APPENDIX K

AMMONIA DISCHARGE CALCULATIONS

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A. DILUTION

$$\text{Dilution factor, } D = \frac{Q_R}{Q + Q_R}$$

where,

Q_R = 7Q20 flow in Drag River = 0.28 m^3/sec; and
Q = average discharge from treatment plant.

i) Stage 1 Expansion

Q = 2,117 m^3/day
= 0.0245 m^3/sec.

$$\text{Dilution, } D_1 = \frac{0.28}{0.0245 + 0.28} = 0.081, \text{ or } \underline{12.4 \text{ to } 1}$$

ii) Stage 2 Expansion

Q = 2,907 m^3/day
= 0.0336 m^3/sec.

$$\text{Dilution, } D_2 = \frac{0.28}{0.0336 + 0.28} = 0.107, \text{ or } \underline{9.3 \text{ to } 1}$$

B. AMMONIA CONCENTRATION (Note 1)

Allowable un-ionized ammonia = 0.02 mg/L (Note 2)
Total ammonia in effluent = 5 mg/L (compliance limit)
pH = 7.5

i) Summer

Temperature = 25°C

Percentage of un-ionized ammonia in solution = 1.8 percent (Note 3) therefore, concentrations of un-ionized ammonia, C, is

$C = 1.8\% \times 5\ mg/L = 0.090\ mg/L$

Applying the dilution factor of 9.3 to 1, concentration in river

$= \frac{0.090}{9.3} = \underline{0.010\ mg/L.}$ This is less than 0.02 mg/L, therefore, acceptable.

ii) Winter

Temperature = 5°C

Percentage of un-ionized ammonia in solution = 0.39 percent (Note 3) therefore, concentrations of un-ionized ammonia, C, is

$C = 0.39\% \times 5\ mg/L = 0.020\ mg/L$

Applying the dilution factor of 9.3 to 1, concentration in river

$= \frac{0.020}{9.3} = \underline{0.002\ mg/L.}$ This is less than 0.02 mg/L, therefore, acceptable.

Notes:

1. Concentrations of total ammonia in the treatment plant effluent are expected to be 5 mg/L in the winter and 2 mg/L in the summer. The calculations are based on 5 mg/L to be conservative. The dilution factor used is that associated with the Stage 2 Expansion. The Stage 1 Expansion will therefore exceed these results, due to improved dilution.

2. From "Water Management - Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment", May 1984, page 32, Table 1.

3. From "Water Management - Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment", May 1984, page 32, Table 1.