OSU sludge study

UNIFIED SEWERAGE AGENCY
OF
WASHINGTON COUNTY

ADMINISTRATION BUILDING — 150 N. FIRST AVENUE
HILLSBORO, OREGON 97123
(503) 648-8621

Joel Wesselman
General Manager
Room 302

September 1, 1977

Department of Environmental Quality
1234 S.W. Morrison Street
Portland, Oregon 97205

Gentlemen:

SUBJECT: Unified Sewerage Agency--Sludge Disposal Records
Mike Cropp Farm for period March 1974 through July 1977

Agency records are incomplete with regard to the amount of anaerobic vs. aerobic sludge. For the purpose of calculating the amount of constituents (Table IIIA), I have used a figure of 60% anaerobic and 40% aerobic digested sludge.

The original planned application rate was 90,000 gallons per acre. While the highest amount applied per acre was 74,230 gallons, the average for the entire period was 33,232 gallons per acre. This is 63% below the planned application rate, which in part is due to specific crop requirements.

The tables and attachments may provide you with some useful information to be able to assess the effects of sludge disposal on this site. Tables I, II and III reflect the total estimated pounds of each constituent applied, assuming that the total application on an acre was either anaerobic or aerobic. Table IIIA assumes that the application rate for that year was 60% anaerobic and 40% aerobicly digested sludge. Table IV gives the amount, acres covered and application rate for each month sludge was disposed of at the Cropp Farm. Table V gives a rough estimate of the average application rates of each constituent over the entire disposal period. Tables VI and VII are the results of tests performed on three field soil samples and four well water samples.

If you have any questions, or require additional information, please don't hesitate to call us.

Very truly yours,

John W. Warren

John W. Warren
Operations Supervisor

JWW:mc
Encls.
cc - Mr. Mike Cropp

UNIFIED SEWERAGE AGENCY

1974 Sludge Analysis

Table I

	Anaerobic		Aerobic	
Constituent	lbs/1000 gal	lbs/acre*	lbs/1000 gal	lbs/acre
Total Sulfur, as S	0.71	36.9	0.1	5.2
Organic Nitrogen, as N	12.0	623.4	4.9	254.5
Ammonia Nitrogen, as N	6.0	311.7	0.2	10.4
Cod	217.0	11272.7	80.5	4181.8
Alkalinity, as $CaCo_3$	24.0	1246.8	1.6	83.1
Acidity, as $CaCo_3$	2.0	103.9	0.6	31.2
Total Phosphorus, as P	0.59	30.6	0.5	25.9
Chloride	1.87	97.1	0.9	46.8
Suspended Solids	269.0	13974.0	82.0	4259.7
TDS	12.0	623.4	4.7	244.2
Zinc	0.86	44.7	0.2	10.4
Copper	0.13	6.8	0.04	2.1
Nickel	0.01	0.5	0.01	0.5

* Based on 51,948 gallons/acre

UNIFIED SEWERAGE AGENCY

1975 Sludge Analysis

Table II

Constituent	Anaerobic		Aerobic	
	lbs/1000 gal	lbs/acre*	lbs/1000 gal	lbs/acre*
Chrome (total)	0.66	32.4	0.001	0.05
Zinc	0.88	43.2	0.15	7.4
Iron	8.62	423.6	1.92	94.5
Copper	0.20	9.8	0.04	2.0
Nickel	trace		trace	
Total Sulfur as S	0.65	31.9	0.24	11.8
Organic Nitrogen, as N	10.23	502.8	6.10	299.8
Ammonia Nitrogen, as N	5.42	266.4	0.24	11.8
COD	202.48	9950.9	132.32	6502.9
Alkalinity, as $CaCo_3$	21.60	1061.5	2.35	115.5
Acidity, as $CaCo_3$	1.27	62.4	1.66	81.6
Total Phosphorus, as P	0.50	24.6	0.31	15.2
Chloride	1.24	60.9	0.35	17.2
Total Suspended Solids	242.24	11904.9	99.20	4875.2
Total Dissolved Solids	15.75	774.0	5.64	277.2

* Based on 49145 gallons/acre

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1976 Sludge Analysis*

Table III

	Anaerobic		Aerobic	
Constituent	lbs/1000 gal	lbs/acre**	lbs/1000 gal	lbs/acre**
ORG-N	8.346	246.6	8.353	246.8
Total P	1.249	36.8	1.424	42.1
Chloride	1.374	40.6	0.651	19.2
Zn	0.5	14.8	0.28	8.3
Cu	0.149	4.4	0.079	2.3
Ni	trace		trace	
Cr	1.39	41.1	0.053	1.7
Pb	0.014	0.4	0.069	2.0
Fe	3.55	104.9	1.49	44.0

* These figures are based upon an average of the concentrations of each constituent based on analysis performed on each source of sludge in the Agency during this time period, and may not reflect the true rate of application. See Attachment 1.

**Based on 29,543 gallons/acre

Table IIIa

Estimated Pounds Applied/Acre
Based on 60% Anaerobic and 40% Aerobic

Anaerobic Sludge

Constituent	1974		1975		1976	
	lb/1000 gal	lbs/acre	lb/1000 gal	lbs/acre	lb/1000 gal	lbs/ac
ORG-N	12.0	374.0	10.23	301.7	8.35	148.0
Total-P	.59	18.4	.50	14.7	1.25	22.2
Zn	.86	26.8	.88	25.9	.50	8.7
Cu	.13	4.1	.20	5.9	.15	2.7
Ni	.01	0.3	---	---	---	---
Chloride	1.87	58.3	1.24	36.6	1.37	24.3

Aerobic Sludge

Constituent	1974		1975		1976	
	lb/1000 gal	lbs/acre	lb/1000 gal	lbs/acre	lb/1000 gal	lbs/ac
ORG-N	4.90	101.8	6.10	119.9	8.35	98.7
Total-P	.50	10.4	.31	6.1	1.42	16.8
Zn	.20	4.2	.15	2.9	.28	3.3
Cu	.04	0.8	.04	0.8	.08	0.9
Ni	.01	0.2	---	---	---	---
Chloride	.90	18.7	.35	6.9	.65	7.7

Note: 1. Drop in ORG-N Anaerobic and increase ORG-N Aerobic.

2. Increase in total-P Aerobic.

3. Increase in Cu Aerobic.

UNIFIED SEWERAGE AGENCY

Cropp Farm Sludge Disposal Site

Table IV

Month & Year	Million Gallons Hauled	Acres Covered	Application Rate
March 1974	.201	--	--
April 1974	.913	--	--
May 1974	.883	--	--
June 1974	.988	50	19,760/acre
July 1974	1.448	30	48,266/acre
August 1974	1.554	40	38,850/acre
September 1974	1.541	--	--
October 1974	1.930	26	74,230/acre
November 1974	1.701	28	60,750/acre
December 1974	1.676	24	69,833/acre
Totals	12.835	198	311,689 acres
Average/Month	1.283	33	51,948 gal/a
January 1975	1.527	23	66,391/acre
February 1975	.930	18	51,666/acre
March 1975	.812	12	67,666/acre
April 1975	.984	20	49,200/acre
May 1975	1.023	35	29,228/acre
June 1975	.968	55	17,600/acre
July 1975	1.328	44	30,181/acre
August 1975	1.554	30	51,800/acre
September 1975	1.354	25	54,160/acre
October 1975	1.522	28	54,357/acre
November 1975	1.165	20	58,250/acre
December 1975	1.244	21	59,238/acre
Totals	14.411	331	589,737 acres
Average/Month	1.20	27.6	49,145 gal/a
January 1976	1.061	18	58,944/acre
February 1976	.908	45	20,177/acre
March 1976	1.066	53	20,113/acre
April 1976	1.061	53	20,018/acre
May 1976	1.055	53	19,905/acre
June 1976	.910	45	20,222/acre
July 1976	1.017	51	19,941/acre
August 1976	.94	15	62,666/acre
September 1976	.6068	15	40,453/acre
October 1976	.5782	17	34,011/acre
November 1976	.4886	24	20,358/acre
December 1976	.3365	19	17,710/acre
Totals	10.028	408	354,519 acre
Average/Month	.835	34	29,543 gal/
January 1977	.5566	31	17,955/acre
February 1977	.422	26	16,230/acre
March 1977	.465	23	20,217/acre
April 1977	.444	30	14,800/acre
May 1977	.423	35	12,086/acre
June 1977	.465	65	7,153/acre
July 1977	.798	44	18,136/acre
Totals	3.574	254	106,577 acre
Average/Month	.510	36	15,225 gal/

UNIFIED SEWERAGE AGENCY

Average Pounds of Each Constituent Applied/Acre
For the Period June 1974 Through July 1977*

Table V

Constituent	Lbs./1,000 gal.	Lbs./acre
Cr	0.66	21.9
Zn	0.88	29.2
Fe	8.62	286.5
Cu	0.20	6.6
Ni	trace	---
Total S	0.65	21.6
ORG-N	10.23	339.9
NH_3-N	5.42	180.1
COD	202.48	6,728.8
Alk	21.60	717.8
Acid	1.27	42.2
Total P	0.50	16.6
Cl	1.24	41.2
TSS	242.24	8,050.1
TDS	15.75	523.4

*Based on March 14, 1975 sludge analysis and the average application rate of 33,232 gallons/acre.

UNIFIED SEWERAGE AGENCY

Type of Sample, Soils

1977

Table VI

(All values in mg/kg. Dry Basis except as noted.)

	Locations*		
Storet No. - Analysis	Field #1	Field #2	Field #3 Cabbage
00500 Total Solids (wt/wt basis)	79.3%	77.8%	77.9%
00625 Total Kjeldahl Nitrogen	881.0	907.9	981.5
00665 Total Phosphorus	835.8	786.6	770.3
00916 Total Calcium	44.0	42.5	47.0
00927 Total Magnesium	5,815.	5,380.	5,250.0
00929 Total Sodium	9,150.	9,650	9,300.
00937 Total Potassium	167.7	191.5	151.5
01034 Total Chrome	38.5	42.33	38.5
01042 Total Copper	15.49	19.50	17.00
01045 Total Iron	289.3	368.3	280.3
01051 Total Lead	25.0	25.0	30.0
01067 Total Nickel	28.97	34.50	31.47
01077 Total Silver	5.5	5.0	6.5
01092 Total Zinc	72.49	76.44	65.90
01027 Total Cadmium	4.5	6.0	4.5
00401 pH, Units	6.3	5.15	6.05

* See attachment 2 for location identification

UNIFIED SEWERAGE AGENCY

West Basin

Type of Sample, Water

(All values in mg/l except as noted)

1977

Table VII

Storet No. - Analysis	Locations			
	Well #4	LC Well	North Plains School	MC Well
00500 Total Solids	232.	230.	419.	180.
00625 Total Kjeldahl Nitrogen	0.75	0.75	1.05	0.72
00665 Total Phosphorus	1.20	0.0	0.0	0.33
00916 Total Calcium	18.47	22.97	15.97	12.97
00927 Total Magnesium	10.395	8.945	6.595	4.095
00929 Total Sodium	43.50	10.00	28.50	37.50
00937 Total Potassium	2.875	0.685	6.350	2.815
01034 Total Chrome	0.0	0.0	0.0	0.0
01042 Total Copper	0.0	0.01	0.0	0.0
01045 Total Iron	1.205	0.045	0.0	0.07
01051 Total Lead	0.0	0.0	0.0	0.0
01067 Total Nickel	0.0	0.0	0.0	0.0
01077 Total Silver	0.0	0.0	0.0	0.0
01092 Total Zinc	0.45	0.17	0.22	0.14
01027 Total Cadmium	0.0	0.0	0.0	0.0
00401 pH, Units	7.87	6.75	8.30	8.17

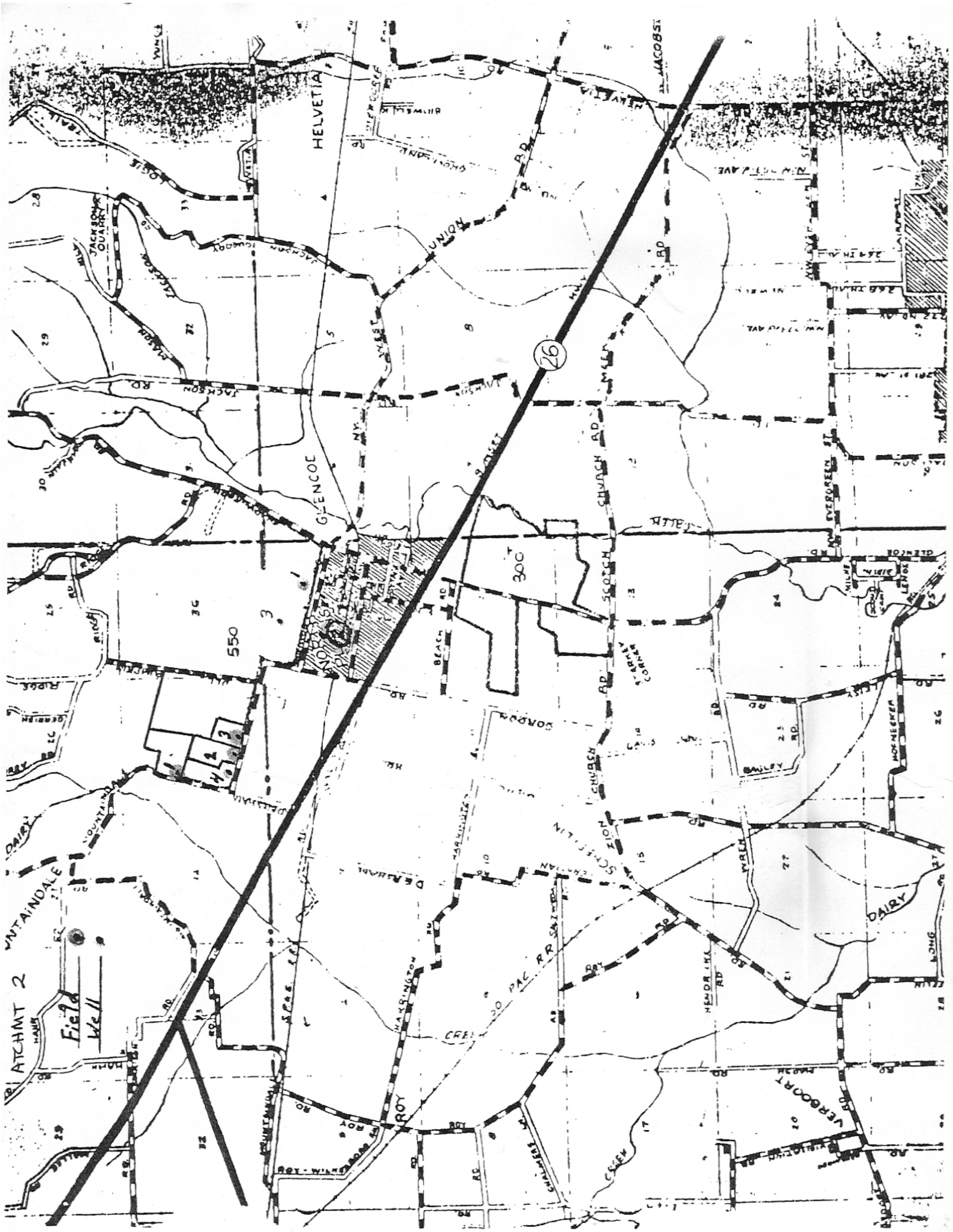
See Attachment 2 for location identification

1976

UNIFIED SEWERAGE AGENCY

Attachment 1

Treatment Plant and Digester	pH	Cr mg/1	Zn mg/1	Pb mg/1	Fe mg/1	Cu mg/1	Ni mg/1	ORG-N mg/1	PO_4 ≡ (for) mg/1	Cl mg/1	Salmonella per 100 ml
Forest Grove 2° Anaerobic Dig.	6.70	0	1.18	tr.	8.4	tr.	0	71.4	76.0	70.39	---
Aloha 2° Anaerobic Dig.	7.47	5.15	50.0	1.5	480.0	15.80	tr.	1789.2	181.5	120.50	---
Aloha 2° Aerobic Dig.	6.92	2.95	42.5	0.75	190.0	10.20	0	1727.6	216.0	130.20	240
Fanno Creek 2° Anaerobic Dig.	7.00	5.30	100.0	1.5	660.0	30.87	tr.	1643.6	181.5	221.80	---
Tigard 2° Anaerobic Dig.	6.30	17.95	150.0	4.16	860.0	41.40	tr.	2021.6	150.0	260.30	---
Tigard 2° Aerobic Dig.	6.40	7.39	47.5	1.44	310.0	14.53	tr.	975.4	155.0	45.80	---
Sherwood 2° Anaerobic Dig.	7.10	975.0	15.0	1.92	330.0	5.80	0	1724.8	141.2	137.40	---
Metzger 2° Anaerobic Dig.	7.14	1.95	47.5	0.72	215.0	13.60	tr.	1453.2	169.0	178.40	2
Metzger 2° Aerobic Dig.	5.77	tr.	10.0	0.32	36.0	3.65	0	301.7	141.2	58.34	---


HELVETIA
JACKSON QUARRY
UNION
26
GLENCOE
SCOTCH CHURCH RD
550
300
EVERGREEN ST
BEACH
ZION CHURCH
DAIRY
HARRINGTON
SO PAC RR
ROY
VERBOORT
ATCHMT 2
Field Well

List of People Waiting for Sludge

		Acres
Dave Zumwolt	1330 S.W. 345th, Hillsboro	5
Roy Walters	Rt. 2, Box 46, Gaston	140
Karl Voss	Rt. 1, Box 193W, Forest Grove	600
Raphael Toner	Rt. 3, Box 187, Gaston	50
George Spiesschaert	Rt. 1, Box 373, Forest Grove	70
John Stevens	Rt. 4, Box 302C, Hillsboro	8
Mike Schmidlin	Timber Rt. Box 192, Veinonia	16
Dick Smith	Rt. 1, Box 262, Cornelius	20
Lyle Smith	Rt. 3, Box 601C, Hillsboro	5
Darrel Rose	Rt. 2, Box 120, Forest Grove	19
Deon Pahricks	Rt. 1, Box 264, Cornelius	40
Ron Naught	1416 N.W. Jackson, Hillsboro	27
Oregon Roses	1170 E. T.V. Highway, Hillsboro	38
Glen Walters	Rt. 1, Box 278, Forest Grove	54
Ken Logan	Rt. 3, Box 283, Hillsboro	80
John Lundy	Rt. 4, Box 245, Sherwood	30
Bob Kauer	Rt. 3, Box 546, Cornelius	609
Darrel Adams	Rt. 2, Box 260, Hillsboro	71
Mike Anderson	Rt. 1, Box 208, Forest Grove	45
William Anliker	1050 N.W. Brookwood	11
Bailey Nursery	Rt. 1, Box 9, Yamhill	223
Jim Bauer	Rt. 2, Box 259B, Cornelius	8
John Brinegar	18400 S.W. Pacific Hwy.	7
J. Clark	Rt. 2, Box 402, Forest Grove	5
D.L. Darby	Box 287, Gaston	25
Keith Delastamutt	Rt. 3, Box 44E, Gaston	7
Vince Dodpins	Rt. 4, Box 182, Aloha	90
Bob Epler	Rt. 1, Box 185, Forest Grove	273
Jim Fisher	Rt. 2, Box 28, Gaston	61
Bob Ganger	1640 S.W. 325, Hillsboro	25
Leo Gossman	5010 S.W. Sewel Rd., Hillsboro	5
Ewrin Heaton	Rt. 6, Box 643, Hillsboro	59
M. Heisler	Rt. 1, Box 130A, Gaston	5
Wayne Hensley	Rt. 1, Box 348, Forest Grove	35
Mike Jenkins	1616 S.W. Sunset, Beaverton	40
Mike Crop	Rt. 1, Box 325M, Cornelius	662
	TOTAL ACRES	3,468