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CHEMICALS DISCHARGED TO THE
COLUMBIA RIVER FROM DUN FACILITIES
FISCAL YEAR 1970

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CHEMICALS DISCHARGED TO THE
COLUMBIA RIVER FROM DUN FACILITIES
FISCAL YEAR 1970

INTRODUCTION

This report summarizes the chemical disposal data from facilities operated by Douglas United Nuclear, Inc., during Fiscal Year 1970.

The total quantity of chemicals discharged to the Columbia River from the Single-Pass Reactor facilities is detailed in Section I and from the N Reactor facilities in Section II. In addition to the gross quantities shown, supplemental information has been included to note the manner and normal rate of discharge.

Section III summarizes the disposal frequencies and estimated quantities of chemicals discharged to the 300 Area process ponds from DUN facilities. These materials are discharged to the process sewer and flow to the 300 Area process ponds. A portion of the chemicals reach the Columbia River through underground seepage. Section III also includes a report of the former Plutonium Recycle Test Reactor water plant. Douglas United Nuclear, Inc., placed this facility in operation in FY 1970 to supply a portion of the area water needs formerly supplied by the City of Richland.

As the process sewer system in the 300 Area serves other companies as well, the controls established by DUN include routine composite sampling of the 300 Area process ponds. The automatic sampler collects integrated samples of pond inlet water that are analyzed weekly. This analytical data is included in Section IV.

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SECTION ISINGLE-PASS REACTOR FACILITIES

<u>Chemical</u>	<u>Quantity Consumed - Pounds</u>		
	<u>100-KE</u>	<u>100-KW</u>	<u>Total</u>
<u>Water Treatment</u>			
Aluminum Sulfate ^{1, 2}	596 404	752 470	1 348 874 ⁷
Bauxite ¹	2 901 386	1 744 200	4 645 586
Sulfuric Acid (as 100%) ²	14 107 167	9 770 279	23 877 446
Chlorine ³	548 063	383 464	931 527 ⁸
Polyacrylamide ⁴	17 200	9 150	26 350 ⁹
Sodium Dichromate ⁵	272 403	252 128	524 531

Reactor Decontamination

Turco 4306-C, 4528-F ⁶	52 575	00	52 575
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Explanatory Notes

1. Total of these two quantities represents an average aluminum sulfate feed rate of 15.0 ppm. The aluminum contribution from these two sources would be about 1.37 ppm with essentially all retained at the filters and discharged to the river through process sewers during filter backwashing.
2. Sulfate (SO₄) contribution from these two chemicals represents about 21.0 ppm continual discharge to the river in the reactor effluent system.
3. Represents a continual feed of about 0.84 ppm of which essentially all discharge to the river in the form of chlorides in the reactor effluent system.
4. Represents an average feed of 0.024 ppm. This material is retained at the filters and discharged to the river through process sewers during filter backwashing.
5. Represents an average feed of 0.52 ppm sodium dichromate or about 0.075 ppm sodium and 0.175 ppm chromium continually discharged to the river in the reactor effluent system.
6. Quantity shown includes 1,200 pounds of Turco 4528-F for through-reactor decontamination of one crossheader (PTA 158, Supp. B) on 2-19-70 and 51,375 pounds of Turco 4306-C for rear face hardware internal decontamination on 2-20-70. Spent material was discharged to the trench with no direct discharge to the river.
7. Additional aluminum sulfate was consumed at 100-B (190,470 pounds) and 100-D (142,416 pounds) in water treatment at these locations for a total consumption of 1,681,760 pounds.
8. Additional chlorine was consumed at 100-B (24,500 pounds) and 100-D (30,650 pounds) in water treatment at these locations for a total consumption of 986,677 pounds.
9. Additional polyacrylamide was consumed at 100-B (200 pounds) and 100-D (200 pounds) in water treatment at these locations for a total consumption of 26,750 pounds.

SECTION II

N REACTOR FACILITIES

<u>Chemical</u>	<u>Quantity Consumed</u>
<u>Water Treatment - Filtered¹</u>	
Aluminum Sulfate	440 729 lbs.
Polyacrylamide	1 250 lbs.
Chlorine	30 000 lbs.
<u>Water Treatment - Demineralized²</u>	
Sulfuric Acid (as 100%)	1 806 829 lbs.
Sodium Hydroxide (76% Na ₂ O basis)	757 361 lbs.
<u>Other System Additives³</u>	
Ammonium Hydroxide (25% NH ₃ by weight)	54 743 gals.
Sodium Dichromate	15 300 lbs.
Hydrazine, N ₂ H ₄ (25% solution)	8 840 lbs.
Morpholine, NH (CH ₂) ₂ O (CH ₂) ₂	3 220 lbs.

Explanatory Notes

1. Total filtered water requirements averaged 7,040 gpm. Aluminum sulfate coagulant feed rate averaged 14.3 ppm with the aluminum content being a calculated 1.3 ppm and sulfate a calculated 6.9 ppm. Essentially all of the aluminum is retained at the filters and discharged to the river through the waste discharge line during filter backwashing. Polyacrylamide, filter conditioner material, represents an average feed rate of 0.041 ppm with the material retained at the filters and discharged to the river through the waste discharge line during filter backwashing. Chlorine represents a continual feed of about 0.97 ppm discharged eventually to the river in the form of chlorides.
2. Sulfuric acid regenerations totaled 927 with the average pounds of acid used per regeneration being 1,949. The sulfate discharged to the river through the outfall line at each regeneration averaged a calculated 1,910 pounds. Caustic regeneration totaled 386 with the average pounds of caustic used per regeneration being 1,962. The sodium discharged to the river through the outfall line at each regeneration averaged a calculated 1,120 pounds.
3. Ammonium hydroxide is used for pH correction of primary system makeup water and sodium dichromate is added to the rod cooling water system. Both these systems discharge to the crib. Hydrazine and morpholine are both primarily additives to the secondary system. This system discharges to the river through the outfall line.

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SECTION III

300 AREA FACILITIES
ESTIMATED QUANTITY (POUNDS) DISCHARGED TO 300 PONDS

<u>Chemical</u>	<u>Estimated Quantity (Lbs.)</u>	<u>Basis</u>
Aluminum Nitrate	20 800	Total store order purchases
Ammonium Bifluoride	26 000	Total store order purchases
Calcium Carbonate	156 000	Total store order purchases
Deoxidizer (Oakite)	12 480	Total store order purchases
Nitric Acid	786 450	Total store order purchases
Sodium Hydroxide	471 936	Total store order purchases
Sodium Nitrate	11 000	Total store order purchases
Sulfuric Acid	44 679	Total store order purchases
Turco Aluminetch	15 500	Total store order purchases

Explanatory Notes

The chemicals are discharged to the process sewer in periodic batches and then flow to the 300 Area process ponds. Actual quantities and frequency of discharge are variable with the following tabulation presented to indicate the location where major quantities are routinely required and the approximate frequency of disposal to the sewer system.

<u>Chemical</u>	<u>Bldg.</u>	<u>Use Location</u>	<u>Est. Quan- tity (Lbs)</u>	<u>Approx. Discharge Frequency</u>	<u>Indicated Total (Lbs)</u>
Aluminum	333	Cu & Zr-2 Cleaning	160	3 times/mo.	5 750
Nitrate	333	Preweld Etch	200	Weekly	10 000
	333	Final Etch	400	2 times/mo.	9 500
				TOTAL	25 250
Ammonium	333	Cu & Zr-2 Cleaning	140	3 times/mo.	5 000
Bifluoride	333	Prebraze Etch	160	Weekly	8 000
	333	Prebraze Etch	130	Weekly	6 500
	333	Preweld Etch	160	4 times/mo.	7 500
	333	Final Etch	120	2 times/mo.	2 750
				TOTAL	29 750
Calcium Carbonate	333	Added as required to lime pit.			
Deoxidizer	313	Cap & Can Machine	550	4 times/yr.	2 000
(Oakite LNC)	313	Special Products	200	Every 2 weeks ¹	1 250
	306	N Pilot Plant	480	Every 2 weeks	12 000
				TOTAL	15 250
Nitric Acid	313	Final Etch Machine	4500	4 times/yr.	18 000
	333	Cu & Zr-2 Cleaning	800	3 times/mo.	29 000
	333	Copper Strip	1500	4 times/wk.	300 000
	333	Prebraze Etch	1000	Weekly	50 000
	333	Prebraze Etch	700	Weekly	35 000
	333	Prebraze Etch	800	Monthly	10 000
	333	Preweld Etch	1100	Weekly	55 000
	333	Final Etch	600	2 times/mo.	15 000
	333	Uranium Cleaning	500	Every 8 weeks	(3 000) ²

<u>Chemical</u>	<u>Bldg.</u>	<u>Use Location</u>	<u>Est. Quantity (Lbs)</u>	<u>Approx. Discharge Frequency</u>	<u>Indicated Total (Lbs)</u>
Nitric Acid	333	Uranium Cleaning	300	Every 12 weeks	(1 000) ²
(cont.)	333	Chem. Mill	1700	Every 8 weeks	(10 000) ²
	306N	Chem. Mill	500	Monthly	(6 000) ²
	306N	Copper Strip	4000	Monthly	48 000
	306N	Bright Etch	1000	Monthly	12 000
	306N	Billet Etch	600	8 times/yr.	5 000
	313	Uranium Recovery	(quantity based on store orders plus transfers ²)		165 000
				TOTAL	742 000
Sodium Hydroxide	313	Sleeve Machine	2000	Weekly	100 000
	313	Stripper Tank	500	8 times/mo.	48 000
	313	Tool Cleaning	500	3 times/mo.	18 000
	313	Anodizing	650	Daily	170 000
	313	Uranium Recovery	(quantity based on calculated nitric acid usage)		105 000
				TOTAL	441 000
Sodium Nitrate	313	Special Products	42	2 times/wk. ³	2 000
	313	Recovery Operations	100	8 times/mo.	9 500
				TOTAL	11 500
Sulfuric Acid	333	Cu Strip & Chem Mill	4200	Every 8 weeks	(25 000) ²
	306N	Chem. Mill	2000	Monthly	(24 000) ²
	313	Uranium Recovery			49 000
				TOTAL	49 000
Turco Aluminetch	313	Cap & Can Machine	55	Every 2 days	7 000
	313	Special Products	42	2 times/wk.	4 250
				TOTAL	11 250

1. First three months only, then discontinued.
2. To 313 Recovery Operations.
3. First six months only, then discontinued.

ESTIMATED QUANTITY (POUNDS) FOR WATER TREATMENT

Aluminum Sulfate	30 000
Polyacrylamide	100

Explanatory Note

This facility was placed into routine operation in March, 1970. The 30,000 pounds of aluminum sulfate represent about 3,000 pounds of aluminum retained at the filters and discharged directly to the river during filter backwashing. The polyacrylamide is also retained at the filters and discharged directly to the river during filter backwashing.

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SECTION IVCHEMICAL ANALYSES OF INLET STREAM TO 300 AREA PROCESS PONDS*

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Cl, ppm	12.48	0.186	3.73
Cu, ppm	1.10	0.003	0.184
Fe, ppm	1.76	0.006	0.171
F, ppm	6.50	0.0	2.295
NO ₃ , ppm	289	25	106
SO ₄ , ppm	66	11	35
Cr ⁺⁶ , ppm	0.29	0.004	0.022
U, ppm	0.45	0.035	0.170
pH	9.7	4.3	8.3

*Weekly integrated samples - 36 samples included.

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