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Ref.: WAB0016 (total= 3 pages)
To: Chairman Dr. Wayne Stobo and Members,
Halifax/Halifax County Watershed Advisory Board (**WAB**), HRM
From: S. M. Mandaville (Professional Lake Manage.), Chairman & Exec. Director
Date: June 26, 2000
Subject: **TREATMENT LEVELS IN SEWAGE TREATMENT PLANTS**

I recall several discussions/inquiries about the `level of treatment' in STPs during many of our Board meetings this year. Many times incorrect info has been offered by consultants and others. Here, I will point out to some published literature. Please note the following:

- **There is nothing like 100% removal.**
- **Tertiary does not necessarily mean removal of all substances/pollutants. It depends upon what the STP is designed for.**
- **I am also concerned about `claims' that LAND DISPOSAL is the answer. This is not a panacea either, and only certain substances are removed.**
- **There is also a concern how certain substances may reach shallow groundwater.**
- **Further concern is the lateral export of Phosphorus over time to the receiving LAKES (see our submission #WAB0015 dated June 23, 00 relating to phosphorus export from onsite septic systems!**

VIMP: Also please find enclosed two pages from established literature on removal efficiencies. In the case of Table WAB0016-3, you will have to adjust the effluent characteristics for various treatment systems by comparing the present raw wastewater characteristics to the raw waste in the first row. I had already provided these in our 66-page submission #WAB0002 during March, 00 but for convenience, they have been inserted here!

References:

Mandaville, S.M. 2000. Limnology- Eutrophication and Chemistry, Carrying Capacities, Loadings, Benthic Ecology, and Comparative Data. Soil & Water Conservation Society of Metro Halifax. xviii, Synopses 1, 2, 3, 13, and 14. 210p. {available at the DalTech Library and the Dalhousie Killam Science Library, Halifax}

Myers, E.P., and Harding, E.T. 1983. Ocean Disposal of Municipal Wastewater: Impacts on the Coastal Environment. 2 vols., MIT- Sea Grant College Program Report. MIT SG 83-33.

USEPA. 1976. Areawide assessment procedures manual. Vols I-III. Municipal Environ. Res. Lab., Cincinnati, Ohio. EPA-600/9-76-014.

USEPA. 1980. Clean Lakes Program Guidance Manual. Office of Water Regulations and Standards, Washington. EPA-440/5-81-003.

Table WAB0016--1: Typical removals (in %) from Wastewater Treatment Systems (Myers and Harding, 1983)

	PRIMARY (Screening and grit removal, and Primary sedimentation)	SECONDARY (Biological oxidation (activated sludge), and Secondary sedimentation)	TERTIARY (Biological and chemical processes, carbon adsorption, filtration, ion exchange, and membrane separation processes)
Suspended solids	50-60	85-90	>95
BOD_5	35	85-90	>95
Nitrogen	0-20	10-30	80-95
Phosphorus	0-20	10-30	80-95
Heavy metals	0-40	15-65	50->95

Table WAB0016--2: Typical Industrial Effluent Concentrations in mg/l (USEPA, 1980)

Parameter	Food	Textiles	Paper	Chemicals	Petroleum	Metal
BPT-1977						
TSS	40	49	58	40	10	20
BOD_5	29	22	39	30	15	38
Cl	565	25	135	---	---	---
TP	17	2	---	5	---	0.50
TN	50	2	---	20	70	62
BAT-1983						
TSS	10	8	23	13	5	5
BOD_5	7	11	22	15	5	4
Cl	565	25	135	---	---	---
TP	1.2	2	---	3	---	0
TN	9	2	---	3	28	5

Table WAB0016--3: Typical Treatment System Performance- STPs (USEPA, 1976)

Description of System	Effluent Characteristics (mg/l)						
	BOD_5	TSS	COD	TP	NH_3-N	NO_3-N	UOD
Raw Waste	210	230	400	11	20	0	406
Primary	130	100	250	9	20	0	286
Primary & Metal Salt Addition ($FeCl_3$)	100	50	185	2	20	0	241
Primary & Trickling Filter	45	60	90	8	18	0	150
Primary, Trickling filter & Metal Salt ($FeCl_3$)	25	30	50	2	18	0	120
Primary & Activated Sludge	20	20	45	7	17	0	107
Primary, Activated Sludge, Metal Salt (Alum)	15	15	35	2	17	0	100
Primary, Activated Sludge/ Nitrification	10	20	35	8	2	18	24
Primary, Activated Sludge, Nitrification, Denitrification	10	20	45	8	1	1	20
Primary Metal Salt Addition (Alum), Activated Sludge/Nitrification, Filtration	10	10	45	1	2	18	24
Preliminary, Two-Stage Lime, Filtration, Carbon Adsorption	5	5	25	1	20	0	99
Primary Metal Salt Addition (Alum), Activated Sludge, Nitrification, Denitrification, Polymer, Filtration	5	5	30	0.5	1	1	12
Primary Metal Salt Addition (Alum), Activated Sludge, Nitrification, Denitrification, Polymer, Filtration, Carbon Adsorption	3	5	10	0.5	1	1	12
Small-Flow Treatment Systems, i.e., Package Plants; Contact stabilization plant 0.1-1.0 mgd	20	20	45	---	17	0	107
Small-Flow Treatment Systems, i.e., Package Plants; Extended Aeration Plant 0.01-0.1 mgd;	20	20	45	---	2	0	107
Oxidation Ditch; 0.05-10. mgd (designed for nitrogen removal)	15	15	46	6	1	8	27
Land Application	---	---	---	---	---	---	---

UOD= Ultimate Oxygen Demand= $(1.5 \times BOD_5) + (4.57 \times NH_3)$