## Application for Permits to Mine in Alaska (APMA)- BLM Supplement C – Water Management Plan

A water management plan (WMP) for placer mining operations should detail how the mine operator will manage all waters on the mine site, including storm water, to prevent unnecessary or undue degradation to the environment. Key components include estimation of a 5-year storm event, a determination of runoff from that storm event, and the location and sizing of runoff control structures designed around the storm event runoff. Runoff controls include rolling dips on roads, ditches, sediment fencing, and emergency spillways on sediment ponds. All sediment ponds must be designed to maintain a minimum of two feet of freeboard at all times, even during a high precipitation event. The WMP should be considered a tool for mine site design, operations management, reclamation operations, and post closure monitoring.

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The following list identifies what you should include in your WMP:

**1 ) Affected Water Resources and Site Information**

In addition to the information required in sections 17 and 23-29 of the APMA, please include dated photographs showing the general area of operations including the proposed water sources, bypass location and location of mining, sediment ponds, and treatment site(s).

**2) Water Management on Site**

In addition to the information outlined in the sketch checklist of the APMA, please also include the following on the submitted Plan Map:

(i) Settling ponds
   a. Location and dimensions of emergency spillway and infiltration ditches

(ii) Sediment/Erosion Control
   a. Location of any areas of potential slope instability
   b. Location of sediment barriers, traps, or other erosion control structures/methods (e.g. straw matting, coir rolls, silt fences, brush barriers, riprap, etc.)

**3) Settling Pond Design**

(i) In support of the information provided in sections 24-25 of the APMA, please complete the attached worksheet. This worksheet was adopted from the Yukon Placer Secretariat's Guidebook for Mitigation Measures for Placer Mining in the Yukon and should help you determine if settling ponds are properly designed. The Yukon Guidebook shows several typical methods of constructing settling pond damps and outlet structures. http://www.yukonplacersecretariat.ca/infocentre.html.

**SETTLING POND WORKSHEET (1989 version) POND VOLUME**

**Sediment Storage Volume:**

1. Estimate the total volume of gravel that will be processed while using this pond system: _____ $yds^3$ per year.

2. Sediment that will accumulate in ponds: Value from Line 1 x 0.5 = _____ $yds^3$
(*Note: 0.5 can be replaced with 0.2 when using good pre-settling facilities; or it can be replaced with a factor based on site experience).

**Retention Time Volume:**

3. Estimate process water flow: _____ gallons per minute (gpm).

4. Estimate water gain from surface runoff and seepage: _____ gpm.

5. Line 3 + Line 4 = _____ gpm (total flow through ponds).

6. Line 5 x 0.296 = _____ $yds^3$/hour (water flow through ponds).

7. Select design retention time: _____ hours (Use 4 hours for estimating purposes).

8. Line 6 x Line 7 = _____ $yds^3$ retention time volume (volume of water that must be stored to get adequate retention time in the ponds).

**Storm Surge Volume:**

9. Estimate the total surface area that will drain into the ponds (include the area of the mining cut, processing area, and settling facilities themselves as well as any other areas that will drain into the ponds): _____ $ft^2$.

10. Use a 5-year, 6-hour precipitation event: _____ inches.
*Note: Please use the following web site to determine the precipitation level for your specific site: *http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_ak.html*.

11. (Line 9 x Line 10) ÷ 324 *[conversion factor]* = _____ $yds^3$ (water from storm)

**Pond Volume:**

12. Line 2 + Line 8 + Line 11 = _____ $yds^3$ total pond volume required (sediment storage volume plus retention time volume plus storm surge volume). This volume can be in one large pond or can be divided up into several smaller ponds from the processing plant down to the recycle pond. Pond volume below the recycle pond should be considered extra and should not be included in the total pond volume required.

**Pond Surface Area, Flow-Through Rate:**

The limiting factor controlling pond performance is surface area, so while the ponds must have adequate volume they must also have the maximum possible (practical) surface area.

13. Line 12 ($yd^3$) x 27 = _____ $ft^3$ (unit conversion)

14. Line 13 ($ft^3$) / desired depth (maximum of 8 ft.) = _____ $ft^2$ (surface area)

15. Line 14 / 43,560 = _____ acres - (settling area size)

*Note that one pond alone should have the resultant settling area size. If multiple ponds are used, only one pond needs to be this size; others may be smaller.

**Check the flow through rate:**

16. Line 5 / Line 15 =_____ gpm per acre.

This number should be 3,700 gpm/acre or less. A number much higher than this means the surface area of the settling facilities is too small.

**Configuration:**

Where possible, settling facilities should have a length to width ratio of at least 3:1. Very narrow ponds are less efficient because water velocity through the ponds causes scouring and re-suspension of sediment. Ideally, the length to width ratio should be 5:1. Therefore, to calculate your length to width ratio you should use the following formulas:

| For 3:1 | For 5:1 |
|---|---|
| $x = \sqrt{a} \div 3$ | $x = \sqrt{a} \div 5$ |
| x = _____ ft wide | x = _____ ft wide |
| 3x = _____ ft long | 5x = _____ ft long |

Where "a" is surface area ($ft^2$) obtained from line 14 and x is width (ft).