

MEMO

TO: MAT WEAVER

FROM: CHERIE PADILLA

DATE: DECEMBER 23, 2010

RE: REQUEST FOR TECHNICAL REVIEW FOR 47-7659 AND 47-7731

Two permits for fish propagation use are ready to be licensed. Jim Stanton conducted a field examination on the permits last year and even though the facility is no longer used, raceways and other equipment were still in place so Jim was able to record data that can be used in finding facility volume.

In the past, the department has based volumetric limits for fish propagation on the full available rate x 365 days x 1.9835. At this point, Shelley doesn't feel that this is the best way to estimate volume limits without evaluating 1) the availability of water under the permitted source and 2) the size of the facility, number of fish produced, etc.

I began doing some research and quickly found that this would require a more rigorous analysis than I am qualified to do. I hope that you can assist me in finding both rate and volumetric limits based on beneficial use and what was realistically used. I spoke the permit holder and he doesn't have records on the facility but suspected that he raised 15,000 lbs of trout fish/year. He also told me that it takes 9 months for the fish to go from egg to 1 lb in size, at which time he would sell the fish. Since we know the facility volume, it would probably be useful to back-calculate the number of fish (or carrying capacity) since the permit holder was only guessing.

Here is information that I have dug up in my research:

Jim's measurements for **facility volume**:

Raceways: $9 \times (10' \times 20' \times \text{average of } 3.5' \text{ deep}) = 6300 \text{ ft}^3$

Fry House: 104.6 ft^3

Lowest Raceways: 9617.4 ft^3

Upper Inside Raceways: 331.8 ft^3

Outside Raceways: 3072 ft^3

4998 ft^3

Total $24,423.8 \text{ ft}^3 / 43560 = 0.56 \text{ af}$ (note that Jim's field exam included a comment that says the facility's volume is actually $18,019 \text{ ft}^3$)

Surface area of the facility: I added together all his measurements and got $12,026 \text{ ft}^2 / 43560 = 0.28 \text{ acres}$

Density Index (D) A common method for estimating maximum carrying capacity in a tank or raceway is the Density Index (D). The Density Index is a factor which, when multiplied by rearing unit volume in cubic feet (V) and by fish length in inches (L) will give the maximum allowable weight of fish (W): $W = D \times V \times L$

Rule of thumb, D for trout should be from 0.4 to 1

While the D is useful in estimating carrying capacity, it considers only space (pounds of fish per unit volume). Another very important consideration in establishing carrying capacity is flow rate. The flow rate determines how rapidly fresh water will replace "used" water (water in which fish have reduced dissolved oxygen concentrations and excreted waste products).

The Flow Index (F) takes flow rate into consideration when estimating maximum allowable weight of fish that a culture unit can hold: $W = F \times L \times I$
Where W = maximum allowable weight of fish (pounds) F= Flow Index L= Length of fish in inches I= Water inflow (gallons per minute)

As a rule of thumb, F values for trout raceways range from 0.5 to 1.5. Actual F values will depend on several factors, especially the dissolved oxygen concentration of the inflowing water. To estimate the Flow Index for a specific culture unit, fish are added while water flow is held constant. When enough fish have been placed in the system so that the dissolved oxygen level of the outflowing water has been reduced below 6 ppm, the unit is at maximum. F will then be equal to this value in pounds divided by the average fish length in inches times flow rate in lpm: $F = W / L \times I^1$

Trout Weight/Length Relationship²

While we don't have information on fish length, we know that there is a relationship between length of fish and weight in lbs. And we know that the weight of the fish in this facility will range between ~0lbs-1lb.

The relationship between total length (L) and total weight (W) for nearly all species of fish is expressed by the equation:

$$W = aL^b$$

Values of W usually have been calculated from the logarithmic (base 10) equivalent:

$$\log W = \log a + b \cdot \log L$$

¹ Density and Flow Index information taken from www.elsenburg.com/trd/animalprod/akwa/downloads/troutmarket.pdf. Page 6

² Weight/Length Information found at <http://www.dnr.state.mi.us/publications/pdfs/IFR/manual/SMII%20Chapter17.pdf>. Page 1

Source Information

There are two sources associated with the facility, Slaughterhouse Gulch Creek and Seepage Tunnel. While permit 47-7731 authorized 24 cfs from Slaughterhouse Gulch Creek, Jim found that the system is only capable of holding 16.45 cfs. Even though the system is capable of carrying 16.45 cfs, I wonder how we know that this amount was put to beneficial use and can the source produce 16.45 cfs throughout the year.

Slaughterhouse Gulch Creek is actually wastewater and is characterized in an EIS that I found that was conducted for 47-4314 (voided permit for power purposes) as follows:

2. Water and Aquatic Resources

Slaughterhouse Gulch Creek is an irrigation waste waterway that receives flows from a major irrigation canal, runoff from an adjacent golf course, and other surface runoff. A forebay of less than 1/2 acre is formed by the diversion structure. The project is non-operational and the entire flow is spilled into the bypass channel. Slaughterhouse Gulch Creek discharges into Rock Creek, a tributary of the Snake River. High flows occur during the spring through fall irrigation season (figure 2).

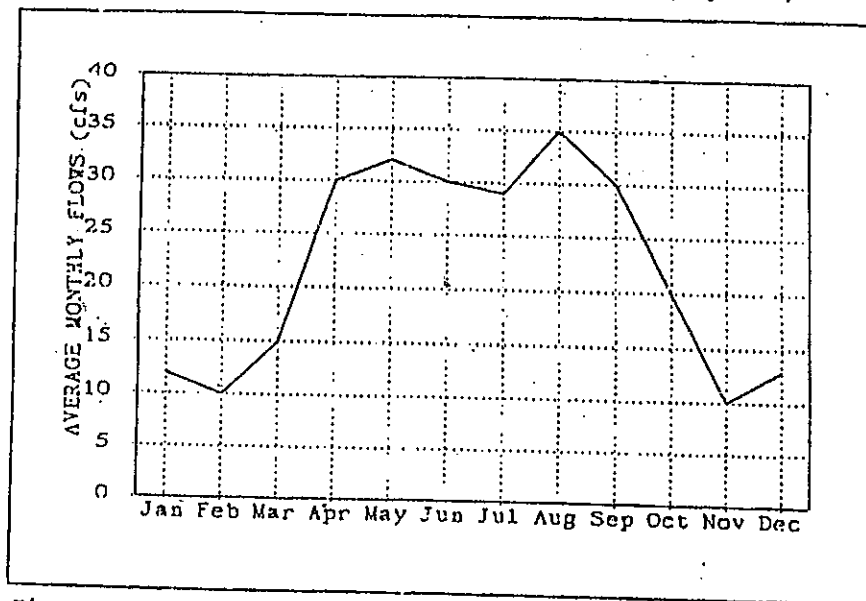


Figure 2. Slaughterhouse Gulch Project average monthly flows.
(Source: Russell Biggs, letter dated July 15, 1982).

According to the above chart, the permit holder of the propagation right can easily divert 16.45 cfs 7 months out of the year or 214 days. As for the other months, the permit holder can potentially divert 12 cfs for 31 days, 10 cfs for 58 days, 15 cfs for 31 days, and 13 cfs for 31 days. If a volume is calculated using this information, we get a total of 10,592.3 afa. This is probably not the best way to find a volumetric limit but it does provide an idea of what the source can provide (the development period for 47-7731 was 6/1982-7/1987).

Seepage Tunnel

There are no other rights that divert from this source and I couldn't find any information pertaining to flow or anything else for that matter on the internet. Since Jim measured 2.56 cfs, and this is the only information available we can assume that the source is capable of 2.56 cfs year round or 1,853.4 afa.