APPENDIX 1

CALCULATION OF RESISTIVITY OF THE POLLUTANT

The volume of water and salt content in the pollutant is calculated in each segment and the resistivity is calculated according to G.F. Hewitt, (1960).

The data is converted to weight percentage (ie., weight of salt/weight of solution). The data at 18°C and temperature coefficient (b_t) was defined by the equation:

\[
R_{18} = R_t \left[1 + b_t(t-18)\right] \tag{A.1}
\]

where:

- \( R_{18} \) - specific resistivity at 18°C
- \( R_t \) - the value at temperature t°C

A table of resistivities and temperature coefficients were prepared.

Tabulation of data at 18°C

To facilitate interpolation, a factor X was defined:

\[
X = \% \text{ NaCl} \times \text{Specific resistivity} \tag{A.2}
\]
\( X \) varied more slowly with concentration than did specific resistivity. The following polynomial expression were obtained for \( X \):

\[
p(= \text{% NaCl}) < 0.1
\]

\[
X = \sum_{n=0}^{3} a_n (\sqrt{p})^n
\]

\( \text{(A.3)} \)

where

\[
\begin{align*}
a_0 & = 53.5590 \\
a_1 & = 24.2130 \\
a_2 & = -138.3184 \\
a_3 & = 745.0609
\end{align*}
\]

\( 0.1 < p < 1.0 \)

\[
X = \sum_{n=0}^{4} a_n (\sqrt{p})^n
\]

\( \text{(A.4)} \)

where

\[
\begin{align*}
a_0 & = 53.6508 \\
a_1 & = 17.7272 \\
a_2 & = -6.9940 \\
a_3 & = -2.0216 \\
a_4 & = 3.0262
\end{align*}
\]

\( 1.0 < p < 10.0 \)

\[
X = \sum_{n=0}^{3} a_n \ln(p)
\]

\( \text{(A.5)} \)

where

\[
\begin{align*}
a_0 & = 65.3068 \\
a_1 & = 7.0523 \\
a_2 & = -3.1346 \\
a_3 & = 1.4293
\end{align*}
\]
Using the above equations the data for specific resistivity against concentration was prepared by means of the computer. The accuracy of the data presented is about ± 1/4%.

**Temperature coefficient**

Coefficients \( b_t \), as defined by Equation (A.1) were calculated for all the available data. The coefficients were independant of concentration for concentration below 0.1% and increased continuously from 0.031 - 0.027 in the temperature range 0-140°C. The variation with temperature was fitted by the equation:

\[
b_t = \sum_{n=0}^{n=4} a_n t^n
\]  

(A.7)

where

\[
a_0 = 2.1179818 \times 10^{-2}
\]
\[
a_1 = 7.8601061 \times 10^{-5}
\]
\[
a_2 = 1.5439826 \times 10^{-7}
\]
\[
a_3 = -6.2634979 \times 10^{-9}
\]
\[
a_4 = 2.2794885 \times 10^{-11}
\]
These values of $b_t$ were obtained. The effect of concentrations on $b_t$ is only slight at moderate concentrations. Using the data generated namely, the specific resistivity against concentration as in Equations A.1 to A.6 and the values obtained for $b_t$ as in Equation A.7, the specific resistivity of the Sodium chloride solution for the known percentage of NaCl for a particular temperature is calculated.