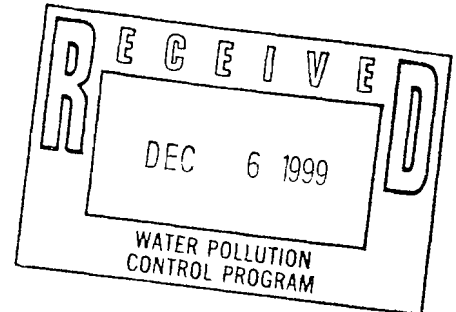




UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII  
901 NORTH 5TH STREET  
KANSAS CITY, KANSAS 66101

DEC 01 1999



Edwin D. Knight, Director  
Water Pollution Control Program  
Division of Environmental Quality  
Missouri Department of Natural Resources  
P.O. Box 176  
Jefferson City, MO 65102

Dear Mr. Knight:

EPA has completed its review of the two total maximum daily loads (TMDLs) as submitted by your office for Goose Creek (WBID 2860) and Saline Creek (WBID 2859), as described in Section 303(d)(1) and which both appear on your Section 303(d) list as impaired by nickel. In accordance with the Clean Water Act (33 U.S.C. 1251 et. seq.), all the required elements are adequately addressed in these TMDLs and EPA approves all aspects of these TMDLs.

EPA also received two Section 303(d)(3) TMDLs in the same submittal package for the same two segments potentially impaired by cobalt. EPA is not required to review and approve these two Section 303(d)(3) TMDLs.

EPA believes, as described in the enclosed decision document, that the two TMDLs for nickel adequately address the pollutant of concern. EPA is not required to review and approve any implementation plan submitted with or as part of a TMDL. However, EPA reminds Missouri that according to the NPDES rules at 40 CFR 122.45(c), permit limits will be expressed as total recoverable metal, rather than dissolved metal. EPA further reminds Missouri that EPA guidance (1991 version of the technical support document, page 110) recommends that when the mine discharge does vary with rainfall, then both mass and concentration limits should be included in the permit, which assures that water quality standards will not be exceeded under any rainfall conditions. EPA believes that correct implementation of these two TMDLs will result in attainment of the applicable water quality standards. The separate elements of each TMDL adequately address the allocations as needed, the critical conditions, and takes into consideration seasonal variation and a margin of safety.

Thank you for your submittal. EPA appreciates Missouri's work to complete and adopt these TMDLs, and looks forward to our continuing partnership in TMDL development. If you have any questions concerning this approval, feel free to contact Don Miller at 913-551-7393.

Sincerely,

A handwritten signature in cursive script, appearing to read "Mary Gale Hutton".

U. Gale Hutton

Director

Water, Wetlands, and Pesticides Division

Enclosure

## TMDL Decision Document

State: Missouri

**First TMDL:**

Waterbody Name: Goose Creek (Fredericktown)

Missouri WBID No: 2860

Pollutant: Nickel

**Second TMDL:**

Waterbody Name: Saline Creek (Fredericktown)

Missouri WBID No: 2859

Pollutant: Nickel

Date of State Submission: November 24, 1999

Date Received By EPA: November 24, 1999

EPA Reviewer: Don Miller

Date of Review: November 26, 1999

Review Criteria	Approve	Comments
<p><b>1. Submittal Letter:</b> State submittal letter indicates final TMDL(s) for specific water(s)/pollutant(s) were adopted by state and submitted to EPA for approval under 303(d).</p>	<p>X</p>	<p><i>In a cover letter dated 24 Nov 99, Missouri indicated that this submittal contains four TMDLs, two of which are 303(d)(1) TMDLs which require EPA review and approval, and two of which are 303(d)(3) TMDLs which do not require EPA review and approval. The water bodies are Goose and Saline Creeks and the pollutant is Nickel. Missouri submitted these TMDLs for approval pursuant to Section 303(d)(2) of the CWA.</i></p>
<p><b>2. Water Quality Standards Attainment:</b> TMDL and associated allocations are set at levels adequate to result in attainment of applicable water quality standards.</p>	<p>X</p>	<p><i>The applicable water quality standard for nickel is 500 ug/l as dissolved metal for protection of aquatic life. These two TMDLs set allocations that will result in the attainment of the applicable water quality standards.</i></p>

<p><b>3. Numeric Target(s):</b> Submission describes applicable water quality standards, including beneficial uses, applicable numeric and/or narrative criteria. Numeric water quality target(s) for TMDL identified, and adequate basis for target(s) as interpretation of water quality standards is provided.</p>	<p>X</p>	<p><i>The beneficial use that is impaired is the aquatic life use. The applicable water quality standard for nickel is 500 ug/l as dissolved metal, which is the numeric water quality target for the two TMDLs. These numeric targets are appropriately taken directly from the water quality standards, and appropriately converted to mass allocations.</i></p>
<p><b>4. Source Analysis:</b> Point, nonpoint, and background sources of pollutants of concern are described, including the magnitude and location of sources. Submittal demonstrates all significant sources have been considered.</p>	<p>X</p>	<p><i>The background concentration of nickel upstream of the primary point source of nickel is 4 ug/l, which is much smaller than the water quality standard for nickel. Therefore, nonpoint and background sources of nickel are not significant contributors to the pollutant loads. The point source is the opening of the Madison Mine which discharges ground water from the flooded mine. This point source is the significant contributor to the pollutant loads. This source flows into Goose Creek, which then flows into Saline Creek.</i></p>
<p><b>5. Allocations:</b> Submittal identifies appropriate wasteload allocations for point sources and load allocations for nonpoint sources. If no point sources are present, wasteload allocations are zero. If no nonpoint sources are present, load allocations are zero.</p>	<p>X</p>	<p><i>These two TMDLs allocate the existing background loads to the Load Allocations, which are 0,002 pounds/day of nickel in each creek. These Load Allocations are small compared to the Load Capacities. The point source Wasteload Allocations are 1,942 pounds/day of nickel for Goose Creek and 1,699 pounds/day of nickel for Saline Creek.</i></p>

<p><b>6. Link Between Numeric Target(s) and Pollutant(s) of Concern:</b> Submittal describes relationship between numeric target(s) and identified pollutant sources. For each pollutant, describes analytical basis for conclusion that sum of wasteload allocations, load allocations, and margin of safety does not exceed the loading capacity of the receiving water(s).</p>	<p>X</p>	<p><i>The link in these two TMDLs between the pollutant of concern and the numeric water quality target is direct. The numeric target is the water quality standard. The source of the nickel is the Madison Mine opening which discharges ground water. The sum of the Load Allocations, the Wasteload Allocations, and the Margin of Safety does not exceed the Loading Capacity in each of these two TMDLs.</i></p>
<p><b>7. Margin of Safety:</b> Submission describes explicit and/or implicit margin of safety for each pollutant.</p>	<p>X</p>	<p><i>Since there was insufficient data and information to establish the uncertainty of the technical analysis in these two TMDLs, a margin of safety of 10% of the Load Capacity was selected. EPA also views the use of conservative assumptions, such as 7Q10 critical flow, to provide additional margin of safety. Since these are phased TMDLs, if water quality standards are exceeded, then the re-opening of these TMDLs will reevaluate the margin of safety based on available additional data.</i></p>
<p><b>8. Seasonal Variations and Critical Conditions:</b> Submission describes method for accounting for seasonal variations and critical conditions in the TMDL(s)</p>	<p>X</p>	<p><i>These two TMDLs examined whether the mine discharge is or is not significantly influenced by the seasons. Missouri considered variations of mine flow and critical flow conditions, and determined that mine flow was dependent on rainfall history. EPA believes these two TMDLs appropriately considered seasonality and critical conditions.</i></p>
<p><b>9. Public Participation:</b> Submission documents provision of public notice and public comment opportunity; and explains how public comments were considered in the final TMDL(s).</p>	<p>X</p>	<p><i>These TMDLs were placed on public notice by DNR from March 19, 1999 to April 23, 1999. No comments were received. DNR has also conducted 6 public meetings on these TMDLs and on other 303(d) listing issues; no comments were received on the Goose Creek nor the Saline Creek TMDLs. This participation opportunity allowed the public to have meaningful input into these two TMDLs.</i></p>

<p><b>10. Technical Analysis:</b> Submission provides appropriate level of technical analysis supporting TMDL elements</p>	<p>X</p>	<p><i>Each element in these TMDLs contain an appropriate technical justification for the decisions made. The loading capacity, seasonal variation, and margin of safety are based on appropriate technical analyses. The nonpoint and point source load allocations are appropriate for the level of complexity of the water quality problem and the data and information available to support the development of these two TMDLs.</i></p>
<p style="text-align: center;"><b>Note:</b> The following criteria do not apply to all TMDLs, but are applied in the situations noted.</p>		
<p><b>11. Monitoring Plan for TMDLs Under Phased Approach (where phased approach is used):</b> TMDLs developed under phased approach identify implementation actions, monitoring plan and schedule for considering revisions to TMDL.</p>	<p>X</p>	<p><i>A monitoring plan is included in the package provided by Missouri DNR for these two TMDLs. The NPDES permit requires wet and dry weather in-stream monitoring and monitoring of the mine discharge. Missouri DNR also will conduct water quality surveys of the two segments to confirm that in-stream water quality standards are achieved. These are phased TMDLs, and will be reopened if future monitoring indicates that water quality standards are exceeded.</i></p>

<p><b>12. Reasonable Assurances (for waters affected by both point and nonpoint sources):</b> Where point source(s) receive less stringent wasteload allocations because nonpoint source reductions are expected and reflected in load allocations, implementation plan provides reasonable assurances that nonpoint implementation actions are sufficient to result in attainment of load allocations in a reasonable period of time. Reasonable assurances may be provided through use of regulatory, non-regulatory, or incentive based implementation mechanisms as appropriate.</p>	<p>X</p>	<p><i>The discharge from the mine remains under the authority of the NPDES permit. This assurance is sufficient to result in the attainment of the wasteload allocation in these two TMDLs.</i></p>
<p><b>Implementation Plan Review Criteria Pursuant to 40 CFR 130.6 and 303(e)</b></p>		
<p><b>13. Clear Implementation Plan:</b> Submittal describes planned implementation actions or, where appropriate, specific process and schedule for determining future implementation actions. Plan is sufficient to implement all wasteload and load allocations in reasonable period of time. TMDL(s) and implementation measures are incorporated into the water quality management plan. Water quality management plan revisions are consistent with other existing provisions of the water quality management plan.</p>	<p>X</p>	<p><i>Implementation of these TMDLs consist of issuing an NPDES permit to Anschutz Mining Corporation which contains a schedule for compliance for treating waters discharged from the mine. The limits for nickel in the NPDES permit should be for total recoverable metal, rather than dissolved metal. The NPDES permit should include both mass and concentration limits, to assure that water quality standards are met under any rainfall conditions. When correctly implemented, this plan is sufficient to implement the wasteload allocations in a reasonable time for these two TMDLs. These TMDLs will be incorporated into Missouri's Water Quality Management Plan.</i></p>

**Goose Creek and Saline Creek (Fredericktown, Missouri)  
Final TMDLs (Total Maximum Daily Load)  
for Nickel and Cobalt (four TMDLs total)**

November 17, 1999

Name: **Goose Creek**

Missouri WBID No.: 2860

Class: P (Class P streams maintain permanent flow even in drought)

Beneficial Uses: Livestock and Wildlife Watering, Protection of Aquatic Life, Fish Consumption

Size of Impaired Segment: 0.5 miles

Location of Impaired Segment: From the point at which the mine water flow enters the creek in the NW Section 15, T33N, R7E to its confluence with Saline Creek

Pollutants: nickel (documented); cobalt (undocumented but believed possible)

Source: emerging ground waters from the Madison Mine

TMDL Priority: High

Name: **Saline Creek**

Missouri WBID No.: 2859

Class: P (Class P streams maintain permanent flow even in drought)

Beneficial Uses: Livestock and Wildlife Watering, Protection of Aquatic Life, Fish Consumption

Size of Impaired Segment: 0.5 miles

Location of Impaired Segment: From the confluence with Goose Creek in SW Section 10, T33N, R7E, to the SE Section 9, T33N, R7E

Pollutants: Nickel (documented) and Cobalt (undocumented but believed possible)

Source: emerging ground waters from the Madison Mine

TMDL Priority: High



## 1. Description of Waterbody, Pollutant of Concern, Pollutant Sources and Priority Ranking

Goose and Saline creeks are listed on Missouri's 1998 303(d) list due to high levels of dissolved nickel from emerging underground waters from Madison Mine. Both streams are ranked high on the TMDL priority list. Cobalt is not included in Missouri's 1998 303(d) list as a pollutant for these segments, but two additional TMDLs are developed here for cobalt because the same management practices applied to nickel will correct any impairment caused by cobalt. Because neither Goose nor Saline creek are on Missouri's 1998 Section 303(d) list for cobalt, Missouri is not required to submit these two TMDLs for approval by EPA. Instead, Missouri is providing these two cobalt TMDLs as Section 303(d)(3) TMDLs, which are for Missouri's management and planning purposes.

The beneficial use impaired in these segments is protection of aquatic life.

Lead deposits were first discovered in the Fredericktown area in 1700 at Mine la Motte. Underground mining began at the Madison Mine in 1847, at which time copper was the main metal of interest. This mining ended in 1849 but the mine reopened during the period 1860-1863 during which time lead and copper were mined. Several different companies owned the Madison Mine between 1901 and 1961 and removed lead, copper, cobalt and nickel ores. The mine was purchased by the present owner, Anschutz Mining Corp., in 1979 as a potential source of cobalt ore but the mine was never de-watered and no mining took place.

The Madison Mine is located in portions of Sections 15, 16, 20 and 21, T33N, R7E. The main area of the mine is located about 1 mile southeast of Fredericktown and the southern portion of the mine is located about 2 miles south of Fredericktown. Ground water has flooded most of the mine. The main mine opening from which miners entered and left and ores were removed was called "the decline." This large mine opening is located in the NW Section 15, T33N, R7E. It has an approximate elevation of 750 feet msl and is the main exit point of ground water from the mine. It is identified on topographic maps as a "flowing well." The outflow of mine water from the decline flows eastward about 500 feet where it flows into Goose Creek.

On the surface are several tailings piles and an area of contaminated soil where a metal smelter was once in operation.

Metal bearing minerals in the walls of the flooded mine continue to be dissolved and released into the mine water. Hufham (1981)<sup>1</sup> took several samples of the water flowing from the decline (Site 1 on the map) and some area streams. Missouri DNR took two additional samples from the decline and downstream locations on Goose and Saline creeks in October 1996 and July 1997. Average levels of dissolved metals from these sampling efforts are shown in Table One as are the appropriate Water Quality Standards (bottom line in *italics*), and sampling locations are shown on the attached map.

Table 1 - Mean Levels of Dissolved Metals, (ug/l) and the last row in the Table gives the state water quality standard chronic value for protection of aquatic life. See map for site locations.

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<sup>1</sup> A Baseline Study of the Heavy Metal Content of Open Waters at Fredericktown, Missouri, Hufham, J. 1981. University of Missouri-Rolla. Rolla, Mo.

Source	Site	Mean Dissolved Metals in Ug/L						
		Nickel	Cobalt	Iron	Lead	Copper	Cd.	Zinc
Hufham	1	4600	3750	42	10	9	2	
Mo. DNR	1	3270	2385		<10	12		145
Hufham	2		4	13	2	4	<1	
Mo. DNR	3	<b>1042</b>	686		<10	6		123
Hufham	4	270	120	20	3	6	<1	
Mo. DNR	5	214	66		<10	<12		44
<b>WQ Std.</b>		<b>500</b>	<b>1000</b>	<b>1000</b>	<b>16</b>	<b>28</b>	<b>11.8</b>	<b>340</b>

The only exceedence of water quality standards documented by these studies is for nickel in Goose Creek (in bold).

Flows from the mine vary somewhat due to the timing and amount of local rainfall, but 0.5-0.7 cfs is a typical range of flows during drier weather. Given the concentrations of nickel and cobalt emerging from the mine and the estimated 7Q10 low flow of both Goose Creek and Saline Creek above Goose Creek, 0.1 cfs each, both nickel and cobalt would appear to exceed water quality standards at the 7Q10 low flow.

Concentrations of lead, copper, cadmium, and zinc in the mine water discharge are less than water quality standards.

In-stream dissolved metals concentrations during wet weather appear to be substantially less, due primarily to dilution by surface flows in Goose and Saline creeks. A storm water quality survey<sup>2</sup> sampled four storm water events in April and May of 1996. Mean levels of dissolved metals at a station on Saline Creek, at about the same location as Site 5, showed nickel and cobalt concentrations only about 12-25% of what Missouri DNR reported. Average amounts reported on Saline Creek during this survey were as follows (in ug/l): nickel 55, cobalt 18, zinc <100, copper <10, lead <5.

## 2. Description of the Applicable Water Quality Standards and Numeric Water Quality Target

The beneficial uses for Goose and Saline creeks are Livestock and Wildlife Watering, Protection of Aquatic Life and Human Health Protection - Fish Consumption. The Protection of Aquatic Life use is impaired in these segments.

The applicable water quality standards for nickel and cobalt are: Nickel, 500 ug/l as dissolved metal for protection of aquatic life. Cobalt, 1000 ug/l as dissolved metal for protection of aquatic life. Missouri's Water Quality Standards include the EPA "three-tiered" approach to anti-degradation. Tier I defines baseline conditions for all waters -- it requires that existing beneficial uses are protected. TMDLs would normally be based on this tier, assuring that numeric criteria (such as dissolved oxygen,

<sup>2</sup> Madison Mine: Site Stabilization Report. 1996. Terranext Corp. for Anschutz Mining Corp.

ammonia) are met to protect uses. Tier II requires no degradation of high-quality waters, unless limited lowering of quality is shown to be necessary for “economic and social development.” A clear implementation policy for this tier has not been developed, although if sufficient data on high-quality waters are available, TMDLs could be based on maintaining existing conditions, rather than the minimal Tier I criteria. Tier III (the most stringent tier) applies to waters designated in the water quality standards as outstanding state and national resource waters; Tier III requires no degradation under any conditions. Management may require no discharge or prohibition certain polluting activities. TMDLs would need to assure no measurable increase in pollutant loading. These TMDLs satisfies Tier I of Missouri’s anti-degradation policy, since after these TMDLs have been implemented, water quality in the impaired segments will be improved and meet the applicable standards, and the beneficial uses will be protected.

### 3. Loading Capacity – Linking Water Quality and Pollutant Sources

Load capacity is defined as the greatest amount of a pollutant a waterbody can receive without violating Water Quality Standards. Missouri’s Water Quality Standards, 10CSR20-7.031 in section (4)(A)1 notes that when permanent stream flows are less than the 7Q10 low flow value (the lowest average flow for seven consecutive days with a recurrence interval of ten years), water quality standards do not apply. Missouri DNR has used this section of the standards to define critical (worst case flow conditions, or design flow conditions) flow for point source discharge of pollutants to be the 7Q10 low flow.

Load calculations for Goose and Saline creeks are made in pounds/day using the formula:

$$(Concentration\ in\ mg/l)(flow\ in\ cu.\ feet/second)(5.4) = Pounds/day \quad (1)$$

Load calculations are made assuming extremely dry weather conditions when streams are least able to dilute the mine water flow from the decline. The design flow condition used is the 7Q10 low flow. This value has not been determined for either Goose or Saline creek since there is insufficient flow information on these streams. However, they are listed as permanently flowing streams in Missouri’s Water Quality Standards based upon many observations made by local Department of Conservation personnel. For the purpose of this load calculation, a 7Q10 flow in Goose Creek is assumed to be 0.1 cfs, and a 7Q10 flow in Saline Creek is assumed to be 0.2 cfs (0.1 cfs from Goose Creek plus 0.1 cfs from Saline Creek upstream of the confluence with Goose Creek).

Thus, the design flow for Goose Creek downstream of the mine discharge is the sum of the upstream 7Q10 low flow of Goose Creek, 0.1 cfs, and the estimated dry weather flow from the decline which is estimated at 0.5 to 0.7 cfs. To contribute to the margin of safety, the high end of this mine flow range will be used because this flow would result in the highest concentration of nickel and cobalt in the stream. Thus, the design flow in Goose Creek is  $0.1 + 0.7 = 0.8$  cfs. Likewise, the design flow for Saline Creek is 0.9 cfs.

The load capacity for dissolved nickel in Goose Creek below the mine water discharge (in pounds/day) is the amount that will result in an in-stream concentration equal to the water quality standard (500 ug/l or 0.5 mg/l) when the stream flow downstream of the mine water discharge is 0.8 cfs. The calculation is the same for dissolved cobalt except that the water quality standard is 1.0 mg/l.

Using Formula 1(above):

Load Capacity: Goose Creek

$$(0.5 \text{ mg/l dissolved Ni})(0.8 \text{ cfs})(5.4) = 2.160 \text{ pounds dissolved nickel per day}$$
$$(1.0 \text{ mg/l dissolved Co})(0.8 \text{ cfs})(5.4) = 4.320 \text{ pounds dissolved cobalt per day}$$

Load Capacity: Saline Creek

$$(0.5 \text{ mg/l dissolved Ni})(0.9\text{cfs})(5.4) = 2.43 \text{ pounds per day dissolved nickel}$$
$$(1.0 \text{ mg/l dissolved Co})(0.9\text{cfs})(5.4) = 4.86 \text{ pounds per day dissolved cobalt}$$

#### 4. Load Allocations

The nonpoint source load allocation for Goose and Saline creeks are estimated using an estimated 7Q10 low flow of 0.1 cfs in both streams and average nickel and cobalt concentrations<sup>3</sup> and Formula 1 give:

$$(0.004 \text{ mg/l})(0.1 \text{ cfs})(5.4) = 0.002 \text{ pounds/day}$$

for each metal in each stream.

#### 5. Wasteload Allocation

The maximum permissible Waste Load Allocation for Goose Creek is determined by the formula:

$$(Load \ Capacity) - (Nonpoint \ Load \ Allocation) - (Margin \ of \ Safety) - (Held \ in \ Reserve) = Point \ Wasteload \ Allocation \quad (2)$$

A Margin of Safety of 10% of the Load Capacity was selected (see below).

In addition to the Margin of Safety on Saline Creek, approximately 11% of the load capacity (0.243 #/day nickel and 0.486 #/day cobalt) will be held in reserve for future development.

Thus, Formula 2 yields the following Wasteload Allocations for nickel and cobalt:

$$\text{Goose Creek: Nickel } (2.160) - (0.002) - (0.216) - (0) = 1.942 \text{ pounds/day.}$$
$$\text{Cobalt } (4.320) - (0.002) - (0.432) - (0) = 3.886 \text{ pounds/day.}$$

$$\text{Saline Creek: Nickel } (2.160) - (0.002) - (0.216) - (0.243) = 1.699 \text{ pounds/day.}$$
$$\text{Cobalt } (4.320) - (0.002) - (0.432) - (0.486) = 3.4 \text{ pounds/day.}$$

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<sup>3</sup> Water quality monitoring by the USGS statewide shows dissolved Cobalt and Nickel concentrations average 2-3 ug/l. Hufham found average dissolved Cobalt and Nickel concentrations in Goose Creek upstream of the mine discharge averaged 4 ug/l.

## **6. Margin of Safety**

There was insufficient data and other information to establish the uncertainty in our knowledge of the loading capacity of these segments. As a result, a Margin of Safety of 10% of the Load Capacity was selected for both Goose and Saline creeks. These values in pounds/day are:

Goose Creek: Nickel 0.216 Cobalt 0.432  
Saline Creek: Nickel 0.243 Cobalt 0.486

As mentioned in the implementation plan for these TMDLs (see below), an NPDES permit was issued to control the discharge containing nickel and cobalt in June 1997, which is considered as Phase I of these TMDLs (even though the permit predates these TMDLs). If future monitoring indicates that applicable water quality standards are exceeded for these segments, then these TMDLs will be reopened, and the Margin of Safety will be re-evaluated based on more data and other information.

## **7. Seasonal Variation**

Seasonal variation of mineralization of mine waters is not considered to occur due to the consistency of water temperatures in the mine throughout the year. The major seasonal variation expected with regard to the mine water discharge would be the volume of flow which would be expected to be somewhat greater during the wetter seasons (i.e., late fall through spring). These increased mine water flows would be offset by increased surface water diluting flows and during the wetter periods of the year, we would expect the ratio of surface water to mine water flows to be much greater than the 1:7 ratio used in this TMDL.

These greater ratios of surface to mine water would mean much more dilution of nickel and cobalt in the streams during wet weather. This assumption is supported by wet weather water quality sampling (see last paragraph, Section 3). Since there is no evidence to link the observed impairment with the seasons, seasonality is not considered to be important in these TMDLs.

## **8. Monitoring Plan for TMDLs Developed under the Phased Approach**

The Goose Creek and Saline Creek TMDLs for nickel and cobalt are phased TMDLs. If the monitoring program outlined below finds exceedences of water quality standards still occur after Phase I implementation, further reductions in nickel and cobalt loads originating from the Madison Mine (and or other discovered sources) would be required through amendment of the NPDES permit.

The NPDES permit requires both storm water and dry weather in-stream monitoring of Goose Creek below the mine water discharge on a regular basis as well as regular monitoring of the mine water discharge with all results reported to the Missouri DNR. In addition, Missouri DNR plans a triennial water quality survey of Goose and Saline creeks during dry weather to confirm that in-stream water quality standards are being achieved during these low flow conditions.

## 9. Implementation Plans

These three TMDLs will be incorporated into Missouri's Water Quality Management Plan.

NPDES Permit MO-0098752 was issued to Anschutz Mining Corporation by the Water Pollution Control Program of Missouri DNR in June 1997 (see attached). The purpose of the permit was to provide Anschutz with a schedule for compliance for treating waters discharged from the Madison Mine property. Included in this permit is a requirement that discharges of mine water from the decline shall not exceed 500 ug/l dissolved nickel and 1000 ug/l dissolved cobalt. At the assumed design mine flow of 0.7 cfs, this permit would allow:

$$(0.5 \text{ mg/l})(0.7 \text{ cfs})(5.4) = 1.89 \text{ pounds/day dissolved nickel; and}$$
$$(1 \text{ mg/l})(0.7 \text{ cfs})(5.4) = 3.78 \text{ pounds/day dissolved cobalt.}$$

These values are both slightly less than the allowable loads calculated above for Goose Creek (dissolved nickel 1.942 pounds/day and dissolved cobalt 3.886 pounds/day), but slightly more than the cobalt and nickel wasteload allocation for Saline Creek. The two cobalt TMDLs are Section 303(d)(3) TMDLs, which do not require EPA review and approval.

The nickel TMDLs are phased and since the NPDES permit limits were issued before these TMDLs were developed, these limits will be allowed to remain in effect until future monitoring indicates whether or not applicable water quality standards are met. If monitoring data and other information indicate that Saline Creek is impaired, then Phase II will re-evaluate the permit limits and take corrective action as appropriate.

The present permit calls for these water quality based limits to be effective in June 2000.

## 10. Reasonable Assurances

The NPDES permit controls the loading the permittee is allowed to discharge. Authority of the NPDES permit provides reasonable assurance of compliance with permit limits.

## 11. Public Participation

The Missouri Department of Natural Resources, Division of Environmental Quality, Water Pollution Control Program, developed this TMDL. The TMDL was placed on public notice from March 19 to April 23, 1999. No comments were received. Six public meetings to allow input from the public on impaired waters were held between August 18 and September 22, 1999. No comments pertaining to Goose or Saline creeks were received during the public notice or the public meetings.

## 12. Administrative Record

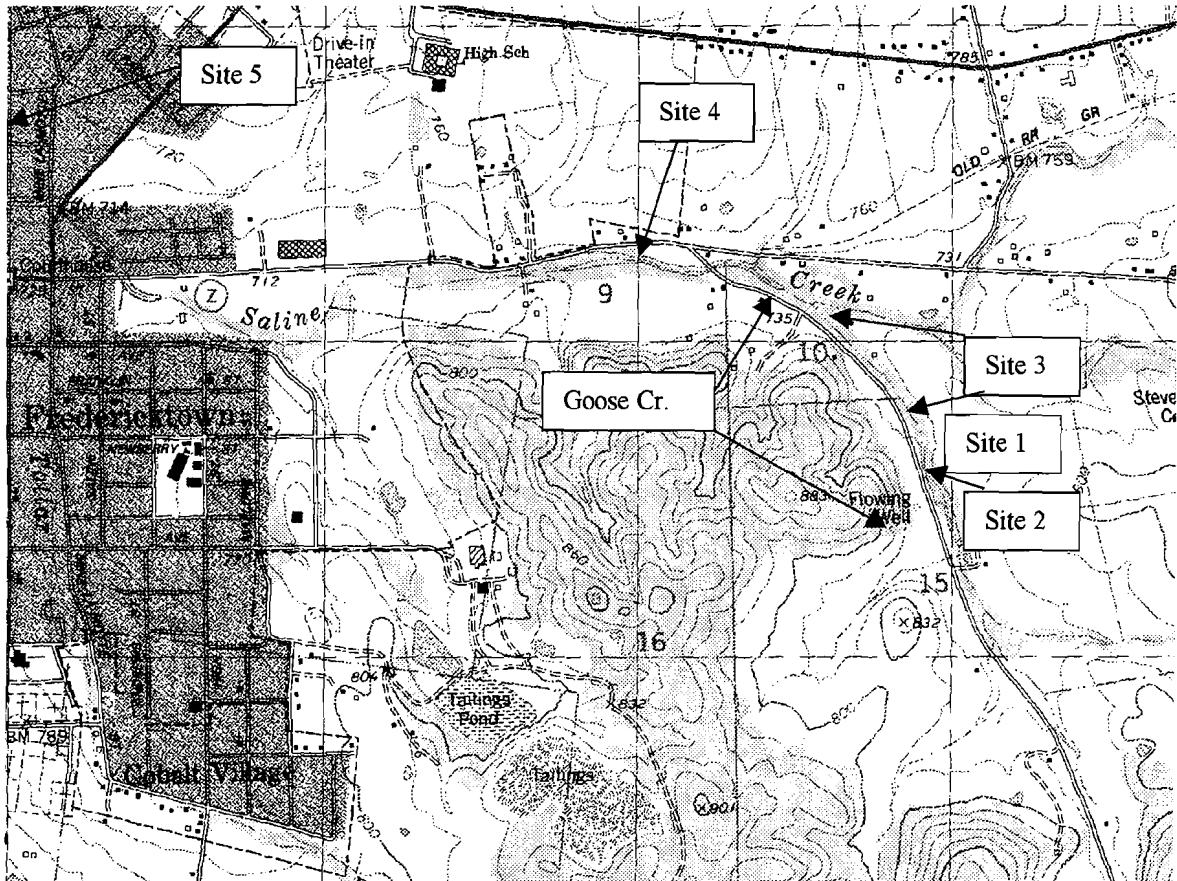
An Administrative Record is being maintained by the Missouri DNR for these four TMDLs.

### References Maintained as Administrative Record

1. Map of Saline and Goose Creeks
2. NPDES permit MO-0098752
3. A Baseline Study of the Heavy Metal Content of Open Waters at Fredericktown, Missouri, Hufham, J. 1981. University of Missouri-Rolla. Rolla, Mo.
4. Madison Mine: Site Stabilization Report. 1996. Terranext Corp. for Anschutz Mining Corp.

## Appendix A

### Map of Saline and Goose Creeks, Fredericktown, Missouri



- Site 1. Flow from Mine
- Site 2. Goose Creek upstream of Mine flow
- Site 3. Goose Creek 0.25 miles downstream of Mine flow
- Site 4. Saline Creek just downstream of Goose Creek
- Site 5. Saline Creek 1.5 miles downstream of Goose Creek