B-134

Record Number	TC36920 *(....Continued)*
Production Size	Small
Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT NO. 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 71 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 71 of 103

Record Number	TC36921	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	O'LEARY PEAK NO. 1 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	O'LEARY PEAK (1983)		
Elevation	7180 FT		
Latitude	35-23-06N	*Decimal Lat*	35.385
Longitude	111-34-22W	*Decimal Long*	-111.57277
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
17	N2 OF NW	23N	008E	GILA AND SALT RIVER

Location Comments 1-1.5 MI W OF ROBINSON MOUNTAIN.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Small

Record Number	**TC36921**	*(....Continued)*
Developent Status	Little Developed Producer, Inactive	
	-- Description of Workings --	
Desc Workings	Surface	
	-- Reference --	
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT NO. 4, 185 P.	
Reference	PEIRCE, H.W., 1990, ARIZONA GECLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.	

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 72 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 72 of 103

Record Number	TC36922	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	MCCORMICK		
	-- Location Information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	SUNSET CRATER WEST (1983)		
Elevation	8210 FT		
Latitude	35-21-43N	*Decimal Lat*	35.36194
Longitude	111-36-18W	*Decimal Long*	-111.605
Accuracy	ACC +/- 1 MI		

Section	Section Fraction	Township	Range	Meridian
24		23N	007E	GILA AND SALT RIVER

Position ABOUT 6 MI W OF SUNSET CRATER.

Location Comments ON E-NE FLANK OF SUGARLOAF OF SAN FRANCISCO MOUNTAIN. THERE ARE THREE GRAVEL PITS IN SECTION 24. LAT-LONG IS FOR THE PIT CLOSEST TO THE CENTER OF THE SECTION.

-- Commodity Information --

Commodity Type	Both
Commodities	VOL PER U
Major	VOL PER
Occurring	U
Ore Materials	PERLITE, OBSIDIAN, CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

B-130

Deposit Desc Comm PERLITE WITH OBSIDIAN IN CINDER BED.

-- Exploration and Development --

Production Size No

Developent Status Occurrence

-- Description of Workings --

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT NO. 4, 185 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 73 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 73 of 103

Record Number	TC36924	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	SLATE MOUNTAIN CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	CAMERON		
Quad 62.5k	EBERT MTN.		
Quad 24k	CHAPEL MOUNTAIN (1989)		
Elevation	7150 FT		
Latitude	35-30-37N	*Decimal Lat*	35.51027
Longitude	111-49-33W	*Decimal Long*	-111.82583
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
35	NW OF SE	25N	005E	GILA AND SALT RIVER

Location Comments 1-2 MI NE OF SLATE MOUNTAIN.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Record Number	TC36924 *(....Continued)*
Production Size	Small
Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT NO. 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILES.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 74 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 74 of 103

Record Number	TC36925	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	CINDER STATION CINDER PIT		
	-- Location Information --		
Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	FLAGSTAFF EAST (1983)		
Elevation	6940 FT		
Latitude	35-07-57N	*Decimal Lat*	35.1325
Longitude	111-37-17W	*Decimal Long*	-111.62138
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
11	SW OF NE	20N	007E	GILA AND SALT RIVER

Position ABOUT 4 MI S OF FLAGSTAFF.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size Small

B-142

Record Number	**TC36925** *(....Continued)*
Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILE.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 75 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 75 of 103

Record Number	TC36927	*User Field*	*93/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	93 04
Site Name	LAVA CLAIM		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11 COLORADO PLATEAU		
Drainage Area	15 LOWER COLORADO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	FLAGSTAFF WEST (1983)		
Elevation	7150 FT		
Latitude	35-09-52N	*Decimal Lat*	35.16444
Longitude	111-42-22W	*Decimal Long*	-111.70611
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
36	NW OF NE	21N	006E	GILA AND SALT RIVER

Position ABOUT 3 MI SW OF FLAGSTAFF.
Location Comments THERE ARE TWO CINDER PITS MARKED ON TOPO. LAT-LONG IS FOR THE SOUTHERNMOST PIT.

-- Commodity Information --

Commodity Type Non-metallic
Commodities VOL
Major VOL
Ore Materials CINDER

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--
Deposit Type VOLCANIC

-- Exploration and Development --

Record Number	**TC36927** *(....Continued)*
Production Size	Small
Developent Status	Little Developed Producer, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Reference	PEIRCE, H.W., 1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERAL CARD FILE.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 76 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 76 of 103

Record Number	TC40400	*User Field*	*94/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 05
Site Name	HUMPHREY PEAK NO.1		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	SUNSET CRATER WEST		
Latitude	35-18-49N	*Decimal Lat*	35.31361
Longitude	111-37-33W	*Decimal Long*	-111.62583
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
02?		022N	002E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	LST MBL
Major	LST MBL
Ore Materials	LIMESTONE, MARBLE

-- Geology --

Host Rock Type Name	Age	Host Rock Unit Name	Age
LIMESTONE, MARBLE	MISS	REDWALL FM	MISS

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type	SEDIMENTARY
Deposit Desc Comm	WHITE LIMESTONE AND MARBLE

-- Exploration and Development --

Production Size	U

Record Number	**TC40400** *(....Continued)*
Developent Status	Prospect, Inactive
	-- Description of Workings --
Desc Workings	Surface
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 77 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 77 of 103

Record Number	I008323	*User Field*	*U95/05
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01

Editor Name	Type	Affiliation	Date	Comments
ORRIS, GRETA J.	R	USGS	1/1/94	
ORRIS, GRETA J.	U	USGS	5/1/95	

Site Name WINONA - SOUTH

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11		
Drainage Area	15		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 24k	WINONA		
Latitude	35-11-38N	*Decimal Lat*	35.19388
Longitude	111-24-24W	*Decimal Long*	-111.40666
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
23		021N	009E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	VOLCANIC CINDERS

-- Geology --

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

B-148

-- Exploration and Development --

Production Size Small

Developent Status Developed Producer, Inactive

-- Description of Workings --

Desc Workings Surface

Workings Comments QUARRY.

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Info Source 94/07/20

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 78 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 78 of 103

Record Number	I008459	*User Field*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 24k	FLAGSTAFF WEST (1983)		
Latitude	35-09-42N	*Decimal Lat*	35.16166
Longitude	111-43-16W	*Decimal Long*	-111.72111
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
35	NE	021N	006E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	VOLCANIC CINDERS

-- Geology --

Host Rock Type VOLCANICS

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size	Small
Developent Status	Little Developed Producer, Inactive

Record Number	1008459	*(....Continued)*

-- Description of Workings --

Desc Workings Surface

-- Reference --

Reference U.S. GEOLOGICAL SURVEY, 1983, FLAGSTAFF WEST 1:24,000 TOPOGRAPHIC QUADRANGLE.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 79 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 79 of 103

Record Number	I008460	*User Field*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	CINDER PITS		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 24k	FLAGSTAFF WEST (1983)		
Latitude	35-09-55N	*Decimal Lat*	35.16527
Longitude	111-42-23W	*Decimal Long*	-111.70638
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
36	NW OF NE	021N	006E	GILA AND SALT RIVER

Location Comments 2ND PIT IS 0.1 MILE S.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	VOLCANIC CINDERS

-- Geology --

Host Rock Type VOLCANICS

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size	Small
Development Status	Little Developed Producer, Inactive

-- Description of Workings --

Desc Workings Surface

-- Reference --

Reference U.S. GEOLOGICAL SURVEY, 1983, FLAGSTAFF WEST 1:24,000 TOPOGRAPHIC QUADRANGLE.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 80 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 80 of 103

Record Number	I008461	*User Field*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	GRAVEL PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Quad 250k	FLAGSTAFF		
Quad 24k	FLAGSTAFF WEST (1983)		
Latitude	35-14-42N	*Decimal Lat*	35.245
Longitude	111-30-54W	*Decimal Long*	-111.515
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
33		022N	007E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	SDG
Major	SDG
Ore Materials	GRAVEL

-- Geology --

Host Rock Type Name	Age	Host Rock Unit Name	Age
SEDIMENTARY ROCKS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type	SEDIMENTARY

-- Exploration and Development --

Production Size	Small
Developent Status	Developed Producer, Inactive

-- Description of Workings --

Desc Workings	Surface

-- Reference --

Reference U.S. GEOLOGICAL SURVEY, 1983, FLAGSTAFF WEST 1:24,000 TOPOGRAPHIC QUADRANGLE.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 81 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 81 of 103

Record Number	I008462	*User Field*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Quad 250k	FLAGSTAFF		
Quad 24k	FLAGSTAFF WEST (1983)		
Latitude	35-10-18N	*Decimal Lat*	35.17166
Longitude	111-41-57W	*Decimal Long*	-111.69916
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
30	NW OF SE	021N	007E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	VOLCANIC CINDERS

-- Geology --

Host Rock Type VOLCANICS

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size	Small
Developent Status	Little Developed Producer, Inactive

-- Description of Workings --

Desc Workings Surface

B-156

-- Reference --

Reference U.S. GEOLOGICAL SURVEY, 1983, FLAGSTAFF WEST 1:24,000 TOPOGRAPHIC QUADRANGLE.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 82 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 82 of 103

Record Number	I008463	*User Field*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	HAPPY JACK NO. 1 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	HOLBROOK		
Quad 24k	HAPPY JACK (1965)		
Latitude	34-44-52N	*Decimal Lat*	34.74777
Longitude	111-25-17W	*Decimal Long*	-111.42138
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
29		016N	009E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	VOLCANIC CINDERS

-- Geology --

Host Rock Type VOLCANICS

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size	Small
Developent Status	Little Develcped Producer, Inactive

Record Number	I008463	*(....Continued)*

-- Description of Workings --

Desc Workings Surface

-- Reference --

Reference U.S. GEOLOGICAL SURVEY, 1965, HAPPY JACK 1:24,000 TOPOGRAPHIC QUADRANGLE.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 83 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 83 of 103

Record Number	I008348	*User Field*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	ADOT MATERIALS PIT NO. 5780		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	YAVAPAI		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	HOLBROOK		
Quad 24k	CASNER BUTTE (1965)		
Elevation	4895 FT		
Latitude	34-44-30N	*Decimal Lat*	34.74166
Longitude	111-41-34W	*Decimal Long*	-111.69277
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
34	NE	016N	006E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	SCORIA, VOLCANIC CINDERS

-- Geology --

Host Rock Type VOLCANICS

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size	Small
Developent Status	Little Developed Producer, Inactive

B-160

-- Description of Workings --

Desc Workings Surface

Workings Comments QUARRY.

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

B-161

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 84 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 84 of 103

Record Number	I008290	*User Field*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	BELLEMONT NO. 3 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Land Status	50		
Administrative Area	NAVAJO ARMY DEPOT		
Quad 250k	FLAGSTAFF		
Quad 24k	BELLEMONT (1980)		
Latitude	35-11-44N	*Decimal Lat*	35.19555
Longitude	111-48-15W	*Decimal Long*	-111.80416
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
18		021N	006E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	VOLCANIC CINDERS

-- Geology --

Host Rock Type VOLCANICS

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size	Small
Developent Status	Little Developed Producer, Inactive

B-162

-- Description of Workings --

Desc Workings Surface

Workings Comments QUARRY.

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 85 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 85 of 103

Record Number	I008291	*User Field*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	BELLEMONT NO. 4 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Quad 250k	FLAGSTAFF		
Quad 24k	BELLEMONT (1980)		
Latitude	35-11-55N	*Decimal Lat*	35.19861
Longitude	111-48-06W	*Decimal Long*	-111.80166
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
18		021N	006E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	VOLCANIC CINDERS

-- Geology --

Host Rock Type VOLCANICS

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size	Small
Developent Status	Little Developed Producer, Inactive

-- Description of Workings --

Desc Workings Surface

B-164

Workings Comments QUARRY.

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 86 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 86 of 103

Record Number	1008292	*User Field*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	BELLEMONT NO. 5 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Quad 250k	FLAGSTAFF		
Quad 24k	BELLEMONT (1980)		
Latitude	35-14-41N	*Decimal Lat*	35.24472
Longitude	111-52-10W	*Decimal Long*	-111.86944
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
33		022N	005E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	VOLCANIC CINDERS

-- Geology --

Host Rock Type VOLCANICS

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size	Small
Developent Status	Little Developed Producer, Inactive

-- Description of Workings --

Desc Workings Surface

B-166

Workings Comments QUARRY.

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 87 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 87 of 103

Record Number	I008293	*User Field*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	BELLEMONT NO. 6 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Quad 250k	FLAGSTAFF		
Quad 24k	BELLEMONT (1980)		
Latitude	35-14-46N	*Decimal Lat*	35.24611
Longitude	111-52-07W	*Decimal Long*	-111.86861
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
33		022N	005E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	VOLCANIC CINDERS

-- Geology --

Host Rock Type VOLCANICS

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size	Small
Developent Status	Little Developed Producer, Inactive

-- Description of Workings --

Desc Workings Surface

B-168

Workings Comments QUARRY.

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 88 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 88 of 103

Record Number	I008294	*User Field*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	BELLEMONT NO. 7 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Quad 250k	FLAGSTAFF		
Quad 24k	BELLEMONT (1980)		
Latitude	35-15-02N	*Decimal Lat*	35.25055
Longitude	111-52-13W	*Decimal Long*	-111.87027
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
33		022N	005E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	VOLCANIC CINDERS

-- Geology --

Host Rock Type VOLCANICS

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size	Small
Developent Status	Little Developed Producer, Inactive

-- Description of Workings --

Desc Workings Surface

B-170

Workings Comments QUARRY.

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 89 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 89 of 103

Record Number	I008295	*User Field*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	GARLAND PRAIRIE NO. 1 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Land Status	41		
Administrative Area	KAIBAB NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 24k	GARLAND PRAIRIE (1974)		
Elevation	7040 FT		
Latitude	35-14-42N	*Decimal Lat*	35.245
Longitude	111-55-58W	*Decimal Long*	-111.93277
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
35		022N	004E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	VOLCANIC CINDERS

-- Geology --

Host Rock Type VOLCANICS

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size	Small
Developent Status	Little Developed Producer, Inactive

-- Description of Workings --

Desc Workings Surface

Workings Comments QUARRY.

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 90 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 90 of 103

Record Number	I008296	*User Field*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	GARLAND PRAIRIE NO. 2 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Land Status	50		
Administrative Area	NAVAJO ARMY DEPOT		
Quad 250k	FLAGSTAFF		
Quad 24k	GARLAND PRAIRIE (1974)		
Elevation	7470 FT		
Latitude	35-11-25N	*Decimal Lat*	35.19027
Longitude	111-53-29W	*Decimal Long*	-111.89138
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
20		021N	005E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	VOLCANIC CINDERS

-- Geology --

Host Rock Type VOLCANICS

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Depcsit Type VOLCANIC

-- Exploration and Development --

Production Size	Small
Developent Status	Little Developed Producer, Inactive

-- Description of Workings --

Desc Workings Surface

Workings Comments QUARRY.

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 91 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 91 of 103

Record Number	1008297	*User Field*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	HAPPY JACK NO. 2 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Quad 250k	HOLBROOK		
Quad 24k	HAPPY JACK (1965)		
Latitude	34-44-25N	*Decimal Lat*	34.74027
Longitude	111-25-18W	*Decimal Long*	-111.42166
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
29		016N	009E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	VOLCANIC CINDERS

-- Geology --

Host Rock Type VOLCANICS

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size	Small
Developent Status	Little Developed Producer, Inactive

-- Description of Workings --

Desc Workings Surface

B-176

Workings Comments QUARRY.

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Mineral Resources Data System (MRDS)

Record Number	1008298	*User Field*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	HAPPY JACK NO. 3 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Quad 250k	HOLBROOK		
Quad 24k	HAPPY JACK (1965)		
Latitude	34-44-29N	*Decimal Lat*	34.74138
Longitude	111-25-00W	*Decimal Long*	-111.41666
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
29		016N	009E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	VOLCANIC CINDERS

-- Geology --

Host Rock Type	VOLCANICS

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type	VOLCANIC

-- Exploration and Development --

Production Size	Small
Developent Status	Little Developed Producer, Inactive

-- Description of Workings --

Desc Workings	Surface

B-178

Workings Comments QUARRY.

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 93 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 93 of 103

Record Number	I008299	*User Field*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	FLAGSTAFF WEST NO. 3 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 24k	FLAGSTAFF WEST (1983)		
Latitude	35-12-19N	*Decimal Lat*	35.20527
Longitude	111-44-53W	*Decimal Long*	-111.74805
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
15		021N	006E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	VOLCANIC CINDERS

-- Geology --

Host Rock Type VOLCANICS

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size	Small
Developent Status	Little Developed Producer, Inactive

-- Description of Workings --

Desc Workings Surface

Workings Comments QUARRY.

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 94 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 94 of 103

Record Number	1008300	*User Field*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	FLAGSTAFF WEST NO. 4 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 24k	FLAGSTAFF WEST (1983)		
Latitude	35-10-32N	*Decimal Lat*	35.17555
Longitude	111-42-08W	*Decimal Long*	-111.70222
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
25	SW OF NE	021N	006E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	VOLCANIC CINDERS

-- Geology --

Host Rock Type VOLCANICS

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size	Small
Developent Status	Little Developed Producer, Inactive

-- Description of Workings --

Desc Workings Surface

Workings Comments QUARRY.

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 95 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 95 of 103

Record Number	I008301	*User Field*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	FLAGSTAFF WEST NO. 5 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 24k	FLAGSTAFF WEST (1983)		
Latitude	35-10-27N	*Decimal Lat*	35.17416
Longitude	111-42-22W	*Decimal Long*	-111.70611
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
25	SE OF NE	021N	006E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	VOLCANIC CINDERS

-- Geology --

Host Rock Type VOLCANICS

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size	Small
Developent Status	Little Developed Producer, Inactive

-- Description of Workings --

Desc Workings Surface

Workings Comments QUARRY.

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 96 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 96 of 103

Record Number	I008302	*User Field*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	BASALT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	GILA		
Land Status	41		
Administrative Area	TONTO NATIONAL FOREST		
Quad 250k	HOLBROOK		
Quad 62.5k	PINE		
Quad 24k	BUCKHEAD MESA		
Latitude	34-18-45N	*Decimal Lat*	34.3125
Longitude	111-24-15W	*Decimal Long*	-111.40416
Accuracy	EST +/- 0.5 MILE.		

Section	Section Fraction	Township	Range	Meridian
		011N	009E	GILA AND SALT RIVER

Location Comments NE¼ OF THE TOWNSHIP.

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	BASALT

-- Geology --

Host Rock Type BASALT

Host Rock Type Name	Age	Host Rock Unit Name	Age
BASALT			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size No

B-186

Record Number	1008302	*(....Continued)*
Developent Status	Occurrence	

-- Description of Workings --

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 97 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 97 of 103

Record Number	I008369	*User Field*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	YAVAPAI		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	HOLBROOK		
Quad 24k	CASNER BUTTE (1965)		
Latitude	34-43-38N	*Decimal Lat*	34.72722
Longitude	111-38-07W	*Decimal Long*	-111.63527
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
32		016N	007E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	SCORIA, VOLCANIC CINDERS

-- Geology --

Host Rock Type VOLCANICS

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size	Small
Developent Status	Little Developed Producer, Inactive

B-188

Record Number	I008369	*(....Continued)*

-- Description of Workings --

Desc Workings Surface

Workings Comments QUARRY.

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 98 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 98 of 103

Record Number	I008288	*User Field*	*U95/05
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01

Editor Name	Type	Affiliation	Date	Comments
ORRIS, GRETA J.	R	USGS	1/1/94	
ORRIS, GRETA J.	U	USGS	5/1/95	

Site Name WINONA - NORTH

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11		
Drainage Area	15		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 24k	WINONA		
Latitude	35-11-48N	*Decimal Lat*	35.19666
Longitude	111-24-18W	*Decimal Long*	-111.405
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
14		021N	009E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	VOLCANIC CINDERS

-- Geology --

Host Rock Type	Name	Age	Host Rock Unit Name	Age
VOLCANICS				

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

B-190

-- Exploration and Development --

Production Size Small

Developent Status Developed Producer, Inactive

-- Description of Workings --

Desc Workings Surface

Workings Comments QUARRY.

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Info Source 94/07/20

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 99 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 99 of 103

Record Number	I008289	*User Fieid*	*94/3
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 01
Site Name	BELLEMCNT NO. 1 CINDER PIT		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Land Status	41		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 24k	BELLEMCNT (1980)		
Latitude	35-12-10N	*Decimal Lat*	35.20277
Longitude	111-45-08W	*Decimal Long*	-111.75222
Accuracy	ACC		

Section	Section Fraction	Township	Range	Meridian
15		021N	006E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	VOL
Major	VOL
Ore Materials	VOLCANIC CINDERS

-- Geology --

Host Rock Type VOLCANICS

Host Rock Type Name	Age	Host Rock Unit Name	Age
VOLCANICS			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type VOLCANIC

-- Exploration and Development --

Production Size	Small
Developent Status	Little Develcped Producer, Inactive

B-192

-- Description of Workings --

Desc Workings Surface

Workings Comments QUARRY.

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 100 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 100 of 103

Record Number	1008458	*User Field*	*94/5
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 02
Site Name	PHOENIX CEMENT CO. CLAIMS		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	YAVAPAI		
Land Status	41		
Administrative Area	PRESCOTT NATIONAL FOREST		
Quad 250k	PRESCOTT		
Quad 24k	CLARKDALE		
Latitude	34-47-45N	*Decimal Lat*	34.79583
Longitude	112-07-25W	*Decimal Long*	-112.12361
Accuracy	ESTIMATED LOCATION, +/- -0.5 MILE.		

Section	Section Fraction	Township	Range	Meridian
03		016N	002E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	LST
Major	LST
Ore Materials	LIMESTONE

-- Geology --

Host Rock Type LIMESTONE

Host Rock Type Name	Age	Host Rock Unit Name	Age
LIMESTONE			

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type SEDIMENTARY

-- Exploration and Development --

Production Size	No
Developent Status	Prospect, Inactive

-- Description of Workings --

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4, 185 P.

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 101 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 101 of 103

Record Number	TC40399	*User Field*	*94/6
Record Type	Site	*File Link ID*	CIMRI, IMS; PMR
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 05
Site Name	ANITA		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	TUSAYAN WEST, RED BUTTE		
Latitude	35-08-41N	*Decimal Lat*	35.14472
Longitude	111-38-00W	*Decimal Long*	-111.63333
Accuracy	EST, +/- 0.5 MILE		

Section	Section Fraction	Township	Range	Meridian
20, 29		029N	002E	GILA AND SALT RIVER

-- Commodity Information --

Commodity Type	Both
Commodities	PB LST
Major	PB
Minor	LST
Ore Materials	LIMESTONE?

-- Geology --

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type SEDIMENTARY

Deposit Desc Comm LIMESTONE BRECCIA FRAGMENTS IN BASE-METAL MINERALIZED BRECCIA PIPE.

-- Exploration and Development --

Production Size U
Developent Status Prospect, Inactive

-- Description of Workings --

B-196

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.

Prod Comments INACTIVE PROSPECT

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 102 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 102 of 103

Record Number	TC41204	*User Field*	*U94/9
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 05
Site Name	LIMESTONE OCCURRENCE		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11		
Administrative Area	COCONINO NATIONAL FOREST		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	FLAGSTAFF WEST (1983)		
Latitude	35-08-40N	*Decimal Lat*	35.14444
Longitude	111-37-55W	*Decimal Long*	-111.63194
Accuracy	EST		

Section	Section Fraction	Township	Range	Meridian
02, 03		020N	007E	GILA AND SALT RIVER

Position APPROXIMATELY 3 MILES SE OF FLAGSTAFF.
Location Comments PARTLY IN COCONINO NATIONAL FOREST AND POSSIBLY WITHIN THE FLAGSTAFF CORPORATE BOUNDARY.

-- Commodity Information --

Commodity Type Non-metallic
Commodities LST
Major LST
Ore Materials LIMESTONE

-- Geology --

Age Mineralization PERM

Host Rock Type Name	Age	Host Rock Unit Name	Age
LIMESTONE	PERM	KAIBAB LST	PERM

-- Deposit Description --
--Individual Ore Bodies--
Deposit Type SEDIMENTARY

Record Number	TC41204 *(....Continued)*
	-- Exploration and Development --
Production Size	No
Developent Status	Occurrence
	-- Description of Workings --
	-- Reference --
Reference	PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.
Prod Comments	INACTIVE OCCURRENCE

Mineral Resources Data System (MRDS)

Report Title
Issue Date 00/00/00 *Number* 103 of 103
Current Date Monday, April 7, 1997 *Current Time* 10:24:50 *Printed* 103 of 103

Record Number	TC41205	*User Field*	*94/6
Record Type	Site	*File Link ID*	CIMRI, IMS
Reporter	ORRIS, GRETA J.		
Reporter Affiliation	USGS	*Report Date*	94 05
Site Name	WINONA NO. 1		

-- Location Information --

Country	UNITED STATES	*Country Code*	US
State	ARIZONA	*State Code*	AZ
County	COCONINO		
Physiographic Prov	11		
Land Status	46		
Administrative Area	WALNUT CANYON NATIONAL MONUMENT		
Quad 250k	FLAGSTAFF		
Quad 100k	FLAGSTAFF		
Quad 24k	FLAGSTAFF EAST		
Latitude	35-10-27N	*Decimal Lat*	35.17416
Longitude	111-30-05W	*Decimal Long*	-111.50138
Accuracy	EST, +/- 0.5 MILE		

Section	Section Fraction	Township	Range	Meridian
25		021N	008E	

-- Commodity Information --

Commodity Type	Non-metallic
Commodities	LST
Major	LST
Ore Materials	LIMESTONE

-- Geology --

Host Rock Type Name	Age	Host Rock Unit Name	Age
LIMESTONE	PERM	KAIBAB LST	PERM

-- Deposit Description --
--Individual Ore Bodies--

Deposit Type	SEDIMENTARY

-- Exploration and Development --

Production Size	U
Develcpent Status	Prospect, Inactive

B-200

-- Description of Workings --

Desc Workings Surface

-- Reference --

Reference PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES REPORT 4, 185 P.

Prod Comments INACTIVE PROSPECT