Seprotech
Water. Pure and Simple

estimation purposes".

Ref.9
excerpt from "Wastewater Engineering Treatment, Disposal, and Reuse", 3rd ed., Metcalf and Eddy Inc., revised by George Tchobanoglous and Franklin L. Burton, p.808, table 12-14, which shows,"...typical concentrations of thickened sludge for a rotating biological contactor is 2 to 5%".

Ref.10
excerpt from "Design Information on Rotating Biological Contactors", by Richard C. Brenner, EPA-600/2-84-106, section 2.10, which states, " Murphy and Wilson recommend surface overflow rates less than 600 gpd/sq.ft. to maximize solids removal... DeCarlo recommends that peak hydraulic rates be limited to 1000 to 1200 gpd/sq.ft.".

Ref.11
excerpt from "EPA Process Design Manual, Wastewater Treatment Facilities for Sewered Small Communities", Oct 1977, EPA-625/1-77-009, section 9.2.4.6, p.9-43, which states, " Sludge produced by the RBC unit is similar to humus sludge from a trickling filter. The amount of sludge produced will depend on waste characteristics and loading rates. An RBC unit designed for 80% BOD5 removal would produce about 0.7 lb. of sludge per lb. of BOD5 removed; 95% percent removal would produce about 0.3 lb. of sludge."

Ref.12
excerpt from "Design Information on Rotating Biological Contactors", by Richard C. Brenner, EPA-600/2-84-106, section 5.5.2.2, which states, "Figure 5-19 represents data for one day for a given stage...The zero-order removal rate above bulk liquid ammonia nitrogen concentrations of 5 mg/l in Figure 5-19 is projected at 0.3 lb. NH3-N/day/1000 sq.ft., same as the Autotrol design". (Figure 5-19 attached)

Ref.13
excerpt from Ministry of Environment and Energy - Ahlberg & Kwong Report - "Winter Operation"
No process or operating problems were experienced throughout the winter. The minimum temperature encountered in the unit, with a raw sewage feed rate of 320 gpd, was 4 oC. Process performance remained good during the winter even under conditions of intermittent operation.

Ref.14
excerpt from the Forgie study
For the RBC unit and wastewater tested, the effect of temperature on removal efficiency over the 15 oC to 5 oC range was relatively low (theta = 1.001 to 1.02)

Ref.15
excerpt from Trinh - Environment Canada "Exploration Camp Wastewater Characterization and Treatment Plant Assessment"
It [the RBC] also operated at a low liquid temperature of 4 oC during one week without the effluent quality deteriorating.

Ref.15
WEF MOPNo. 8, p913
Oxygen recovery is 2.86 mg O2/mg NO3-N reduced."

Ref.16
excerpt from "Design Information on Rotating Biological Contactors", by Richard C. Brenner, EPA-600/2-84-106, section 2.9.3, which states, " The observed denitrification rate at 550F was approximately 0.85 lb NO3-N /day/1000sq. ft.."

Ref.17
excerpt from "Design Information on Rotating Biological Contactors", by Richard C. Brenner, EPA-600/2-84-106, section 2.9.2, which states, " The commonly used design value for the required methanol dosage is 3 mg/mg NO3-N reduced."

Ref.18
WEF MOPNo. 8, p913 states that "Oxygen recovery is 2.86 mg O2/mg NO3-N reduced." and that Heterotrophic biomass production is approximately 0.4 mg VSS/mg COD removed"

APPENDIX “B”

- Tables 10.1 to 10.4 from “Cold Regions Utilities Monograph, 3rd Edition

TABLE 10-3 TYPICAL QUANTITITES OF SEWAGE FLOW

Source		Quantity L/(p•d)
1. Communities and Permanent Military Bases		
a. 1,000 population with conventional piped water and sewage		
Thule Air Force Base, Greenland		303
College, AK		265
Fairbanks, AK		303
Ski resorts in Colorado and Montana		345
	Average	300
b. 1,000 population with conventional piped water and sewage		
Bethel, AK		265
DEW Line, Greenland		208
	Average	240
c. with truck-haul systems, conventional internal plumbing	Average	140
d. with truck-haul systems, low-flush toilets	Average	90
e. no household plumbing, water tanks and honey-bucket toilet	Average	1.5
f. same as (e) above but with central bathhouse and laundry	Average	15
2. Construction Camps		
North Slope, Ak (1971)		189
"Typical" Canadian		227
Alaska Pipeline (1976)		258
	Average	220
3. Remote Military with Limited Availability of Water		
McMurdo, Antarctica		151
Barrow, AK (DES Sta)		114
"Typical" Army Field Camp		129
	Average	130

wastes and extra amounts of garbage and grease from institutional kitchens.

10.3.1 Quantity. The resulting quantities of sewage flow depend on the type of installation and its permanence. Table 10-3 summarizes typical sewage flows for various cold-regions situations.

Separate facilities such as schools, laundries, restaurants, and hotels with conventional plumbing tend to have loadings similar to those in conventional temperate zone practice.

Projected data for the community should be used to establish a design value for per-person flow. The average values given in Table 10-3 may be used to

TABLE 10-4 CHARACTERISTICS OF BASIC WASTEWATER CATEGORIES

Parameter	Units	Undiluted (Heinke, 1973)	Moderately Diluted (Eggener & Tomlinson, 1978)	Conventional Diluted (Metcalf & Eddy Inc., 1979)	Greatly Diluted (Bethell, 1981)	Greywater (Hrudey & Raniga, 1981)
BOD_5	mg/L	–	460 280 to 700	220 110 to 400	55 40 to 60	–
COD	mg/L	110,400 80,800 to 134,800	1,000 700 to 1,300	500 250 to 1,000	–	(TOC) 210 40 to 900
Suspended solids (NFR)	mg/L	78,200 66,000 to 85,000	490 370 to 820	220 100 to 350	50 20 to 150	290 40 to 2,000
Total nitrogen	mg/L as N	8,100 7,300 to 9,500	–	40 20 to 90	(NH_3) 10 6 to 30	(NH_3/N) 1.4 8
Phosphorus	mg/L as P	1,200 1,100 to 1,400	–	8 4 to 15	3 2 to 6	9 4 to 20
Calculated flow*	L/(p•d)	1.2 1.1 to 1.4	170 110 to 290	360 200 to 730	1,500 1,300 to 2,000	310 50 to 2,300

All values rounded off from published data.

* Calculated based on 80 g BOD_5 per person per day and 90 g suspended solids (SS) per person per day (where applicable), modified activated sludge, and septic tanks. In some instances, lagoon treatment is followed by land disposal.

TABLE 13-1 WATER DEMAND VALUES FOR VARIOUS CAMPS

Camp Type	Population	Water Demand Range*	Average*
Drilling camp		83 to 227	132
Base camp (Trink, 1981)		121 to 348	200
Exploration base (Murphy et al., 1977)	40 to 100 w/o bleeding		250
	40 to 100 with bleeding		445
Alaska pipeline construction (Eggener and Tomlinson, 1978)	200 to 1,300		265
Alaska pipeline construction (Murphy et al., 1977)	200 to 400		257
Alaska drilling camp (Alaskan Dept. of Health & Welfare, 1969)			212
Correctional camp (Grainge et al., 1973)	44		
Hydro generation construction camp (Belanger and Bodineau, 1977)	4,000 summer 2,000 winter		340**
Artificial island (Heuchert, 1974)			108**
U.S. military camps (Lufkin and Tobiasson, 1969)			
Main base	3,000 to 6,000	442 to 514	514
Ice research camp	25		79
Other camp with snow melt for water supply	96 to 227		121
Other camp with steam to melt snow for water supply	85 to 200		189
Alaska drilling rig camps (North Slope) (Tilsworth and Damron, 1973)			313
Value most frequently quoted	44	227 to 681	149**

* flow rate (L/(p•d))
** wastewater flow rate (L/(p•d))

vary from 1.4 to 1.77 (Lufkin and Tobiasson, 1969; Murphy et al., 1977; Given, 1978). These values do not represent a drastic change from those found for the households in small communities.

In addition to life support, water requirements specific to the work camp activity, for example, equipment washdown, pressure testing, and fire protection must be included in the estimate of total camp water supply.

An evaluation of water usage of various facilities at an Alaskan drilling camp and base camp is shown in Tables 13-2 and 13-3. The percentage of water