

WATER QUALITY PERMITS

Policies & Procedures

Policy No.: WQP-5
Initiated By: R. Shuck
Approved By: Paul Hesse
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PERMIT POLICY FOR MINING ACTIVITIES

PURPOSE: To provide clarification and consistency in the permitting of active, inactive and exploratory mining activities; and

To provide guidance on permitting procedures regarding water quality standards, issuance of permits to the property owner, and permit inactivation procedures to be addressed during the permitting process.

**POLICY/
PROCEDURE:**

I. A. Active Mines

All active mines that have a point source discharge are required to have a permit. The intent is to also apply the permit inactivation portion of this policy to facilities that have had mining activities in recent years, even though they may be currently inactive.

B. Inactive/Abandoned Mines

In general, the division will not actively pursue permitting of currently unpermitted inactive/abandoned mines. On a case-by-case basis however, the division may pursue remediation of significant water pollution problems from inactive/abandoned mines through either point or nonpoint source authority.

C. Exploratory Mining Activities

For exploratory activities, a permit will be required if the activity impacts water quality. A typical example is a mine with historic drainage that is now being entered for exploratory purposes. Such activity would require a permit. However, in this same situation if all exploration was by core drilling from the surface, without entry to the mine, a permit would not be required for the historic drainage. Any predetermination on a permit need is up to the entity, however, any documented impact where a permit does not exist is subject to enforcement for discharging without a permit.

The most common situation encountered will likely be an existing mine with historic drainage. In such a case, if data is available to show that the upstream receiving waters are not currently meeting WQS, the permittee will be given an opportunity to petition the WQCC for consideration of changes to the WQS. This process will likely be a minimum of one year. If the permittee decides to proceed without petitioning the WQCC, the permit will be written based on existing WQS.

II. A. Application

The applicant for exploratory or active mining is to provide a minimum of three sets of analytical data for any historic mine drainage and ambient receiving water upstream of the discharge, where ambient data is not available. Ambient receiving stream data should be from non-runoff periods, to the extent possible. Parameters for analysis shall be the receiving stream WQS or the WQS for the first segment downstream, where the receiving stream does not have assigned metal WQS. The first and last samples shall be a minimum of 30 days apart. Additionally, three flow measurements of the discharge are required, and must coincide with the analytical samples. A flow measuring device may be installed without an effective permit as it is for the purpose of data collection.

B. Water Quality Standards

As a standard practice, division personnel are to advise permit applicants and potential applicants of the need to ensure that proper stream standards and beneficial uses are in place, before making application. Where an application has been received by the Division and standards or classified uses are not currently being met, the applicant is to be given the opportunity to withdraw the application and proceed to collect data and petition the WQCC for a change. For historic drainage from inactive mines, a basic assumption must be made that stream standards and beneficial uses, as established by the WQCC, are being met in the receiving stream. If this assumption is believed incorrect for a segment, the recourse is for the owner or operator to collect sufficient data to demonstrate actual conditions and then petition the WQCC for a change in standards and/or uses. Optimally, this action should be completed prior to permit application and likely will be a one year process, at a minimum.

C. Property Owner

Mine operators and property owners should be alerted to the potential perpetual care responsibility resulting from active mining and/or exploratory activities. In the future, new and renewal permits will be issued jointly to the property owner and operator.

The basis of this policy is that in many cases, mine drainage following completion of the activity is a significant problem. As many facilities are operated under limited term leases, it will be necessary in the future to have both operator and owner involved in the permitting process. By this approach, the division will have a responsible permitted party at lease termination and if a discharge continues to exist, the division will not be in an immediate enforcement position for discharging without a permit.

D. Permit Inactivation

(Exploratory Activities)

A permit for exploratory mining may be inactivated after termination of activities if the effluent loading, without treatment, can be shown to be statistically similar to the historic mass loading. The demonstration for statistical similarity shall be by the "T test for small sample difference between two means" as presented in attachment A. Again a minimum of three samples and concurrent flow measurements will be required but may be limited to the permit parameters. A minimum of 30 days are required between the first and third samples.

(Mining Activities)

A permit for active mining may be inactivated after termination of activities if the effluent, without treatment, can be shown to not violate the WQS and beneficial uses as demonstrated by compliance with permit limitations and applicable WQS. At least one year of appropriate analytical data, supplied by the permittee, will be required for the compliance demonstration with the 30 day average permit limitation. Where the sampling frequency is insufficient to demonstrate compliance with the 30 day average limitation but individual exceedances have been noted, the mean plus one standard deviation of all data may be used as a basis for demonstrating compliance. The monitoring frequency shall be at least monthly. The one year timeframe for data collection will allow for seasonal evaluation.

(General Provisions)

The following are general provisions for permit inactivation on exploratory or mining activities:

1. All activity at the site has ceased.
2. No treatment of any sort is allowed prior to the effluent sampling point.
3. The district engineer has visited the site and concurs with inactivation. DE concurrence shall be specifically stated on the appropriate inactivation request form.
4. Upon request for permit inactivation (entity submittal of the signed inactivation request form), the permittee shall be provided a letter from the P & E section within 30 days which outlines the conditions for the demonstration.

Failure to satisfy any of the above will be grounds for continuing to require a permit for the site.

Background: Inactive mine drainage in Colorado has proven to be a very significant water pollution problem. Any attempt at this time to address historic drainages in total would present a significant economic burden on both the regulated community and the regulatory agency. The primary intent of this policy is to prevent future degradation associated with current and future mining activities. To accomplish this, it is necessary to have the property owner as responsible in the permitting process. In this way, the owner is aware of potential perpetual care responsibilities and can evaluate the economics of the proposed activity prior to being committed to perpetual care. It is possible that some sites may require less optimal mining approaches in order to minimize the potential for perpetual discharge, thus an evaluation of mine closure at the initial stage will become important. Such evaluation may show that mining a specific location is not economical based on closure or perpetual care costs.

To date the division has been in a posture of having to address mine drainage after an activity has ceased. This approach has presented problems for both the division and the regulated community. This policy is intended to eliminate post mining problems in the future by requiring a pre-mining evaluation.

The division policy on permit inactivation for exploratory activities versus actual mining activities addresses each activity differently. For exploratory activity the intent is to protect the WQS during the activity but allow inactivation as long as historic mass loading is unaffected. This allows an entity to evaluate the economic viability of a mine and only holds them accountable for any incremental increase over historic loading. For actual mining activities, the policy is based on the fact that economic gains have been made from the mine and the permittee is therefore responsible to see that any continued discharge, be it historic or new, must not cause an instream violation of water quality standards and classified uses.

ATTACHMENT A

T Test Procedure

The procedure to be followed in determining if exploratory activities have increased the historic mass loading for the mine will be the "T Test" for inference from small samples. An example of this procedure is as follows:

Historic Drainage
(flow x conc)

.37
.42
.30

(mean) $\bar{y}_1 = .3633$

Post Exploration Drainage
(flow x conc)

.43
.39
.44

$\bar{y}_2 = .42$

$$\begin{aligned} (y_i - \bar{y}_1)^2 &= (.37 - .3633)^2 \\ &= (.42 - .3633)^2 \\ &= (.30 - .3633)^2 \\ &= .00727 \end{aligned}$$

$$\begin{aligned} &= (.43 - .42)^2 \\ &= (.39 - .42)^2 \\ &= (.44 - .42)^2 \\ &= .0014 \end{aligned}$$

where n = number of samples
where i = individual sample

The next step is to determine if the samples are drawn from normal populations with equal variances. This is done by the F test as follows:

$$F = \frac{s_1^2}{s_2^2} = \frac{\frac{\sum_{i=1}^{n_1} (y_i - \bar{y}_1)^2}{n_1 - 1}}{\frac{\sum_{i=1}^{n_2} (y_i - \bar{y}_1)^2}{n_2 - 1}} = \frac{\frac{.00727}{2}}{\frac{.0014}{2}} = 5.19$$

It is important to always designate the larger variance as population 1 for the test. Now determine the degrees of freedom (n_1-1) and (n_2-1) and refer to the attached table for F distribution and find 19.00. The interpretation is that as 5.19 is less than 19.00 there is insufficient evidence to indicate a difference in population variance. If the value had been greater than 19.00 a difference would have been indicated and the permit could not be inactivated. As long as the calculated value is less than the table value the next test is for the sums of squares of the deviation about the mean for both samples as follows:

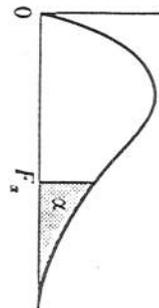
$$S^2 = \frac{\sum_{i=1}^n (y_i - \bar{y}_1)^2}{n_1 + n_2 - 2} + \frac{\sum_{i=1}^n (y_i - \bar{y}_2)^2}{n_1 + n_2 - 2} = \frac{.00727 + .0014}{3+3-2} = .00217$$

$$S = .0466$$

$$t = \frac{\bar{y}_1 - \bar{y}_2}{s \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} = \frac{.3633 - .42}{.0466 \sqrt{\frac{1}{3} + \frac{1}{3}}} = -1.48$$

The next step is to determine the critical value for "T" from the attached table. The critical value is based upon a 99 percent confidence that two sets of data are the same and not independent i.e. significant change has occurred. First determine the degrees of freedom, $n_1+n_2 - 2$, and then read the pertinent factor 3.747 in this case. The negative value on 1.48 is not significant and the interpretation is therefore that 1.48 is less than 3.747 and therefore no statistically significant change in the means has occurred and the permit can be inactivated. If the calculate value for "T" had been greater than the critical value, 3.747, a significant change would be indicated and the permit could not be inactivated.

Percentage points of the *F* distribution



($\alpha = .05$)

Numerator Degrees of Freedom

S_1	Denominator Degrees of Freedom								
	1	2	3	4	5	6	7	8	9
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96
∞	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88

S_1	Denominator Degrees of Freedom										
	10	12	15	20	24	30	40	60	120	∞	S_2
1	241.9	243.9	245.9	248.0	249.1	250.1	251.1	252.2	253.3	254.3	1
2	19.40	19.41	19.43	19.45	19.45	19.46	19.47	19.48	19.49	19.50	2
3	8.79	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53	3
4	5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63	4
5	4.74	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.36	5
6	4.06	4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70	3.67	6
7	3.64	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.23	7
8	3.35	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.93	8
9	3.14	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.71	9
10	2.98	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54	10
11	2.85	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.40	11
12	2.75	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30	12
13	2.67	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25	2.21	13
14	2.60	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18	2.13	14
15	2.54	2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.11	2.07	15
16	2.49	2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.06	2.01	16
17	2.45	2.38	2.31	2.23	2.19	2.15	2.10	2.06	2.01	1.96	17
18	2.41	2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.97	1.92	18
19	2.38	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93	1.88	19
20	2.35	2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.90	1.84	20
21	2.32	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87	1.81	21
22	2.30	2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.84	1.78	22
23	2.27	2.20	2.13	2.05	2.01	1.96	1.91	1.86	1.81	1.76	23
24	2.25	2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79	1.73	24
25	2.24	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.71	25
26	2.22	2.15	2.07	1.99	1.95	1.90	1.85	1.80	1.75	1.69	26
27	2.20	2.13	2.06	1.97	1.93	1.88	1.84	1.79	1.73	1.67	27
28	2.19	2.12	2.04	1.96	1.91	1.87	1.82	1.77	1.71	1.65	28
29	2.18	2.10	2.03	1.94	1.90	1.85	1.81	1.75	1.70	1.64	29
30	2.16	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62	30
40	2.08	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51	40
60	1.99	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.39	60
120	1.91	1.83	1.75	1.66	1.61	1.55	1.50	1.43	1.35	1.25	120
∞	1.83	1.75	1.67	1.57	1.52	1.46	1.39	1.32	1.22	1.00	∞

From "Tables of Percentage Points of the Inverted Beta (*F*)-Distribution,"
Biometrika, Vol. 33 (1943), pp. 73-88, by Maxine Merrington and Catherine M.
 Thompson. Reproduced by permission of the *Biometrika* Trustees.

T Table

d.f.	t .010
1	31.821
2	6.965
3	4.541
4	3.747
5	3.365
6	3.143
7	2.998
8	2.896
9	2.821
10	2.764
11	2.718
12	2.681
13	2.650
14	2.624
15	2.602
16	2.583
17	2.567
18	2.552
19	2.539
20	2.528
21	2.518
22	2.508
23	2.500
24	2.492
25	2.485
26	2.479
27	2.473
28	2.467
29	2.462
inf.	2.326