

MEMORANDUM

To: 29-2292

Fr: Bryce Contor

Date: 6/16/2001

Re: Analysis of Diversion Rate

- 1) licensed rate is 4.24 cfs on 460 acres
 $\approx 0.0092 \text{ cfs/acre}$
- 2) Permit was for 5.0 cfs on 330 acres
- 3) Examiner found 8 lines x 33 joints
with $1/64"$ & $5/32"$ nozzles.
(Other notation is $1/64 \times 3/32$ - possibly dual-nozzle heads)
- 4) Examiner's notes include
$$\begin{array}{r} \text{" 5 gal in 55 sec = .606} \\ \text{— " 170 " = .196} \\ \hline \text{.802} \end{array}$$

212 inches "
- 5) Examiner's notes include
" Spaulding test shows 16.5 seconds for 100 ft
or 303' (sprinkler hookup)."
- 6) Examiner's notes include
" Demand on meter $2.45 \times 10 \dots$ Static H is 150,
lifts 183 "

Notes also show 200 hp US motor.

7) Sprinkler calculation, Assume 6 gpm/nozzle

$$6 \text{ gpm} \times 8 \text{ lines} \times 33 \text{ nozzles} = 1584 \text{ gpm}$$

$$\approx 3.53 \text{ cfs}$$

At 8 gpm/nozzle

$$8 \text{ gpm} \times 8 \text{ lines} \times 33 \text{ nozzles} = 2112 \text{ gpm}$$

$$\approx 4.71 \text{ cfs}$$

8) Double-check spooling Calculation

$$\frac{100 \text{ ft}^3}{16.5 \text{ s}} = 6.06 \text{ ft}^3/\text{s} = 303 \text{ inches}$$

9) Theoretical based on Motor horsepower

$$\text{GPM} = \frac{\text{Water hp} \times 3960}{\text{TDM}}$$

$$\text{Water hp} = \text{Motor HP} \times \text{pump efficiency}$$

$$= 200 \times 0.70 = 140$$

$$\text{TDM} = \text{lift} + \text{friction} + \text{psi} \times 2.31$$

$$183 + 15 (\text{assumed}) + 50 \times 2.31 (\text{assumed})$$

$$= 313.5 \text{ ft.}$$

Memo 6/16/01 p3

$$GPM = \frac{140 \times 3960}{313.5} = 1770 \approx 3.94 \text{ cfs}$$

10) Theoretical based on demand KW

$$\begin{aligned} \text{Water hp} &= KW \times 1.34 \times \text{motor eff} \times \text{pump eff} \\ &= 245 \times 1.34 \times .92 \times .70 = 212 \text{ hp} \end{aligned}$$

$$GPM = \frac{212 \times 3960}{313.5} = 2678 \approx 5.97 \text{ cfs}$$

11) Examiner notes 10 lines in place but "actually operates 8 lines."

$$10 \times 6 \text{ gpm} \times 33 \text{ nozzles} \approx 1980 \text{ gpm} \approx 4.41 \text{ cfs}$$

$$10 \times 8 \text{ gpm} \times 33 \text{ nozzles} \approx 2640 \text{ gpm} \approx 5.88 \text{ cfs}$$

12) Attempt to interpret notes about "5 gal in 55 sec" and "5 gal in 170 sec:"

I assume there are 2-nozzle impact heads and the figures report a bucket-and-stopwatch calculation of both nozzles on one head.

$$\frac{5 \text{ gal}}{55 \text{ sec}} \times \frac{60 \text{ sec}}{\text{min}} = 5.45 \text{ gal/min}$$

$$\frac{5 \text{ gal}}{170 \text{ sec}} \times \frac{60 \text{ sec}}{\text{min}} = 1.76 \text{ gal/min}$$

$$\text{Total} = 7.21 \text{ gpm}$$

13) Use measured Q/nozzle:

$$8 \text{ lines} \times 33 \text{ nozzles} \times 7.21 \text{ gpm} = 1903 \text{ gpm} = 4.24 \text{ cfs}$$

$$10 \text{ lines} \times 33 \text{ nozzles} \times 7.21 \text{ gpm} = 2379 \text{ gpm} = 5.30 \text{ cfs}$$

14) Per-acre analysis

$$\begin{array}{l} \text{licensed rate } 4.24/460 = 0.0092 \text{ cfs/acre} \\ \text{claimed } 4.24/369 = 0.0114 \text{ cfs/acre} \end{array}$$

$$\begin{array}{l} \text{sprinkling/licensed } 6.06/460 = 0.0132 \text{ cfs/acre} \\ \text{sprinkling/claimed } 6.06/369 = 0.0164 \text{ cfs/acre} \end{array}$$

$$\begin{array}{l} \text{motor theor/licensed } 3.94/460 = 0.0086 \text{ cfs/acre} \\ \text{motor theor/claimed } 3.94/369 = 0.0106 \text{ cfs/acre} \end{array}$$

$$\begin{array}{l} \text{demand theor/licensed } 5.97/460 = 0.013 \text{ cfs/acre} \\ \text{demand theor/claimed } 5.97/369 = 0.016 \text{ cfs/acre} \end{array}$$

Conclusion

There is close agreement between the Sprinkling Meter result (6.06 cfs), the demand-based theoretical (5.97) and an assumed 8 gal/min/nozzle rate on 10 lines (5.88 cfs). Any of these values

Memo 6/16/01 p 5

gives a reasonable rate/acre less than the std 0.02 gfs/acre.

I plan to invite claimant to file a beneficial use claim for additional Q based upon the field exam, with date of priority 6/9/1953.

The discrepancy with the nozzle-and-stopwatch method can be explained by the fact that sprinkler nozzles can have considerable variability depending on length of line, distance from pump, and elevation. This is somewhat rolling land, with the pump on the uphill side. If the measured nozzle were near the pump, it may have been one of the lower-flowing nozzles, particularly if it were near the end of its line.

The spauling Q is the most reliable of these methods and consistent with other calculations.