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## STORY OF THE MAGMA MINE

Since the Magma Copper Company began operations in 1910 to the end of 1956, the Magma mine has produced a total of over 11,000,000 tons of all classes of ore, from which 1,200,000,000 pounds of copper have been recovered. The ore mined averaged better than 5.6 percent copper and contained 2.1 ounces of silver and .032 ounces of gold per ton. A total of 70 million pounds of zinc have been recovered from 806,440 tons of copper-zinc ore, included in the total tonnage mentioned above.

### History of the District and Early Development \*

The Magma mine is situated in the Pioneer (Superior) mining district, Pinal County, Arizona, approximately 70 miles southeast of Phoenix and 21 miles west of Miami. Superior is served by a 30-mile standard-gage railroad which connects with a branch of the Southern Pacific R.R. at Magma, Arizona. The elevation of the mine is about 3,500 feet.

The discovery in 1875 of the Silver King mine, one of the famous old Arizona silver producers, first attracted attention to the Superior District. The Silver Queen, which later became the Magma, was located in the same year about three miles south of the Silver King. In the early days the Queen mine was worked for silver, which was, however, associated with considerable chalcocite. The Magma Copper Co. was organized in 1910 by William Boyce Thompson and associates. This company has maintained nearly continuous operations to the present time. It built a railroad and a concentrator in 1914 and completed its smelter in 1924. The mine, which has reached the 4800-foot level is now the deepest in Arizona. The constant high tenor of its ore has made the Magma one of the low-cost producers of the United States, despite depth, temperature and heavy ground.

Previous to 1910, the underground work at the Magma mine consisted of a

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\* Arizona Bureau of Mines Bull. #1145, by M. N. Short and Eldred D. Wilson.

U. S. B. M. Information Cir. #6168 & 7300 by Fred Snow and Ed J. Caldwell.

of diamond drilling.

Geology, Ore Deposits and Mineralization \*

At the Magma Mine the rocks are essentially the same as at Ray. The oldest formation, the Pinal schist, has been penetrated by the 3,600 foot level of the Magma mine. There it is unconformably overlain by conglomerate, quartzite and limestone. The older rocks are intruded by large masses of diabase. The limestone and underlying formations are invaded by dikes and sills of quartz monzonite porphyry. Exploration of the Magma vein for a length of 8,700 feet and a depth of 4,800 feet has revealed three groups of ore shoots. Most of the production has come from the main or middle ore body. The west ore body was west of the Main fault below the 2,250 foot level. It consisted of copper ore now largely mined out. The east ore bodies lie between the main crosscuts and No. 6 shaft and consist largely of zinc-copper ore.

Considering the size of the Magma ore bodies, the outcrop of its vein is inconspicuous. Above the main ore body the bleached faulted porphyry dike is stained by copper and iron and locally contains small masses of residual chalcocite. The main ore body has its apex between the 400 and 500-foot levels and extends to the lowest workings of the mine. The ore shoot is of replacement type and is richest where its walls are of diabase. Commercial ore is confined to the fault zone itself.

The sinking of the No. 5 shaft between the Main and Concentrator faults disclosed an ore body in the Magma vein that extended from 100 feet above the 2,250-foot level to approximately 100 feet below the 2,500-foot level. It was fifteen feet in width and averaged 7 per-cent copper, principally as bornite, and is known as West Ore Body.

Several small ore shoots have been found in the Magma vein east of the main crosscuts between the 1,600 and 3,200-foot levels. Their ore is principally

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sphalerite, but copper minerals are locally abundant.

On most levels, bornite<sup>1/</sup> is the principal mineral, although in places chalcopyrite<sup>2/</sup> predominates. Pyrite<sup>3/</sup> is abundant with the chalcopyrite, but less so where bornite is the dominant mineral. Above the 1200-foot level, the western branch of the main ore shoot contains no copper minerals but consists of sphalerite<sup>4/</sup> and galena<sup>5/</sup>. Below that level it changes abruptly into a bornite-rich ore with little or no zinc and lead. Tennantite<sup>6/</sup> is important from the 1,200 to the 3,600-foot level, where enargite<sup>7/</sup> takes its place in the western part of the ore body. Deep level chalcocite<sup>8/</sup> accounts for about 5 percent of the copper in the lower levels of the main ore body. There it invariably occurs intergrown with bornite.

#### Mining \*

As stated before, the No. 1 shaft had been sunk to the 400-foot level before Magma Copper Company took it over. The small isolated bodies of high-grade ore were probably mined by the square-set method, but as the workings were inaccessible at the time Magma took over the property, the method used is not known.

Early in 1914 a 2-compartment winze was sunk from the 800 to the 1,000 foot level where a high-grade bornite ore body was discovered. This winze was later enlarged to three compartments and became a part of No. 2 shaft.

By the end of 1916 No. 2 shaft had been sunk from the 200-foot, the main adit level at that time, to below the 1,600-foot level. A double drum electric hoist was installed underground on the 200 level. In 1917 a second working shaft to the lower levels became necessary. As the 2-compartment No. 1 shaft was in bad condition

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  - 3/ Pyrite - Iron Sulphide 46.7% Iron.
  - 4/ Sphalerite - Zinc Sulphide - 67.1% Zinc.
  - 5/ Galena - Lead Sulphide - 86.6% Lead
  - 6/ Tennantite - Arsenical Copper Sulphide - 57.5% Copper.
  - 7/ Enargite - Arsenical Copper Sulphide - 48.4% Copper.
  - 8/ Chalcocite - Copper Sulphide - 79.8% Copper.

\* U. S. B. M. Information Circulars 6168 and 6319.

near the 100 level due to the early stoping operations, it was decided to sink a new 3-compartment shaft (No. 3). By the end of 1919, both No. 2 and No. 3 shafts had been sunk to below the 2,000-foot levels; also the 500 adit had been connected to all shafts, and was used for the main outlet of the mine. At present, the portal of this adit is connected with the various parts of the surface plant by means of a standard-gage railroad system.

In 1919 No. 4 shaft was started from the surface to be used as the main outlet for the ventilation system. In 1921-22 No. 2 shaft was sunk below the 2,250-foot level. Development work was pushed on the 1,800 and 2,000-foot levels, and a large body of ore blocked out, sufficient to warrant the building of a smelter and increasing the capacity of the concentrator to 750 tons per day. These improvements were completed early in 1924.

For the economical operation of the western part of the mine, No. 5 shaft was begun in 1926 and completed to below the 2,960 level late in 1928. It connects with a short adit on the 500 level. It has since been sunk to the 4,800-foot level. Nos. 6, 7, & 8 shafts have been sunk in connection with the ventilation system; No. 6 on the eastern end of the property and No. 7 on the western end, both to the 2,550-foot level. The No. 8 has been sunk to below the 4,800-foot level.

All permanent workings are driven in the country rock. Haulage drifts, usually are driven in the footwall of the vein. Experience has shown that a pillar at least 60 feet thick between the footwall drift and the vein is desirable.

Most of the ore mined above the 800-foot level was stoped by the rill or "inclined cut and fill" method. Later the timbered rill and a combination rill stope and pillar system have been employed. Haulage is by trolley and storage battery locomotives on an 18-inch gage track.

The mine is in high temperature rock, and the company has installed the best mechanical ventilating system they could devise. Also every precaution against fire is employed. In addition, a squad of men is trained in standard mine-rescue

practices and is available at all times. Mine safety work is in charge of a safety engineer who has organized workmen's committees who make regular safety inspections of all working places.

#### Milling \*

The first mill was constructed in 1914 and had a rated capacity of 150 tons. It was designed for gravity and flotation concentration using Wilfley tables and the old style deep-bottomed Callow cells. The first Marcy mill to be put to commercial use was installed at this time for coarse grinding. A Chalmers & Williams tube mill was used for fine grinding. The flotation concentrates from an Akins classifier, dropped into a storage bin. A freight wagon was used to haul the concentrates to a platform scale near the narrow-gage railroad. High-grade ore sorted from a picking belt in the mill also was hauled to the scale. Here the ore and concentrates were loaded on the narrow-gage cars and hauled to Magma, where transfer was made to the standard-gage cars of the Arizona Eastern R. R. for transportation to the smelter at Hayden.

A second section, capacity 50 tons, was built in 1915 for treating lead-zinc ore. It ran for about three months on this kind of ore and then was changed over to treat copper ore.

In 1921 and 1922, a third section was added and the capacity brought up to 600 tons.

After the smelter construction was completed in 1924, the system for pumping the concentrates from the mill to the smelter filter plant was installed.

In August, 1928, a 4-foot Symons cone crusher was installed replacing two 24 inch Symons horizontal disk crushers. The crushing time for 700 to 800 tons of ore was reduced from 10 or 12 hours to 8 hours or less; and the jaw opening of the Blake crusher was increased from 2 to  $3\frac{1}{2}$  inches.

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The milling ore during the first fifteen years of operation averaged about 7% copper .037 oz. gold and 3.48 oz. silver.

The fresh water supply was obtained from the mine and stored in a 600,000 gallon old tailings pond.

In 1936, the deep Callow cells were replaced by Agitair flotation machines. In 1937, a fourth section of the mill was installed to treat copper-zinc ore. This section has a capacity of 450 to 500 tons and contains two No. 66 Marcy mills which operate in closed circuit with two 60-inch Akins classifiers. The copper-zinc ore was later switched to the No. 1 Section.

The electric power supplied to the mill is either generated at the smelter by waste heat and direct fired boilers, or is obtained from the Salt River Valley Water Users' Association.

As already stated, a new concentrator was placed in operation in 1948, and is the last word in mill design, with all up-to-date features.

The average recovery of copper from 5% copper ore is about 97%, with a 26% or 28% copper concentrate. The copper-zinc ore averages about 1.2% copper and 8.4% zinc and a 50% zinc concentrate and 17% copper concentrate are produced. The zinc concentrate is filtered and shipped to Bartlesville, Okla. However, the Company has not mined its copper-zinc ores since 1952.

#### Smelting \*

The construction of the smelter was begun in February, 1923 and completed in April, 1924. The original capacity was 500 tons of dry charge in 24 hours. By the addition of a sixth roaster in 1930 the capacity was increased to 600-650 tons a day.

The construction of a natural-gas pipe-line to Superior was completed in January 1936, and thereafter the reverberatory furnace, roasters, direct-fired boilers, and assay furnaces were fired with gas. Fuel oil is kept in storage in

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\* U. S. B. M. Information Circular #7300.

case the gas supply fails.

A crushing plant at the north end of the smelter, adjacent to the filter plant, is used to handle direct-smelting ore, silica ore and limerock, which are hauled from the mine by the Magma Arizona Railroad in 50-ton cars. Cleanings from the convertor aisle of the smelter are also crushed here.

There are four parallel bedding bins, each with a capacity of 2,300 tons. They are fed by conveyor belts, equipped with automatic trippers. Conveyor belts deliver the bedded material to a storage bin from which the waste charge is transported to the furnace in cars. Roasting was discontinued in September, 1949.

The reverberatory furnace is 100 feet in length and 22 feet in inside width, with over-all height of 13 feet 11 inches. The bottom  $\frac{1}{4}$  feet is filled with crushed silica. The side walls are built of silica brick 27 inches thick for the first 5 feet 10 inches,  $22\frac{1}{2}$  inches thick for the next 5 feet, and 18 inches thick for the remainder of the height. The furnace is shut down every 2 years, or whenever the entire arch has become too thin.

The charge per shift is usually 160 tons of ore and concentrate 10 to 15 tons of silicious fettling material. The matte, which has a grade of 32 to  $3\frac{1}{4}$  percent copper, runs through a semi-circular cast-iron launder into matte ladles of 12 tons capacity. A 40-ton crane carries the ladles to the converters. The slag runs into a launder built of crushed silica, then into a semi-circular cast-iron launder to the motor-dump 17-ton cinder cars on tracks below. They are hauled by a trolley locomotive to the slag dump south of the smelter.

The converting plant consists of two 12-foot Great Falls converters lined with 15-inch magnesite brick. Silicious converter flux is fed to the converter from a hopper above it. The converter slag is poured back into the head end of the reverberatory furnace. The finished copper is transferred by a 12-ton ladle from the converter to the casting-machine; which casts the copper into bars which are loaded into railroad cars for shipment back east to a refinery. The bullion bars

contain 99% copper, and about 27 ounces of silver and .65 ounces of gold per ton.

### Conclusion

Although the Magma mine is included among the few bonanza mines of the State, along with the United Verde, the U. V. X. and the Copper Queen, the profitable operation of the property has demanded the highest quality of management and engineering skill. General Manager Wesley Goss has received loyal and efficient co-operation from his entire organization.

The ventilation problem has involved the expenditure of over a million dollars, and has taxed the brains of the company's engineers. Being the deepest mine in the State, safe mining methods and practices had to be employed. Fire hazards had to be guarded against, and the expenditures for such measures were by no means small.

With twelve hundred men on its payroll, the Company had to provide suitable living conditions for its employees. The town of Superior, with an estimated population of 5,000, is almost entirely dependent upon the Magma mine for its economic existence. The taxes which the Company pays support an excellent school system. Labor relations have always been amicable and still are. The Company's annual reports to its stockholders are most informative. Its financial statements and reports of property development are quite complete. Among other things, the 1956 Annual Report had this to say:

"The stockholders of the Company at a special meeting held October 15, 1956, acting upon the recommendation of the Board of Directors, increased the authorized capital stock of the Company from \$12,000,000 consisting of 1,200,000 shares of the par value of \$10 each, to \$30,000,000 consisting of 3,000,000 shares of the same par value.

On December 3, 1956 the Company paid from its current earnings a five per cent stock dividend, being one share for every twenty shares held on November 2, 1956. The issuance of 57,367 shares in payment of the dividend increased the shares outstanding from 1,147,337 to 1,204,704 shares. Under the San Manuel loan agreement

with the Government no cash dividends may be paid without the Government's consent. No cash dividend in any case could be contemplated in 1957 as the Company must continue to conserve its cash for the planned capital expenditures, needed working capital, and provision for debt retirement."

April, 1957

## STORY OF THE MAGMA MINE

Since the Magma Copper Company began operations in 1910 to the end of 1951, the Magma mine has produced a total of 8,823,770 tons of all classes of ore, from which 946 million pounds of copper have been recovered. The ore mined averaged better than 5½ percent copper and contained 2.2 ounces of silver and .033 ounces of gold per ton. A total of 61,132,027 pounds of zinc have been recovered from 736,275 tons of copper-zinc ore, included in the total tonnage mentioned above.

### History of the District and Early Development\*

The Magma mine is situated in the Pioneer (Superior) mining district, Pinal County, Arizona, approximately 70 miles southeast of Phoenix and 21 miles west of Miami. Superior is served by a 30-mile standard-gage railroad which connects with a branch of the Southern Pacific R.R. at Magma, Arizona. The elevation of the mine is about 3,500 feet.

The discovery in 1875 of the Silver King mine, one of the famous old Arizona silver producers, first attracted attention to the Superior District. The Silver Queen, which later became the Magma, was located in the same year about three miles south of the Silver King. In the early days the Queen mine was worked for silver, which was, however, associated with considerable chalcocite. The Magma Copper Co. was organized in 1910 by William Boyce Thompson and associates. This company has maintained nearly continuous operations to the present time. It built a railroad and a concentrator in 1914 and completed its smelter in 1924. The mine, which has reached the 4800-foot level is now the deepest in Arizona. The constant high tenor of its ore has made the Magma one of the low-cost producers of the United States, despite depth, temperature and heavy ground.

Previous to 1910, the underground work at the Magma mine consisted of a shaft sunk to the 400 foot level, where small isolated bodies of high-grade ore were developed and stoped. From 1910 to 1914 the shaft was sunk to a depth of 800 feet, and active exploration started on several levels. The first important bodies of ore were discovered on the 600 and 800 foot levels during this period.

An electric power line was completed by 1914 connecting the Magma mine with the power line from Roosevelt Dam, by way of the Inspiration Mine. Early the same year a 2-compartment winze was sunk from the 800 to the 1,000 foot level where a high-grade bornite ore body was discovered. In 1915 a narrow-gage railroad was constructed to serve Superior and was changed over to the present standard-gage road in 1923. Before the smelter was completed in 1924, the

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\* Arizona Bureau of Mines Bull. #145, by M. N. Short and Eldred D. Wilson

U. S. B. M. Information Circular #6168 & 7300 by Fred Snow and Ed J. Caldwell

concentrates had been transported to Hayden for smelting.

The concentrator, first built in 1914, was kept up-to-date through the years, with research and remodeling, and since 1948 the Magma Company has had a real gem of a mill capable of handling up to 1500 tons of ore per day, and is sectioned to treat copper ore and copper-zinc ore separately.

After about 1902 the Lake Superior and Arizona Mining Company drove the Carlton and Holt tunnels and sank a 1400-foot incline in ground between the Magma vein and Queen Creek. Copper ore, containing some silver and gold, was produced in 1907 and during World War I. Since 1920, the ground has been owned by the Magma Copper Co. In 1932 T. D. Herron and C. Laster leased the mine and opened large bodies of gold ore. Their production during 1932 to 1937 inclusive, as stated in the annual reports of the Magma Copper Company, amounted to 56,649 tons of ore which yielded 372,420 pounds of copper, 53,162 ounces of silver, and 31,598 ounces of gold.

Since the beginning of operations in 1910, the Magma Copper Co., has done the following work, according to its 1951 Annual Report:

| <u>Drifting</u> | <u>Cross-Cutting</u> | <u>Raising</u> | <u>Sinking</u> | <u>Total</u> |
|-----------------|----------------------|----------------|----------------|--------------|
| 200,002 ft.     | 94,491 ft.           | 114,906 ft.    | 29,425 ft.     | 438,824 ft.  |

Geology, Ore Deposits and Mineralization\*

At the Magma Mine the rocks are essentially the same as at Ray. The oldest formation, the Pinal schist, has been penetrated by the 3600 foot level of the Magma mine. There it is unconformably overlain by conglomerate, quartzite and limestone. The older rocks are intruded by large masses of diabase. The limestone and underlying formations are invaded by dikes and sills of quartz monzonite porphyry. Exploration of the Magma vein for a length of 8,700 feet and a depth of 4800 feet has revealed three groups of ore shoots. Most of the production has come from the main or middle ore body. The west ore body was west of the Main fault below the 2250 foot level. It consisted of copper ore now largely mined out. The east ore bodies lie between the main crosscuts and No. 6 shaft and consist largely of zinc-copper ore.

Considering the size of the Magma ore bodies, the outcrop of its vein is inconspicuous. Above the main ore body the bleached faulted porphyry dike is stained by copper and iron and locally contains small masses of residual chalcocite. The main ore body has its apex between the 400 and 500-foot levels and extends to the lowest workings of the mine. The ore shoot is of replacement type and is richest where its walls are of diabase. Commercial ore is confined to the fault zone itself.

The sinking of the No. 5 shaft between the Main and Concentrator faults disclosed an ore body in the Magma vein that extended from 100 feet above the

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2250-foot level to approximately 100 feet below the 2500-foot level. It was fifteen feet in width and averaged 7 per-cent copper, principally as bornite, and is known as West Ore Body.

Several small ore shoots have been found in the Magma vein east of the main crosscuts between the 1600 and 3200-foot levels. Their ore is principally sphalerite, but copper minerals are locally abundant.

On most levels, bornite<sup>1</sup> is the principal mineral, although in places chalcopyrite<sup>2</sup> predominates. Pyrite<sup>3</sup> is abundant with the chalcopyrite, but less so where bornite is the dominant mineral. Above the 1200-foot level, the western branch of the main ore shoot contains no copper minerals but consists of sphalerite<sup>4</sup> and galena<sup>5</sup>. Below that level it changes abruptly into a bornite-rich ore with little or no zinc and lead. Tennantite<sup>6</sup> is important from the 1200 to the 3600-foot level, where enargite<sup>7</sup> takes its place in the western part of the ore body. Deep level chalcocite<sup>8</sup> accounts for about 5 percent of the copper in the lower levels of the main ore body. There it invariably occurs intergrown with bornite.

#### Mining\*

As stated before, the No. 1 shaft had been sunk to the 400-foot level before Magma Copper Company took it over. The small isolated bodies of high-grade ore were probably mined by the square-set method, but as the workings were inaccessible at the time Magma took over the property, the method used is not known.

Early in 1914 a 2-compartment winze was sunk from the 800 to the 1,000 foot level where a high-grade bornite ore body was discovered. This winze was later enlarged to three compartments and became a part of No. 2 shaft.

By the end of 1916 No. 2 shaft had been sunk from the 200-foot, the main adit level at that time, to below the 1600-foot level. A double drum electric hoist was installed underground on the 200 level. In 1917 a second working shaft to the lower levels became necessary. As the 2-compartment No. 1 shaft was in bad condition near the 100 level due to the early stoping operations, it was decided to sink a new 3-compartment shaft (No. 3). By the end of 1919, both No. 2 and No. 3 shafts had been sunk to below the 2,000-foot levels; also the 500 adit had been connected to all shafts, and was used for the main outlet of the mine. At present, the portal of this adit is connected with the various parts of the surface plant by means of a standard-gage railroad system.

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- 1 Bornite - Copper - Iron - Sulphide 63.3% Copper
  - 2 Chalcopyrite - Copper - Iron - Sulphide 34.6% Copper
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  - 4 Sphalerite - Zinc Sulphide - 67.1% Zinc
  - 5 Galena - Lead Sulphide - 86.6% Lead
  - 6 Tennantite - Arsenical Copper Sulphide - 57.5% Copper
  - 7 Enargite - Arsenical Copper Sulphide - 48.4% Copper
  - 8 Chalcocite - Copper Sulphide - 79.8% Copper

\* U.S.B.M. Information Circulars 6168 and 6319.

In 1919 No. 4 shaft was started from the surface to be used as the main outlet for the ventilation system. In 1921-22 No. 2 shaft was sunk below the 2250-foot level. Development work was pushed on the 1800 and 2000-foot levels, and a large body of ore blocked out, sufficient to warrant the building of a smelter and increasing the capacity of the concentrator to 750 tons per day. These improvements were completed early in 1924.

For the economical operation of the western part of the mine, No. 5 shaft was begun in 1926 and completed to below the 2960 level late in 1928. It connects with a short adit on the 500 level. It has since been sunk to the 4800-foot level. Nos. 6, 7, & 8 shafts have been sunk in connection with the ventilation system; No. 6 on the eastern end of the property and No. 7 on the western end, both to the 2550 foot level. The No. 8 has been sunk to below the 4800 foot level.

All permanent workings are driven in the country rock. Haulage drifts, usually are driven in the footwall of the vein. Experience has shown that a pillar at least 60 feet thick between the footwall drift and the vein is desirable.

Most of the ore mined above the 800 foot level was stoped by the rill or "inclined cut and fill" method. Later the timbered rill and a combination rill stope and pillar system have been employed. Haulage is by trolley and storage battery locomotives on an 18-inch gage track.

The mine is in high temperature rock, and the company has installed the best mechanical ventilating system they could devise. Also every precaution against fire is employed. In addition, a squad of men is trained in standard mine-rescue practices and is available at all times. Mine safety work is in charge of a safety engineer who has organized workmen's committees who make regular safety inspections of all working places.

#### Milling\*

The first mill was constructed in 1914 and had a rated capacity of 150 tons. It was designed for gravity and flotation concentration using Wilfley tables and the oldstyle deep-bottomed Callow cells. The first Marcy mill to be put to commercial use was installed at this time for coarse grinding. A Chalmers & Williams tube mill was used for fine grinding. The flotation concentrates from an Akins classifier, dropped into a storage bin. A freight wagon was used to haul the concentrates to a platform scale near the narrow-gage railroad. High-grade ore sorted from a picking belt in the mill also was hauled to the scale. Here the ore and concentrates were loaded on the narrow-gage cars and hauled to Magma, where transfer was made to the standard-gage cars of the Arizona Eastern R. R. for transportation to the smelter at Hayden.

A second section, capacity 50 tons, was built in 1915 for treating lead-zinc ore. It ran for about three months on this kind of ore and then was changed over to treat copper ore.

In 1921 and 1922, a third section was added and the capacity brought up to 600 tons.

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\* U. S. B. M. Information Circulars 6319 and 7300.

After the smelter construction was completed in 1924, the system for pumping the concentrates from the mill to the smelter filter plant was installed.

In August, 1928, a 4-foot Symons cone crusher was installed replacing two 24 inch Symons horizontal disk crushers. The crushing time for 700 to 800 tons of ore was reduced from 10 or 12 hours to 8 hours or less; and the jaw opening of the Blake crusher was increased from 2 to 3½ inches.

The milling ore during the first fifteen years of operation averaged about 7% copper .037 oz. gold and 3.48 oz. silver.

The fresh water supply was obtained from the mine and stored in a 600,000 gallon old tailings pond.

In 1936, the deep Callow cells were replaced by Agitair flotation machines. In 1937, a fourth section of the mill was installed to treat copper-zinc ore. This section has a capacity of 450 to 500 tons and contains two No. 66 Marcy mills which operate in closed circuit with two 60-inch Akins classifiers. The copper-zinc ore was later switched to the No. 1 Section.

The electric power supplied to the mill is either generated at the smelter by waste heat and direct fired boilers, or isobtained from the Salt River Valley Water Users' Association.

As already stated, a new concentrator was placed in operation in 1948, and is the last word in mill design, with all up-to-date features.

The average recovery of copper from 5% copper ore is about 97%, with a 26% or 28% copper concentrate. The copper-zinc ore averages about 1.2% copper and 8.4% zinc and a 50% zinc concentrate and 17% copper concentrate are produced. The zinc concentrate is filtered and shipped to Burtlesville, Okla.

#### Smelting\*

The construction of the smelter was begun in February, 1923 and completed in April, 1924. The original capacity was 500 tons of dry charge in 24 hours. By the addition of a sixth roaster in 1930 the capacity was increased to 600-650 tons a day.

The construction of a natural-gas pipe-line to Superior was completed in January 1936, and thereafter the reverberatory furnace, roasters, direct-fired boilers, and assay furnaces were fired with gas. Fuel oil is kept in storage in case the gas supply fails.

A crushing plant at the north end of the smelter, adjacent to the filter plant, is used to handle direct-smelting ore, silica ore and limerock, which are hauled from the mine by the Magma Arizona Railroad in 50-ton cars. Cleanings from the convertor aisle of the smelter are also crushed here.

There are four parallel bedding bins, each with a capacity of 2300 tons. They are fed by conveyor belts, equipped with automatic trippers. Conveyor belts deliver the bedded material to a storage bin from which the wet charge is transported to the furnace in cars. Roasting was discontinued in Sept. 1949.

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\* U.S.B.M. Information Circular #7300.

The reverberatory furnace is 100 feet in length and 22 feet in inside width, with over-all height of 13 feet 11 inches. The bottom 4 feet is filled with crushed silica. The side walls are built of silica brick 27 inches thick for the first 5 feet 10 inches, 22½ inches thick for the next 5 feet, and 18 inches thick for the remainder of the height. The furnace is shut down every 2 years, or whenever the entire arch has become too thin.

The charge per shift is usually 160 tons of ore and concentrate 10 to 15 tons of silicious fettling material. The matte, which has a grade of 32 to 34 percent copper, runs through a semi-circular cast-iron <sup>ladle</sup> into matte ladles of 12 tons capacity. A 40-ton crane carries the ladles to the converters. The slag runs into a <sup>ladle</sup> built of crushed silica, then into a semi-circular cast-iron <sup>ladle</sup> to the motor-dump 17-ton cinder cars on tracks below. They are hauled by a trolley locomotive to the slag dump south of the smelter.

The converting plant consists of two 12-foot Great Falls converters lined with 15-inch magnesite brick. Silicious converter flux is fed to the converter from a hopper above it. The converter slag is poured back into the head end of the reverberatory furnace. The finished copper is transferred by a 12-ton ladle from the converter to the casting-machine; which casts the copper into bars which are loaded into railroad cars for shipment back east to a refinery. The bullion bars contain 99% copper, and about 27 ounces of silver and .65 ounces of gold per ton.

#### Conclusion

Although the Magma mine is included among the few bonanza mines of the State, along with United Verde and Copper Queen, the profitable operation of the property has demanded the highest quality of management and engineering skill. The ventilation problem alone has involved the expenditure of over 1,000,000 dollars, and taxed the brains of the company's engineers. Being the deepest mine in the state, safe and efficient mining methods and practices had to be employed. Fire hazards had to be guarded against and the expenditures for such measures were by no means small.

With over eleven hundred men on its payroll, the Company had to provide suitable living conditions for its employees. The town of Superior, with an estimated population of 4300 is almost entirely dependent upon the Magma mine for its economic existence. The taxes which the Company pays support an excellent school system. Labor relations have always been amicable and still are. The Company's annual reports to its stockholders are the most informative of all corporation reports. Its financial statements and reports of property development are quite complete. Among other things the 1951 Annual Report had this to say:

"No dividend was paid in 1951, it being necessary to continue the cash-conserving policy in order to make repayments of the borrowed funds and to finance San Manuel.

The average net operating cost of producing copper in 1951 was 17.84 cents per pound. This cost includes all operating costs, profit or loss of the Railroad Company, Arizona taxes, Federal Social Security taxes, and amortization of prepaid development, and after deducting gold, silver and zinc credits, but excluding

depreciation, depletion, and federal income and excess profits taxes. The comparable cost for 1950 was 14.61 cents per pound. This increase of operating cost resulted from the lower grade of both the copper and zinc ores mined, and from large increases in labor and supply costs.

The company received for all copper produced in 1951 an average price of 24.15 cents per pound, as compared with 21.05 cents per pound in 1950.

Production for 1951 and for comparative purposes, for the two preceding years, was as follows:

| Year | Copper<br>(lbs) | Silver<br>(oz) | Gold<br>(oz) | Zinc Concts.<br>(tons) |
|------|-----------------|----------------|--------------|------------------------|
| 1949 | 41,003,355      | 371,402        | 11,533       | --                     |
| 1950 | 48,285,474      | 517,518        | 14,257       | 5,390                  |
| 1951 | 36,934,477      | 491,223        | 10,962       | 12,628 "               |

Magma has been fortunate in having first-rate managers who have received loyal and efficient cooperation from their entire organization. In the 37 years of production, the Company has paid \$21,240,313.13 in dividends to its stockholders, of whom a goodly percentage are Arizona citizens. This is equivalent to  $2\frac{1}{4}$  cents per pound of copper produced, and indicates the narrow margin the mine has worked on through the ups and downs of the copper industry. It is now engaged in developing the big San Manuel Mine near Mammoth, Arizona. The San Manuel ore-body is estimated to contain at least 500 million tons of ore with a content of 0.8% copper. Plans call for mining at the rate of 30,000 tons daily, with an annual output of approximately 140 million pounds of blister copper. The Magma mine itself, however, is by no means reaching the point of exhaustion. Every year it is developing new ore of promising grade.

Arizona Department of Mineral Resources

July, 1952

**AUTHORIZATION TO DISCHARGE UNDER THE  
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM**

In compliance with the provisions of the Clean Water Act, as amended, (33 U.S.C. 1251 et seq., the "Act),

Magma Copper Company  
Superior Division  
P.O. Box 37  
Superior, Arizona 85273

is authorized to discharge from wastewater control facilities at the Superior Mine  
(Discharge Serial No. 001)

to receiving waters named unnamed wash tributary to Queen Creek

Latitude: 33° 17' 15" N  
Longitude: 111° 06' 54" W

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein, and in the attached 12 pages of EPA Region 9 "Standard Federal NPDES Permit Conditions," dated January 29, 1988.

This permit shall become effective on

This permit and the authorization to discharge shall expire at midnight,  
(five years after effective date).

Signed this        day of

For the Regional Administrator

**DRAFT**

Director, Water Management Division

**A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS**

**1. Effluent limits (discharge prohibitions) for Discharge Serial No. 001**

a. Beginning with the effective date of this permit, the permittee shall not discharge wastewater to receiving waters except overflow from facilities as defined in b. below.

b. "Facilities" are the waste control facilities designed, constructed and maintained to contain the runoff from 3.05 inches of rainfall within 24 hours, all process generated wastewater and mine drainage, and operated in a reasonable manner to maintain a state of availability to contain runoff from recurring or subsequent precipitation.

2. Discharges resulting from a rainfall event in excess of that described in condition A.1.b. above shall be monitored and limited as listed below. All metals limits are for total recoverable metals as specified in Methods for Chemical Analysis of Water and Wastes (EPA 600/4-79-020) method 4.1.4. Results shall be reported as total metal.

| PARAMETER        | DAILY MAXIMUM   | MONITORING |             |
|------------------|---|------------|-------------|
|                  | mg/l  | frequency  | sample type |
| Suspended Solids | ***   | once/day   | composite   |
| Arsenic (as As)  | 0.05  | once/day   | composite   |
| Cadmium (as Cd)  | 0.01  | once/day   | composite   |
| Copper (as Cu)   | 0.05  | once/day   | composite   |
| Lead (as Pb)     | 0.05  | once/day   | composite   |
| Mercury (as Hg)  | 0.0002  | once/day   | composite   |
| Selenium (as Se) | 0.01  | once/day   | composite   |
| Zinc (as Zn)     | 0.5   | once/day   | composite   |
| pH               | not less than 6.5 nor greater than 9.0 Standard Units | once/day   | composite   |

\*\*\*Monitoring and reporting required. No limit set at this time.

Any flow will be monitored continuously, the remainder of the items are monitored once per day. No limits are set on flow at this time, however, the flow will be the minimum needed to protect the integrity of the containment facilities during a flood event.

3. For the purposes of this permit, the gauge station used to monitor rainfall shall be that operated by the National Weather Service at

Superior, Arizona

The permittee may establish a gauge station at the facility, in which case rainfall shall be recorded on a daily basis. A National Weather Service Standard Rain Gauge shall be used.

4. Not later than 10 days after any discharge from the permittee's facility to the waters of the United States, the permittee shall submit to the Regional Administrator and State Agency the following information:
- a. the description and cause of the discharge;
  - b. the date, time and duration of the discharge;
  - c. actions taken to reduce, eliminate or prevent recurrence of the discharge; and
  - d. the rainfall, in inches per day for each day which contributed to or caused the discharge.
5. In addition, the discharge will meet the following general requirements:
- a. The discharge shall not cause changes in the taste, color or odor of the receiving water nor shall it cause detectable off-flavor in the flesh of fish.
  - b. The discharge shall not result in floating debris, oil, grease, scum and other floating materials which result in unsightly conditions in the receiving water or produce a deposit on a shoreline or bank bordering such waters or which adversely affect the ecosystem.
  - c. There shall be no discharge of substances that will settle to form sludge or bottom deposits which result in unsightly, putrescent or odorous conditions in the receiving water or which adversely affect the ecosystem.
  - d. There shall be no discharge of substances in concentrations which produce undesirable aquatic life or result in the dominance of nuisance species.
  - e. Effluent samples shall be taken downstream from any additions from the treatment works, and prior to mixing with the receiving waters.
  - f. There shall be no discharge of toxic substances that violate water quality standards for the State of Arizona, including those in A.C.R. R9-21-205.
  - g. The discharge shall not:
    - 1) lower the dissolved oxygen concentration of the receiving water to less than 1 mg/l;
    - 2) raise the natural ambient water temperature of the receiving water more than 3 degrees celsius; or

- 3) cause the turbidity of the receiving water to exceed 50 nephelometric turbidity units.

## B. REPORTING AND MONITORING

### 1. Reporting of Monitoring Results

Monitoring results obtained during the month shall be submitted on forms to be supplied by the Regional Administrator, to the extent that the information reported may be entered on the forms. The results of all monitoring required by this permit shall be submitted in such a format as to allow direct comparison with the limitations and requirements of the permit. Unless otherwise specified, discharge flows shall be reported in terms of the average flow over each monthly period and the maximum daily flow over that monthly period. Each monthly report is due by the 28th of the following month, i.e. January report is due by February 28. Duplicate signed copies of these, and all other reports required herein, shall be submitted to the Regional Administrator and the State at the following addresses:

Water Management Division  
Attention W-4  
Environmental Protection Agency  
215 Fremont Street  
San Francisco, CA 94105

Arizona Dept. of Envir. Quality  
Office of Water Quality  
Water Permits/UST Compliance Unit  
2005 North Central Avenue  
Phoenix, AZ 85004

### 2. Twenty-Four Hour Reporting of Noncompliance

The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances to the following persons or their offices:

Mr. Steve Fuller, USEPA  
(415) 974-8314

Mr. John Rampe, ADEQ  
(602) 257-2333

If the permittee is unsuccessful in contacting the persons above, he shall report by 9 a.m. on the first business day following the noncompliance. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including dates and times, and, if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

### 3. Intermittent Discharge Monitoring

If the discharge is intermittent rather than continuous, then on the first day of each such intermittent discharge, the permittee shall monitor and record data for all the characteristics listed in the monitoring requirements, after which the frequencies of analysis listed in the monitoring requirements shall apply for the duration of each such intermittent discharge. In no event shall the permittee be required to monitor and record data more often than twice the frequencies listed in the monitoring requirements.

#### 4. Monitoring Modification

Monitoring, analytical, and reporting requirements may be modified by the Regional Administrator upon due notice.

### C. DEFINITIONS

1. The "monthly or weekly average" discharge means the total discharge by weight during a calendar monthly or weekly period, respectively, divided by the number of days in the period that the facility was discharging. Where less than daily sampling is required by this permit, the monthly or weekly average discharge shall be determined by the summation of all the measured discharges by weight divided by the number of days during the monthly or weekly period when the measurements were made.
2. A "discrete" sample means any individual sample collected in less than 15 minutes. A "discrete" sample for enteric virus means any individual sample collected in less than 3 hours.
3. The "daily maximum" discharge means the total discharge by weight during any calendar day.
4. The "monthly or weekly average" concentration, other than for fecal or total coliform bacteria, means the arithmetic mean of measurements made during a calendar monthly or weekly period, respectively. The "monthly or weekly average" concentration for fecal or total coliform bacteria means the geometric mean of measurements made during a monthly or weekly period, respectively. The geometric mean is the  $n$ th root of the product of  $n$  numbers.
5. The "daily maximum" concentration means the measurement made on any single discrete sample or composite sample.
6. A "composite sample" means, for flow rate measurements, the arithmetic mean of no fewer than 8 individual measurements taken at equal intervals for 24 hours or for the duration of discharge, whichever is shorter. A composite sample means, for other than flow rate measurement, a combination of 8 individual portions obtained at equal time intervals for 24 hour(s) or for the duration of the discharge, whichever is shorter. The volume of each individual portion shall be directly proportional to the discharge flow rate at the time of sampling. The sampling period shall coincide with the period of maximum discharge flow.

## **EPA Region 9 - Standard Federal NPDES Permit Conditions** (Updated as of January 29, 1988)

### **1) Duty to Reapply [40 CFR 122.21(d)]**

- The permittee shall submit a new application 180 days before the existing permit expires.

### **2) Applications [40 CFR 122.22]**

(a) All permit applications shall be signed as follows:

(1) For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

(i) A president, secretary, treasurer, or vice-president of the corporation in charge of a principle business function, or any other person who performs similar policy- or decision-making functions for the corporation, or

(ii) the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding \$25 million (in second-quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(2) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or

(3) For a municipality, State, Federal, or other public agency: By either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes: (i) The chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

(b) All reports required by permits and other information requested by the Director shall be signed by a person described in paragraph (a) of this Section, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

(1) The authorization is made in writing by a person described in paragraph (a) of this section;

(2) The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.) and,

(3) The written authorization is submitted to the Director.

(c) Changes to authorization. If an authorization under paragraph (b) of this section is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph (b) of this section must be submitted to the Director prior to or together with any reports, information, or applications to be signed by an authorized representative.

(d) **Certification.** Any person signing a document under paragraph (a) or (b) of this section shall make the following certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

3) **Duty to comply** [40 CFR 122.41(a)]

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

(1) The permittee shall comply with effluent standards or prohibitions established under section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

(2) The Clean Water Act provides that:

(A) Any person who causes a violation of any condition in this permit is subject to a civil penalty not to exceed \$25,000 per day of each violation. Any person who negligently causes a violation of any condition in this permit is subject to a fine off not less than \$2,500 nor more than \$25,000 per day of violation, or by imprisonment for not more than one year, or both for a first conviction. For a second conviction, such a person is subject to a fine of not more than \$50,000 per day of violation, or by imprisonment for not more than two years, or both. [Updated pursuant to the Water Quality Act of 1987]

(B) Any person who knowingly causes violation of any condition of this permit is subject to a fine of not less than \$5,000 nor more than \$50,000 per day of violation, or by imprisonment for not more than three years, or by both for a first conviction. For a second conviction, such a person is subject to a fine of not more than \$100,000 per day of violation, or by imprisonment of not more than six years, or both. [Updated pursuant to the Water Quality Act of 1987]

(C) Any person who knowingly causes a violation of any condition of this permit and, by so doing, knows at that time that he thereby places another in imminent danger of death or serious bodily injury shall be subject to a fine of not more than \$250,000, or imprisonment of not more than 15 years, or both. A person who is an organization and violates this provision shall be subject to a fine of not more than \$1,000,000 for a first conviction. For a second conviction under this provision, the maximum fine and imprisonment shall be doubled. [Updated pursuant to the Water Quality Act of 1987]

**4) Need to halt or reduce activity not a defense [40 CFR 122.41(c)]**

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

**5) Duty to mitigate [40 CFR 122.41(d)]**

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

**6) Proper operation and maintenance [40 CFR 122.41(e)]**

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

**7) Permit actions [40 CFR 122.41(f)]**

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

**8) Property rights [40 CFR 122.41(g)]**

This permit does not convey any property rights of any sort, or any exclusive privilege.

**9) Duty to provide information [40 CFR 122.41(h)]**

The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish to the Director upon request, copies of records required to be kept by this permit.

**10) Inspection and entry [40 CFR 122.41(i)]**

The permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

(1) Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

(2) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

(3) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

(4) Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location.

11) Monitoring and records [40 CFR 122.41(j)]

(1) Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

(2) The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time.

(3) Records of monitoring information shall include:

(i) The date, exact place, and time of sampling or measurements;

(ii) The individual(s) who performed the sampling or measurements;

(iii) The date(s) analyses were performed;

(iv) The individual(s) who performed the analyses;

(v) The analytical techniques or methods used; and

(vi) The results of such analyses.

(4) Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

(5) The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained in this permit shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than two years per violation, or by both for a first conviction. For a second conviction, such a person is subject to a fine of not more than \$20,000 per day of violation, or imprisonment for not more than four years, or both. [Updated pursuant to the Water Quality Act of 1987]

12) Signatory requirement [40 CFR 122.41(k)]

(1) All applications, reports, or information submitted to the Director shall be signed and certified. (See 40 CFR 122.22)

(2) The CWA provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than two years per violation, or

by both for a first conviction. For a second conviction, such a person is subject to a fine of not more than \$20,000 per day of violation, or imprisonment of not more than four years, or both. [Updated pursuant to the Water Quality Act of 1987]

13) Reporting requirements [40 CFR 122.41(1)]

(1) Planned changes. The permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

(i) The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR 122.29(b); or

(ii) The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under 40 CFR 122.42(a)(1).

(2) Anticipated noncompliance. The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

(3) Transfers. This permit is not transferable to any person except after notice to the Director. The Director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the Clean Water Act (CWA). (See 40 CFR 122.61; in some cases, modification or revocation and reissuance is mandatory.)

(4) Monitoring reports. Monitoring results shall be reported at the intervals specified elsewhere in this permit.

(i) Monitoring results must be reported on a Discharge Monitoring Report (DMR).

(ii) If the permittee monitors any pollutant more frequently than required by the permit, using test procedures approved under 40 CFR Part 136 or as specified in the permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR.

(iii) Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified by the Director in the permit.

(5) Compliance schedules. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.

(6) Twenty-four hour reporting.

(i) The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or

planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

(ii) The following shall be included as information which must be reported within 24 hours under this paragraph.

(A) Any unanticipated bypass which exceeds any effluent limitation in the permit.  
(See 40 CFR 122.41(g).)

- (B) Any upset which exceeds any effluent limitation in the permit.

(C) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Director in the permit to be reported within 24 hours. (See 40 CFR 122.44(g).)

(iii) The Director may waive the written report on a case-by case basis for reports under paragraph (6)(ii) of this section if the oral report has been received within 24 hours.

(7) Other noncompliance. The permittee shall report all instances of noncompliance not reported under paragraphs (4), (5), and (6) of this section, at the time monitoring reports are submitted. The reports shall contain the information listed in paragraph (6) of this section.

(8) Other information. Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, it shall promptly submit such facts or information.

14) Bypass [40 CFR 122.41(m)]

(1) Definitions

(i) "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.

(ii) "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

(2) Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs (3) and (4) of this section.

(3) Notice-

(i) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, of possible at least ten days before the date of the bypass.

(ii) Unanticipated bypass. If the permittee shall submit notice of an unanticipated bypass as required in paragraph (a)(6) of section 13) (24-hour notice).

(4) Prohibition of bypass.

(i) Bypass is prohibited, and the Director may take enforcement action against a permittee for bypass, unless:

(A) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(B) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

(C) The permittee submitted notices as required under paragraph (3) of this section.

(ii) The Director may approve an anticipated bypass, after considering its adverse effects, if the Director determines that it will meet the three conditions listed above in paragraph (4)(i) of this section.

15) Upset [40 CFR 122.41(n)]

(1) Definition.

"Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

(2) Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of paragraph (3) of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

(3) Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(i) An upset occurred and that the permittee can identify the cause(s) of the upset;

(ii) The permitted facility was at the time being properly operated; and

(iii) The permittee submitted notice of the upset as required in paragraph 13)(6)(ii)(B)(24-hour notice).

(iv) The permittee complied with any remedial measures required under 40 CFR 122.41(d).

(4) Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

**16) Existing manufacturing, commercial, mining, and silvicultural dischargers [40 CFR 122.42(a)]**

In addition to the reporting requirements under 40 CFR 122.41(l), all existing manufacturing, commercial, mining, and silvicultural dischargers must notify the Director as soon as they know or have reason to believe:

(1) That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

(i) One hundred micrograms per liter (100 ug/l);

(ii) Two hundred micrograms per liter (200 ug/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/l) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;

(iii) Five times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

(iv) The level established by the Director in accordance with 40 CFR 122.44(f).

(2) That any activity has occurred or will occur which would result in any discharge, on a nonroutine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

(i) Five hundred micrograms per liter (500 ug/l);

(ii) One milligram per liter (1 mg/l) for antimony;

(iii) Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7);

(iv) The level established by the Director in accordance with 40 CFR 122.44(f).

**17) Publicly owned treatment works [40 CFR 122.42(b)]**

This section applies only to publicly owned treatment works as defined at 40 CFR 122.2.

(1) All POTW's must provide adequate notice to the Director of the following:

(i) Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of CWA if it were directly discharging those pollutants; and

(ii) Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

(iii) For purposes of this paragraph, adequate notice shall include information on (i) the quality and quantity of effluent introduced into the POTW, and (ii) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

(2) [The following condition has been established by Region 9 to enforce applicable requirements of the Resource Conservation and Recovery Act] Publicly owned treatment works may not receive hazardous waste by truck, rail, or dedicated pipe except as provided under 40 CFR 270. Hazardous wastes are defined at 40 CFR 261 and include any mixture containing any waste listed under 40 CFR 261.31 - 261.33. The Domestic Sewage Exclusion (40 CFR 261.4) applies only to wastes mixed with domestic sewage in a sewer leading to a publicly owned treatment works and not to mixtures of hazardous wastes and sewage or septage delivered to the treatment plant by truck.

18) Reopener clause [40 CFR 122.44(c)]

This permit shall be modified or revoked and reissued to incorporate an applicable effluent standard or limitation under sections 301(b)(2)(C), and (D), 304(b)(2) and 307(a)(2) which is promulgated or approved after the permit is issued if that effluent standard or limitation is more stringent than any effluent limitation in the permit, or controls a pollutant not limited in the permit.

19) Privately owned treatment works [The following conditions were established by Region 9 to enforce applicable requirements of the Resource Conservation and Recovery Act and 40 CFR 122.44(m)]

This section applies only to privately owned treatment works as defined at 40 CFR 122.2.

(1) Materials authorized to be disposed of into the privately owned treatment works and collection system are typical domestic sewage. Unauthorized materials are hazardous waste (as defined at 40 CFR Part 261), motor oil, gasoline, paints, varnishes, solvents, pesticides, fertilizers, industrial wastes, or other materials not generally associated with toilet flushing or personal hygiene, laundry, or food preparation, unless specifically listed under "Authorized Non-domestic Sewer Dischargers" elsewhere in this permit.

(2) It is the permittee's responsibility to inform users of the privately owned treatment works and collection system of the prohibition against unauthorized materials and to ensure compliance with the prohibition. The permittee must have the authority and capability to sample all discharges to the collection system, including any from septic haulers or other unsewered dischargers, and shall take and analyze such samples for conventional, toxic, or hazardous pollutants when instructed by the permitting authority or by an EPA, State or Tribal inspector. The permittee must provide adequate security to prevent unauthorized discharges to the collection system.

(3) Should a user of the privately owned treatment works desire authorization to discharge non-domestic wastes, the permittee shall submit a request for permit modification and an application, pursuant to 40 CFR 122.44(m), describing the proposed discharge. The application shall, to the extent possible, be submitted using EPA Forms 1 and 2C, unless another format is requested by the permitting authority. If the privately owned treatment works or collection system user is different from the permittee, and the permittee agrees to allow the non-domestic discharge, the user shall submit the application and the permittee shall submit the permit modification request. The application and request for modification shall be submitted at least 6 months before authorization to discharge non-domestic wastes to the privately owned treatment works or collection system is desired.

**20) Transfers by modification [40 CFR 122.61(a)]**

Except as provided in section 21), a permit may be transferred by the permittee to a new owner or operator only if the permit has been modified or revoked and reissued (under 40 CFR 122.62(b)(2)), or a minor modification made (under 40 CFR 122.63(d)), to identify the new permittee and incorporate such other requirements as may be necessary under CWA.

**21) Automatic transfers [40 CFR 122.61(b)]**

As an alternative to transfers under section 20), any NPDES permit may be automatically transferred to a new permittee if:

(1) The current permittee notifies the Director at least 30 days in advance of the proposed transfer date in paragraph (2) of this section;

(2) The notice includes a written agreement between the existing and new permittees containing a specific date for transfer of permit responsibility, coverage, and liability between them; and

(3) The Director does not notify the existing permittee and the proposed new permittee of his or her intent to modify or revoke and reissue the permit. A modification under this subparagraph may also be a minor modification under 40 CFR 122.63. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in the paragraph (2) of this section.

**22) Minor modification of permits [40 CFR 122.63]**

Upon the consent of the permittee, the Director may modify a permit to make the corrections or allowances for changes in the permitted activity listed in this section, without following the procedures of 40 CFR Part 124. Any permit modification not processed as a minor modification under this section must be made for cause and with 40 CFR Part 124 draft permit and public notice as required in 40 CFR 122.62. Minor modifications may only:

(1) Correct typographical errors;

(2) Require more frequent monitoring or reporting by the permittee;

(3) Change an interim compliance date in a schedule of compliance, provided the new date is not more than 120 days after the date specified in the existing permit and does not interfere with attainment of the final compliance date requirement; or

(4) Allow for a change in ownership or operational control of a facility where the Director determines that no other change in the permit is necessary, provided that a written agreement containing a specific date for transfer of permit responsibility, coverage, and liability between the current and new permittees has been submitted to the Director.

(5)(i) Change the construction schedule for a discharger which is a new source. No such change shall affect a discharger's obligation prior to discharge under 40 CFR 122.29.

(ii) Delete a point source outfall when the discharge from that outfall is terminated

and does not result in discharge of pollutants from other outfalls except in accordance with the permit limits.

(6) When the permit becomes final and effective on or after March 9, 1982, conform to changes respecting 40 CFR 122.41(e), (l), (m)(4)(i)(B), (n)(3)(i), and 122.42(a) issued September 26, 1984.

(7) Incorporate conditions of a POTW pretreatment program that has been approved in accordance with the procedures in 40 CFR 403.11 as enforceable conditions of the POTW's permit.

**23) Termination of permits [40 CFR 122.64]**

The following are causes for terminating a permit during its term, or for denying a permit renewal application:

(1) Noncompliance by the permittee with any condition of the permit;

(2) The permittee's failure in the application or during the permit issuance process to disclose fully all relevant facts, or the permittee's misrepresentation of any relevant facts at any time;

(3) A determination that the permitted activity endangers human health or the environment and can only be regulated to acceptable levels by permit modification or termination; or

(4) A change in any condition that requires either a temporary or a permanent reduction or elimination of any discharge controlled by the permit (for example, plant closure or termination of discharge by connection to a POTW).

**24) Availability of Reports [Pursuant to Clean Water Act Section 308]**

Except for data determined to be confidential under 40 CFR Part 2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Regional Administrator. As required by the Act, permit applications, permits, and effluent data shall not be considered confidential.

**25) Removed Substances [Pursuant to Clean Water Act Section 301]**

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters.

**26) Severability [Pursuant to Clean Water Act Section 512]**

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and remainder of this permit, shall not be affected thereby.

**27) Civil and Criminal Liability [Pursuant to Clean Water Act Section 309]**

Except as provided in permit conditions on "Bypass" (Section 14) and "Upset" (Section 15), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

**28) Oil and Hazardous Substance Liability [Pursuant to Clean Water Act Section 311]**

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Clean Water Act.

**29) State or Tribal Law [Pursuant to Clean Water Act Section 510]**

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the operator from any responsibilities, liabilities, or penalties established pursuant to any applicable State or Tribal law or regulation under authority preserved by Section 510 of the Clean Water Act.