CLOSURE/POST-CLOSURE PLAN

Circle "C" Landfill

Existing Cell

June 1990

Russ Fetrow Engineering Inc.
ENVIRONMENTAL PROBLEM-SOLVING

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CIRCLE "C" LANDFILL

EXISTING LIMITED PURPOSE LANDFILL

CLOSURE/POST-CLOSURE PLAN

1. Closure Plan

1.1 Introduction

The plan outlined below is designed to allow Circle "C" Corporation to close its existing limited purpose landfill cell in a manner which minimizes the threat to human health and the environment from post-closure escape of solid waste constituents or decomposition products and prepares the facility for the post-closure period, as required by WAC 173-304-407(3), (4) and (5).

1.2 Sequence of Closure Activities

Circle "C" will continue to fill waste until final closure contours (see Sheet 3) are reached or until the calendar dates prescribed in the variance issued by the Southwest Washington Health District (SWHD). Actual height of fill will remain approximately three feet below final elevations to allow for the thickness of the top cap. As set forth in the variance, Circle "C" may continue to fill waste through October 31, 1990 if 80 percent of the disposal area

is closed as outlined in this closure plan. Circle "C" expects to begin closure activities between August 15 and September 1.

1.3 Closure Design and Construction

1.3.1 Top Cap

Upon completion of filling, waste will be regraded to achieve design slopes and final contours (see Sheet 3), and a multi-layered low permeability cap will be constructed over the waste (see Top Cap Detail, Sheet 5). An 12 inch layer of 1 inch crushed rock or approved equivalent with no fines will then be placed over the waste, serving as both a leveling course and a gas transmission layer. Next, a nonwoven geotextile filter fabric will be laid down to prevent transport of fines into the gas transmission rock. A 24 inch layer of soil will then be placed in 6 inch lifts and compacted to achieve a permeability of 1×10^{-6} cm/sec or less. On-site soils have been tested (see Appendix D) and are capable of being compacted to achieve the required permeability. Finally, a 6 inch layer of topsoil will be placed and seeded with a mixture of adapted grasses. The final grade of the surface slopes will be a minimum of 2 percent to prevent ponding, and the grade of side slopes will be a maximum of 33 percent to minimize erosion.

1.3.2 Alternate Cap Design for Waste-Over-Waste Closure

Circle "C" Corporation is currently seeking the necessary permits for a new landfill cell adjacent to the existing cell. One alternative currently being investigated is the construction of a new cell over the closed side slope of the old cell. The regulatory viability of this option has not yet been determined; however, such a scenario would in all likelihood require the use of a synthetic flexible membrane liner (FML) in the top cap of the old cell. If this option is approved and a synthetic liner specified, Circle "C" will submit a revised closure design incorporating a FML and appropriate ancillary components. All other aspects of closure will remain the same.

1.3.3 Gas Control System

A passive gas control system will be used to collect and flare methane produced by the decomposition of waste. The tight native clays and silts which form the sides of the landfill will force gases to migrate upward through the relatively porous waste material. Upon reaching the surface of the waste, upward progress will be impeded by the low permeability soil layer, and gas will move laterally through the 12 inch layer of gas transmission rock. The gas will be collected by perforated PVC pipes laid in trenches of gas rock set 12 inches into the surface of the waste (see details 1 and 7, Sheet 5). These trenches will be wrapped with an 8 ounce geotextile to maintain their integrity. These lateral pipes will connect to a central pipe along the crest of the landfill (see Sheet 3) and the collected gases will be

routed to a flare. The flare used will be a Fite brand Model FS VPE-F or equivalent. Since levels of methane may not always be sufficient to support combustion, the flare will be equipped with a continuously burning pilot supplied by a propane tank. Both the tank and the flare will be enclosed by a chain link fence and located in an area of native soil at the perimeter of the landfill, with the tank and controls protected by a roof. Landfill gas condensate will be collected by two solid PVC perimeter lines tying together the downhill ends of the gas laterals. The condensate collection lines will be routed to the leachate collection system.

1.3.3.1 Justification of Passive Gas System

An active gas system is not necessary for the Circle "C" landfill and may actually be less effective than the passive system proposed. Any gas generated within the landfill will exit via the path of least resistance -- in this case the porous gas collection blanket and the collection pipes. Gas generation will build up slight gas pressures, forcing the gas through the collection lines and to the flare compound where it will be burned by a continuous pilot flare.

If an active system were installed the only change in configuration would be the addition of a vacuum pump to pull gas from the landfill. If such a pump were installed at Circle "C", the slight permeability of the clay cap would cause gas levels to drop below combustible levels in a matter of weeks due to the vacuum-induced infiltration of outside air. An active

system could actually cause a backflashing hazard as methane levels drop into the 5-15 percent range and oxygen (in outside air) is introduced into the system.

1.3.4 Extension of Leachate Collection System

Leachate is currently collected by three 6 inch perforated pipes trenched into the landfill during the summer of 1989. These pipes drain to a manhole near the southeast corner of the existing fill (see Sheet 2). Leachate is pumped from the manhole to a 10,000 gallon storage tank and trucked off-site for disposal at the City of Vancouver's Westside Treatment Plant under a wastewater discharge permit. The proposed closure plan calls for filling the area between the northeast face of the landfill and the berm downcanyon of this face, in an area where woodwastes had previously been filled. If sufficient volumes are received to require filling of this area, the leachate collection system must be extended as shown in Sheet 2. A new manhole and pump station will be constructed at the base of the landfill to service the extended system. The existing storage tank will be moved and an all-weather access road and new truck loading dock constructed near the manhole.

The HELP model was run using the proposed landfill design to predict the volumes of leachate that must be handled. An explanation of the assumptions used in running the model, along with the data printouts, is contained in Appendix A. Assuming all leachate generated enters the collection system, the model predicts a peak daily flow of 1160 gallons. The storage tank can therefore store 8.6 days of this predicted peak flow. The manhole

itself will have a storage capacity of approximately 1700 gallons below the leachate pipe. A 20 gpm submersible electric pump will be used to move leachate from the manhole to the storage tank. The pump will be activated by the level of leachate in the manhole, and both the manhole and the tank will be equipped with high-level alarms.

1.3.5 Collection of Discharge From Underdrain

A network of perforated pipes was installed beneath the landfill prior to the original construction to drain a perched water table that exists in the vicinity of the site. This "underdrain" system is connected to a buried 24 inch culvert which runs down the canyon and daylights into a manhole just below the lower sediment pond (formerly a leachate collection pond). After the discharge from this system was analyzed and showed evidence of impact from the landfill (see February 1990 Monitoring Well Sample Analysis Results for Circle "C" Landfill), a pump was installed in the manhole and the fluid collected in a storage tank for off-site disposal as leachate.

The underdrain discharge is currently collected in a separate tank. The flow has been measured at approximately 1/2 gallon per minute during winter months and appears to be relatively constant. If a peak flow of 1 gpm is assumed for design purposes, the pumping and storage system must handle a peak daily flow of 1440 gallons. The existing pump is rated at 20 gpm and the storage tank holds 1000 gallons, providing less than a day's storage

at the assumed peak flow. This tank will be replaced this summer with a larger tank to provide sufficient storage.

1.3.6 Erosion Control

An erosion control plan was developed as a condition of the variance and submitted to the SWHD on April 30, 1990. This plan has been included as Appendix B; the engineering drawings are included with the full set of closure plan drawings as sheets S1-S5.

1.3.7 Quality Assurance/Quality Control

An independent engineering firm will provide third-party confirmation of quality assurance/quality control procedures used in the landfill's construction. This firm will be selected by SWHD via a request for proposals and will report directly to the district. The costs of this oversight will be borne by Circle "C".

1.4 Closure Cost Estimates, Financial Assurance and Fund Withdrawal Intervals

Closure cost estimates are presented in Table 1. Costs for erosion control, installation of gas monitoring wells and construction of additional leachate and underdrain collection facilities are considered to be operational costs of complying with the variance rather than

closure costs and are not included. Cost estimates are based on closure combustion being performed by Circle "C" Corporation.

Funds for closure have been placed in an approved trust account with Security Pacific Bank at the Portland headquarters office. These funds may only be released with the approval of SWHD.

Since closure will essentially occur all at once, a single withdrawal from the closure trust account is projected. Alternatively, 80 percent of the funds may be withdrawn at the beginning of closure activities to accomplish 80 percent closure by October 1 as specified in the variance, with the remaining 20 percent withdrawn as necessary to complete closure by December 1.

1.5 Closure Notification

Notification of intention to close was made in the closure plan submitted to SWHD on January 12, 1990. This notice serves to revise the original closure dates to comply with the variance issued by SWHD. As noted above, Circle "C" expects to begin closure in time to place final cover over 80 percent of the landfill by October 1, 1990. It is expected that closure activities will begin between August 15 and September 1. Closure activities will be completed by the dates specified in the variance.

2. Post-Closure Plan

2.1 Introduction

The post-closure plan outlined below is designed to allow for continued facility maintenance and monitoring as required by WAC 173-304-407(6), (7) and (8).

2.2 Post-Closure Maintenance

Periodic maintenance will be required to insure the integrity of the various environmental control systems. Reseeding and minor regrading of the top cap to repair erosion may be necessary until vegetative cover becomes completely established. Surface water ditches must be cleaned of debris, and sediment ponds dredged as necessary to maintain their design capacity. Leachate lines must be cleaned every 2 years to remove growths, and the leachate pumping station will require routine maintenance. The gas control/flaring system may require occasional servicing.

2.3 Post-Closure Monitoring

2.3.1 Groundwater Monitoring

The locations of the existing monitoring wells are shown on Sheet 1. As a condition of the variance, two additional wells will be installed downgradient of the landfill at locations specified by SWHD. Under the current sampling schedule, wells will be sampled quarterly for the parameters specified in WAC 173-304-490(2)(d)(i); however, the timing and breadth of sampling is being reviewed by SWHD and the Washington Department of Ecology. It is expected that monitoring will be reduced for wells 2 and 3, which appear to be in a cross-gradient position, and analysis for additional parameters will be required for some of the remaining wells. Groundwater surface elevations will be determined each time groundwater is sampled, and groundwater flow rate and direction in both the perched and Lower Troutdale aquifers will be determined at least annually. In addition, the underdrain discharge point below the lower sediment pond will be monitored on the same schedule as the wells until such time as a water quality discharge/disposal permit can be obtained. Samples will be sent to a certified laboratory that follows EPA-approved methods for the tests required. Circle "C" will determine, using a statistical method approved by the jurisdictional health department, whether a statistically significant increase for parameters or constituents at any monitoring well at the compliance point is detected, Circle "C" will proceed with the notification, resampling and corrective action required by WAC 173-304-490(2)(i) and (j), as specified in Section 6 of the Circle "C" Operations Plan. The cost of

an additional sample analyzed for VOCs, BNAs and dissolved metals has been included in the annual monitoring cost as a contingency. Sampling procedures are detailed in Appendix B of the Circle "C" Operations Plan.

2.3.2 Surface Water Monitoring

Surface water will be monitored at four sites: on McCormick Creek, 100 yards upstream of the southern border of the landfill property and on the north side of the La Center Road Culvert; in the lower sediment pond; and at the exit of the small surface runoff culvert below the underdrain discharge point, when this culvert is flowing. Sites will be samples quarterly for the parameters listed in WAC 173-304-490(2)(d)(i).

2.3.3 Gas Monitoring

A network of gas monitoring probes will be installed prior to closure at the locations shown on Sheet 3. These probes will be used to determine the gas concentrations at the property boundary and demonstrate compliance with WAC 173-304-460(2)(b)(i)(B). Gas monitoring will be conducted semi-annually at these probes and at the following additional locations: the leachate manhole, the drainage culverts which enter and exit the pond south of the property (see Sheet 1), the Circle "C" office/shop, the trailer house north of the landfill near monitoring wells 4 and 5, and any new structures which may be constructed on the site to serve a new cell or other activities.

Sites will be monitored for explosive gases and oxygen levels using portable gas detection equipment such as a Gas-Tech Model 1939 OX or equivalent.

2.3.4 Leachate Monitoring

As a condition of Circle "C"'s wastewater discharge permit from the City of Vancouver, leachate is sampled on a monthly basis for pH and on a quarterly basis for chemical oxygen demand and "phenols", which include phenol, cresols, pentachlorophenol, 2,3,4,5-tetrachlorophenol and other phenols detectable by EPA Method 604. Method 604, 625, or approved equivalent must be used for analysis. Sampling frequency and parameters may be modified if an alternative treatment/disposal system is approved and instituted in the future.

2.4 Leachate Treatment/Disposal

After closure, leachate will continue to be hauled to the City of Vancouver Westside Treatment Plant for treatment and disposal under Permit 89-16. Contractual arrangements have set the price for hauling at $0.05/gallon and the price for disposal at $0.042/gallon. Based on the predictions of the HELP model for the closed landfill (included as Appendix A), it is estimated that approximately 270,000 gallons of leachate will be generated each year.

In addition, as a condition of the variance, the discharge from the underdrain system will continue to be collected and hauled to the treatment plant as well. The volume of this discharge is estimated to average approximately 1/2 gallon per minute or 262,800 gallons/year. Due to the relatively low levels of contamination detected in this discharge to date, Circle "C" expects to pursue an alternative, permitted means of disposal for this discharge (e.g. land application).

2.5 Post-Closure Cost Estimates, Financial Assurance and Projected Fund Withdrawal Intervals

Post-closure cost estimates are presented in Table 2. Table 3 presents a present worth analysis based on the closure and post-closure cost estimates. Costs include 20 years of post-closure activities plus an additional 10 years of monitoring the underdrain discharge.

Post-closure funds are held in a trust account with Security Pacific Bank at the Portland headquarters office. In addition to the funds presently in the account, Circle "C" currently deposits $5.46 per yard of waste received to cover the costs of post-closure. The amount deposited per yard is based on the present worth of post-closure costs, the volumes of waste received in each month in 1989, and the number of months the landfill can remain open under the variance.

It is projected that funds will be withdrawn on an annual or other periodic basis with the approval of the health district and placed into an operating account to cover the projected post-closure costs for the next calendar period. Funds may also be withdrawn on an as-needed basis for non-periodic maintenance and repair. All withdrawals of funds from the post-closure trust account must be approved by SWHD.

2.6 Post-Closure Certification

When post-closure activities are complete, Circle "C" Corporation will certify completion of post-closure to SWHD. This certification will be signed by the owner/operator and a professional engineer registered in the state of Washington, and will state why post-closure activities are no longer necessary, as required by WAC 173-304-407(8)(b).

2.7 Deed Clause Changes, Land Use and Zoning Restrictions

Upon completion of closure, Circle "C" will cause a notice to be placed in the deed to the facility property, identifying the property as having been used as a landfill. Any restrictions on future use will be noted in the deed as required by SWHD.

JSC/ FETROW ENGINEERING, INC.
OST ESTIMATE WORKSHEET

ompany: Circle C Corporation
roject: Circle C Landfill
ask: Closure Construction Costs -- Existing Cell
ate: 6/14/90

tem	Description	Units	Quantity	Unit Costs	Total Item Cost
0	Landfill Top Cap				
1.1	Gas Transfer Rock (12" layer)	CUYD	17400	$2.00	$34,800.00
1.2	Geotextile Fabric (8 oz.)	SQFT	451000	$0.12	$54,120.00
1.3	Compacted Clay Top Liner (24")	CUYD	33400	$1.00	$33,400.00
1.4	Compacted Top Soil (6")	CUYD	8700	$1.25	$10,875.00
1.5	Seeding and Fertilizer	Acre	10	$800.00	$8,000.00
0	Landfill Gas System				
2.1	Perf. PVC Collection Pipe (6")	LF	500	$5.00	$2,500.00
2.2	Perf. PVC Collection Pipe (4")	LF	1820	$4.50	$8,190.00
2.3	Gas Collection Rock (backfill)	CUYD	260	$2.00	$520.00
2.4	Gas Trench Geotextile Fabric	SQFT	17400	$0.12	$2,088.00
2.5	Gas Vent Riser w/Post	EA	6	$40.00	$240.00
2.6	Flare w/Pilot, Standpipe	EA	$1.00	$5,000.00	$5,000.00
2.7	Flame Arrestor	EA	$1.00	$1,500.00	$1,500.00
2.8	Solid PVC Pipe to Flare (8")	LF	$420.00	$6.00	$2,520.00
2.9	Gas Structure-Concrete Pad, Fence	EA	$1.00	$3,000.00	$3,000.00
0	Miscellaneous Items	LS	1	$1,345.00	$1,345.00
			Subtotal Construction Costs		$168,098.00
			Contingencies (10%)		$15,000.00
			Washington State Sales Tax (7.8%)		$13,111.64
			QA/QC & Construction Management		$26,000.00
			Total Project Costs		$222,209.64

Note: Costs of Monitoring Well Installation, Erosion Control and extension of leachate collection system are considered operational/variance compliance costs and are not included.

Cost estimate assumes closure construction by Circle "C" Corporation

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TABLE 1

SS PETROW ENGINEERING, INC.
ST ESTIMATE WORKSHEET

mpany: Circle C Corporation
oject: Circle C Landfill
sk: Post Closure Maintenance/Monitoring
te: 6/14/90

em	Description	Units	Quantity	Unit Costs	Total Item Cost
0	Monitoring Labor/Equipment				
1.1	Sampling Technician Labor	HRS	32	$10.00	$320.00
1.2	Sampling Equipment & Supplies	RUN	4	$650.00	$2,600.00
1.3	Annual Summary Report	EA	1	$3,500.00	$3,500.00
0	Water Sample Analysis				
2.1	Quarterly Well Samples	EA	28	$290.00	$8,120.00
2.2	Quarterly Surface Samples	EA	14	$290.00	$4,060.00
2.3	Quarterly Leachate Samples	EA	4	$280.00	$1,120.00
2.4	Annual Toxic Organic Sample	EA	1	$685.00	$685.00
0	Gas Sample Analysis				
3.1	Semi-Annual Gas Samples	EA	2	$640.00	$1,280.00
3.2	Annual Summary Report (included in 1.5 above)				$0.00
3.3	RFEI Administrative costs	ALL	1	$130.00	$130.00
0	Leachate Treatment/Disposal				
4.1	Leachate Transport	GAL	270000	$0.050	$13,500.00
4.2	Leachate Treatment	GAL	270000	$0.042	$11,340.00
0	Landfill Post-Closure Maintenance				
5.1	Crawler Tractor Time	HRS	20	$50.00	$1,000.00
5.2	Grass Seed/Fertilizer	ALL	1	$200.00	$200.00
			Subtotal Post-Closure Costs		$47,855.00
			Contingencies		$965.00
			Annual Post-Closure Costs		$48,820.00

tes: Quarterly well samples includes six wells + underdrain
Surface samples includes 3 sites + culvert below underdrain twice per year
All water sampling performed by employees of landfill operator
Sampling costs to be revised based on changes in sampling schedule by WDOE/SWHD

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TABLE 2

JOE PETROW ENGINEERING, INC.
PRESENT WORTH CALCULATION WORKSHEET

Company: Circle C Corporation
Project: Circle C Landfill
Task: Closure/Post-Closure Costs -- Present Worth at 3% Spread
20 years of post-closure + 10 years monitoring underdrain
Date: 14 June 1990

Year	Capital Costs	Annual Post-Closure Costs	Inf. Index (4.5%)	Total Annual Costs	P. Worth Index (7.5%)	P. Worth Costs	Year
90	$222.210	$0	1.000	$222.210	1.0000	$222.210	0
91		$48,820	1.045	$51.017	0.9302	$47,456	1
92		$48,820	1.092	$53.311	0.8653	$46,130	2
93		$48,820	1.141	$55,704	0.8050	$44,841	3
94		$48,820	1.193	$58,242	0.7488	$43,612	4
95		$48,820	1.246	$60,830	0.6966	$42,374	5
96		$48,820	1.302	$63,564	0.6480	$41,189	6
97		$48,820	1.361	$66,444	0.6028	$40,052	7
98		$48,820	1.422	$69,422	0.5607	$38,925	8
99		$48,820	1.486	$72,547	0.5216	$37,840	9
00		$48,820	1.553	$75,817	0.4852	$36,787	10
01		$48,820	1.623	$79.235	0.4513	$35,759	11
02		$48,820	1.696	$82,799	0.4199	$34,767	12
03		$48,820	1.772	$86,509	0.3906	$33,790	13
04		$48,820	1.852	$90,415	0.3633	$32,848	14
05		$48,820	1.935	$94,467	0.3380	$31,930	15
06		$48,820	2.022	$98,714	0.3144	$31,036	16
07		$48,820	2.113	$103,157	0.2925	$30,173	17
08		$48,820	2.208	$107,795	0.2720	$29.320	18
09		$48,820	2.308	$112,677	0.2531	$28,518	19
10		$48,820	2.412	$117,754	0.2354	$27,719	20
11		$1,805	2.520	$4,549	0.2190	$996	21
12		$1,805	2.634	$4,754	0.2037	$968	22
13		$1,805	2.752	$4,967	0.1895	$941	23
14		$1,805	2.876	$5,191	0.1763	$915	24
15		$1,805	3.005	$5,424	0.1640	$890	25
16		$1,805	3.141	$5,670	0.1525	$865	26
17		$1,805	3.282	$5.924	0.1419	$841	27
18		$1,805	3.430	$6,191	0.1320	$817	28
19		$1,805	3.584	$6,469	0.1228	$794	29
20		$1,805	3.745	$6,760	0.1142	$772	30
				Total Present Worth Costs		$966.075	

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TABLE 3

Appendix A

HELP MODEL

HELP Model Predictions for Leachate Generation at Circle "C" Landfill

The HELP computer model program has been run on the existing landfill site with and without the requested vertical expansion. That data is summarized below and in the attached computer printouts.

The HELP Model requires input data on the number of layers, thickness of layers, purpose (type) of layers, hydraulic characteristics of the layers (texture) and climatologic data. The climatologic data is based on temperature and rainfall for the Vancouver area, using the distribution of Portland's rainfall as a synthetic rainfall generator. Average monthly temperature and rainfall data for Vancouver were used to make the synthetic rainfall and evapotranspiration data more accurate.

The integrity of the reported clay liner beneath the waste and the effectiveness of the recently installed leachate collection system are unknown. Therefore, these elements were not included and the landfill was initially modelled as a closed, capped facility with no leachate collection system or bottom liner. Experience with the HELP model, as well as common sense, indicates that virtually all fluids penetrating a landfill's top cap exit either through the leachate collection system or by percolating though the base of the landfill. With the percentage of leachate captured by Circle "C"'s collection system uncertain, conservative design requires that leachate handling systems are based on the full volume penetrating the cap. As a result, the critical value for design purposes is the percolation from Layer 2 (the clay liner).

The landfill was modelled using the default soil characteristic values in the model that most nearly matched the landfill materials itself. A one foot top soil layer (5×10^{-4} cm/sec) overlies a 2 foot clay cap (10^{-7} cm/sec). Demolition wastes were modeled with municipal hydraulic waste characteristics with a permeability of 2×10^{-4} cm/sec and the initial modelled thickness was 75 feet. In the second model run, a 65 foot layer of waste was modeled to

examine the thinner sections of the landfill. Native soils underlie the existing landfill and were not modelled.

Two runs were completed. The first run was of the closed landfill in its present configuration of about 75 feet of waste. The second run was modelled to represent the area between the existing northeast face of the landfill and the berm downcanyon of this face, which will have a maximum thickness of 65 feet.

The results (see printouts) indicate that the landfill, at 75 feet, will allow an average of 3,600 cubic feet per year per acre to pass through. When the landfill thickness is reduced to 65 feet, the vertical percolation will not change significantly but remains approximately 3,600 cubic feet per year per acre.

Leachate hauling records indicate that the collection system does indeed capture significant quantities of leachate. These records show an average of 5000 gallons/day were collected from the open landfill during January 1990, a month of extremely heavy rains. Obviously, the reported clay bottom liner and/or the native soils underlying the site provide a barrier to downward migration sufficient to cause significant quantities of leachate to exit via the collection system.

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CIRCLE C LANDFILL
CLOSURE - 75 FEET
1-6-89

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GOOD GRASS

LAYER 1

VERTICAL PERCOLATION LAYER

THICKNESS	=	6.00 INCHES
POROSITY	=	0.3980 VOL/VOL
FIELD CAPACITY	=	0.2443 VOL/VOL
WILTING POINT	=	0.1361 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3970 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.0005039999378 CM/SEC

LAYER 2

BARRIER SOIL LINER

THICKNESS	=	24.00 INCHES
POROSITY	=	0.4300 VOL/VOL
FIELD CAPACITY	=	0.3663 VOL/VOL
WILTING POINT	=	0.2802 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4300 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.0000001000000 CM/SEC

LAYER 3

VERTICAL PERCOLATION LAYER

THICKNESS	=	900.00 INCHES
POROSITY	=	0.5200 VOL/VOL
FIELD CAPACITY	=	0.2942 VOL/VOL
WILTING POINT	=	0.1400 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2764 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.0001999999949 CM/SEC

GENERAL SIMULATION DATA

SCS RUNOFF CURVE NUMBER	=	80.12
TOTAL AREA OF COVER	=	43560. SQ FT
EVAPORATIVE ZONE DEPTH	=	28.00 INCHES
UPPER LIMIT VEG. STORAGE	=	2.3880 INCHES
INITIAL VEG. STORAGE	=	2.3820 INCHES

SOIL WATER CONTENT INITIALIZED BY PROGRAM.

CLIMATOLOGICAL DATA

SYNTHETIC RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND SOLAR RADIATION FOR PORTLAND OREGON

MAXIMUM LEAF AREA INDEX	= 3.30
START OF GROWING SEASON (JULIAN DATE)	= 124
END OF GROWING SEASON (JULIAN DATE)	= 287

NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
38.80	42.60	44.70	49.10	54.70	59.70
64.10	64.20	60.80	53.20	45.00	40.70

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	7.44	4.49	4.63	3.34	2.39	1.56
	1.18	1.44	2.55	5.01	5.62	7.70
STD. DEVIATIONS	2.20	1.27	1.77	1.13	1.13	1.02
	0.92	1.16	1.96	1.28	1.82	2.48
RUNOFF						
TOTALS	6.697	3.117	1.855	0.329	0.038	0.021
	0.004	0.061	0.359	2.114	4.275	6.860
STD. DEVIATIONS	2.262	1.267	1.499	0.563	0.093	0.096
	0.012	0.208	0.964	1.301	1.868	2.516
EVAPOTRANSPIRATION						
TOTALS	0.655	1.548	2.843	3.484	2.539	1.662
	1.202	1.382	1.723	2.074	0.995	0.615
STD. DEVIATIONS	0.131	0.207	0.362	0.832	1.117	0.935
	0.800	1.034	1.101	0.455	0.144	0.112

PERCOLATION FROM LAYER 2

TOTALS	0.1313	0.1171	0.1213	0.0987	0.0432	0.0047
	0.0050	0.0091	0.0199	0.1024	0.1238	0.1310
STD. DEVIATIONS	0.0005	0.0019	0.0060	0.0175	0.0253	0.0109
	0.0084	0.0153	0.0232	0.0209	0.0025	0.0010

PERCOLATION FROM LAYER 3

TOTALS	0.0843	0.0770	0.0847	0.0821	0.0848	0.0818
	0.0841	0.0838	0.0808	0.0834	0.0809	0.0837
STD. DEVIATIONS	0.0024	0.0023	0.0024	0.0023	0.0023	0.0022
	0.0023	0.0023	0.0022	0.0022	0.0021	0.0022

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 20

	(INCHES)		(CU. FT.)	PERCENT
PRECIPITATION	47.36	(5.759)	171908.	100.00
RUNOFF	25.729	(5.494)	93395.	54.33
EVAPOTRANSPIRATION	20.721	(3.025)	75218.	43.76
PERCOLATION FROM LAYER 2	0.9077	(0.0482)	3295.	1.92
PERCOLATION FROM LAYER 3	0.9914	(0.0000)	3599.	2.09
CHANGE IN WATER STORAGE	-0.084	(0.082)	-304.	-0.18

****

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 20

	(INCHES)	(CU. FT.)
PRECIPITATION	2.96	10744.8
RUNOFF	2.952	10716.4
PERCOLATION FROM LAYER 2	0.0043	15.5
HEAD ON LAYER 2	6.5	
PERCOLATION FROM LAYER 3	0.0029	10.5
SNOW WATER	1.59	5755.6

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.3980

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.1279

****

****

FINAL WATER STORAGE AT END OF YEAR 20

LAYER	(INCHES)	(VOL/VOL)
1	2.38	0.3966
2	10.32	0.4300
3	247.09	0.2745
SNOW WATER	0.00	

****
****

****
****

CIRCLE C LANDFILL
CLOSURE - 65 FEET THICK
1-6-89

****
****

GOOD GRASS

LAYER 1

VERTICAL PERCOLATION LAYER

THICKNESS	=	6.00 INCHES
POROSITY	=	0.3980 VOL/VOL
FIELD CAPACITY	=	0.2443 VOL/VOL
WILTING POINT	=	0.1361 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3970 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.0005039999378 CM/SEC

LAYER 2

BARRIER SOIL LINER

THICKNESS	=	24.00 INCHES
POROSITY	=	0.4300 VOL/VOL
FIELD CAPACITY	=	0.3663 VOL/VOL
WILTING POINT	=	0.2802 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4300 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.0000001000000 CM/SEC

LAYER 3

VERTICAL PERCOLATION LAYER

THICKNESS	=	780.00 INCHES
POROSITY	=	0.5200 VOL/VOL
FIELD CAPACITY	=	0.2942 VOL/VOL
WILTING POINT	=	0.1400 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2764 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.0001999999949 CM/SEC

GENERAL SIMULATION DATA

SCS RUNOFF CURVE NUMBER	=	80.12
TOTAL AREA OF COVER	=	43560. SQ FT
EVAPORATIVE ZONE DEPTH	=	28.00 INCHES
UPPER LIMIT VEG. STORAGE	=	2.3880 INCHES
INITIAL VEG. STORAGE	=	2.3820 INCHES

SOIL WATER CONTENT INITIALIZED BY PROGRAM.

CLIMATOLOGICAL DATA

SYNTHETIC RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND SOLAR RADIATION FOR PORTLAND OREGON

MAXIMUM LEAF AREA INDEX	= 3.30
START OF GROWING SEASON (JULIAN DATE)	= 124
END OF GROWING SEASON (JULIAN DATE)	= 287

NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
38.80	42.60	44.70	49.10	54.70	59.70
64.10	64.20	60.80	53.20	45.00	40.70

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	7.44	4.49	4.63	3.34	2.39	1.56
	1.18	1.44	2.55	5.01	5.62	7.70
STD. DEVIATIONS	2.20	1.27	1.77	1.13	1.13	1.02
	0.92	1.16	1.96	1.28	1.82	2.48
RUNOFF						
TOTALS	6.697	3.117	1.855	0.329	0.038	0.021
	0.004	0.061	0.359	2.114	4.275	6.860
STD. DEVIATIONS	2.262	1.267	1.499	0.563	0.093	0.096
	0.012	0.208	0.964	1.301	1.868	2.516
EVAPOTRANSPIRATION						
TOTALS	0.655	1.548	2.843	3.484	2.539	1.662
	1.202	1.382	1.723	2.074	0.995	0.615
STD. DEVIATIONS	0.131	0.207	0.362	0.832	1.117	0.935
	0.800	1.034	1.101	0.455	0.144	0.112

PERCOLATION FROM LAYER 2

TOTALS	0.1313	0.1171	0.1213	0.0987	0.0432	0.0047
	0.0050	0.0091	0.0199	0.1024	0.1238	0.1310
STD. DEVIATIONS	0.0005	0.0019	0.0060	0.0175	0.0253	0.0109
	0.0084	0.0153	0.0232	0.0209	0.0025	0.0010

PERCOLATION FROM LAYER 3

TOTALS	0.0838	0.0766	0.0842	0.0817	0.0843	0.0813
	0.0836	0.0832	0.0802	0.0827	0.0803	0.0832
STD. DEVIATIONS	0.0025	0.0024	0.0025	0.0024	0.0025	0.0024
	0.0024	0.0024	0.0023	0.0023	0.0022	0.0023

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 20

	(INCHES)		(CU. FT.)	PERCENT
PRECIPITATION	47.36	(5.759)	171908.	100.00
RUNOFF	25.729	(5.494)	93395.	54.33
EVAPOTRANSPIRATION	20.721	(3.025)	75218.	43.76
PERCOLATION FROM LAYER 2	0.9077	(0.0482)	3295.	1.92
PERCOLATION FROM LAYER 3	0.9850	(0.0000)	3576.	2.08
CHANGE IN WATER STORAGE	-0.077	(0.082)	-281.	-0.16

****

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 20

	(INCHES)	(CU. FT.)
PRECIPITATION	2.96	10744.8
RUNOFF	2.952	10716.4
PERCOLATION FROM LAYER 2	0.0043	15.5
HEAD ON LAYER 2	6.5	
PERCOLATION FROM LAYER 3	0.0029	10.5
SNOW WATER	1.59	5755.6

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.3980

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.1279

FINAL WATER STORAGE AT END OF YEAR 20

LAYER	(INCHES)	(VOL/VOL)
1	2.38	0.3966
2	10.32	0.4300
3	214.03	0.2744
SNOW WATER	0.00	

Appendix B

EROSION CONTROL PLAN

EROSION CONTROL PLAN
CIRCLE C LANDFILL

In the event of a temporary or permanent closure of the existing landfill cell at Circle C, erosion control measures will be necessary to stabilize the soils on-site prior to the winter rains. The measures outlined below are designed to provide both temporary and permanent control of sedimentation at the Circle C site.

1) Revegetation: Establishment of vegetation is the most effective long-term method of controlling sedimentation from bare slopes. Because it requires less maintenance than physical control structures once established, it is especially appropriate for post-closure erosion control. A mix of grasses is used to rapidly establish dense vegetative cover. Hand broadcasting is cost-effective in areas where slopes are not excessive or where soil can be mechanically scarified to hold the seed. Hydroseeding sprays a uniform mix of water, seed and fertilizer over the area to be revegetated and is often used on steep or otherwise inaccessible slopes.

   In the Northwest, heavy fall and winter rains can significantly erode seeded areas before enough vegetative growth occurs to protect the soil. If temperatures are lower and germination is delayed, the seed itself can be washed from the slope. Mulching provides physical protection for the soil and seed, as well as enhancing conditions for germination. Seed that does not germinate immediately remains in place to sprout during winter warm spells or the following spring. Straw applied at the rate of 2 tons/acre can provide effective cover. Using sized wood fiber, mulching can be combined with hydroseeding to apply a even layer of mulch over the seeded area. On extreme slopes, a tackifier can be added to the seed/mulch mix, adding cohesive strength to the mulch and creating a spray-on blanket with high resistance to gullying.

   The method chosen to establish vegetation will depend on the timing of the efforts. Hand broadcasting is most effective in late spring or early fall, as germination and growth can occur before heavy rains begin. If seeding must be delayed due to construction activities, a combination of broadcasting, mulching and more intensive methods on sensitive slopes may be required. Costs of revegetation will need to be weighed against other demands for limited closure funds.

   The approximate areas to be revegetated is shown on Sheet 2; in practice, all areas bare of vegetation at the time of closure excluding permanent roads will be reseeded.

2) Settling Ponds: Sediment production will continue to occur at the site from roadways and from seeded areas until vegetation is established. Settling ponds reduce the velocity of surface flows and hence the sediment load that can be carried by the water. Larger soil particles drop out in the pond rather than in the receiving stream. During large storms, flows exiting the ponds will not be clear, but will contain very fine particles that will tend to remain in suspension.

Circle C will modify the existing on-site structures to maximize their utility as erosion control devices. Both the existing sedimentation pond and the former leachate collection pond will be widened and deepened to increase their holding capacity. Each pond will be equipped with a controlled outlet structure (see details, Sheet 5) to prevent erosion of the outfall and possible breaching. The ponds will be connected in series to maximize detention time.

3) Drainage Control: Surface drainage will be controlled to minimize volumes and velocities (and hence erosive potential) of overland flows. All bare areas in the canyon will be graded to drain into one of the two ponds. Flows from the cap will be directed to a catch basin feeding the upper pond, while flows from the lower canyon area will be routed to a similar catch basin feeding the lower pond. The pond outlet ditches will be lined with rock to trap additional sediment and prevent the ditches themselves from becoming a source of erosion.

4) Siltation Fencing: As a final barrier to off-site transport of sediment, siltation fencing will be installed below the lower sedimentation pond. This fencing both filters and reduces the velocity of surface flows passing through it, and will be of a finer weave than that currently in place at the site.

5) Maintenance: Periodic maintenance will be required to achieve optimum control of sedimentation. Spot seeding may be necessary for areas in which vegetation does not become established. The sedimentation ponds may need to be excavated annually for the first 2-3 years to maintain adequate storage volume, and less frequently as cover is established. Rock ditches may need occasional relining. Sediment deposited in front of siltation fencing may need to be removed once or more a season during the initial period of stabilization.

RUSS FETROW ENGINEERING INC.

P.O. Box 501
Salem, Oregon 97308
Phone: (503) 363-8760
FAX: (503) 588-7716

P.O. Box 47
Eugene, Oregon 97401
Phone: (503) 689-8110
FAX: (503) 689-1524

3000 Stewart Parkway, Suite 108
Roseburg, Oregon 97470
Phone: (503) 672-4754
~~FAX: (503) 672-5310~~

PROJECT _____

TITLE _____

CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SCALE _____ SHEET NO. _____ OF _____

Upper **SEDIMENTATION POND** CIRCLE ONE 4-12-91 T.Th.F.

Drisc-pipe Design, pp 12 & 13 of Catalog

$Q = CiA = 1.9 \times .35 \times 7.22 = 4.8013\ ft^3/s$ For all drainage into catch ba

$C = 7.7\% = .077\ ft/hr$

IF $Q = 4.8013\ \frac{ft^3}{s} \times \frac{7.481\ gal}{ft^3} \times \frac{60s}{min} = 2155\ GPM$

$$I.D. = \sqrt{\frac{2.67 \times .0279 Q}{S^{1/2}}} = 7.96"\ I.D.$$

For HDPE → C = 140 (off chart)

For Concrete → 10" pipe (from nomograph)

1. $Q = CiA$

$C = .35$ for "pastureland" over 10% - hilly

$i = 1.9$ with 20min travel time & 25yr storm

$A =$ varies

Area to North of Service Road (clay Borrow, etc): A = 6.05 Ac

$Q = (.35)(1.9)(6.05) = 4.02\ cfs$ or $1,804\ gpm$

Size the Pipe — culvert under road into sedimentation pond

1) Slope: $IE_{in} = 180$, $IE_{out} = 165$, $\Delta h = 15'$, $L = 100'$ ∴ 15%

2) $I.D. = \sqrt{\frac{2.67 \times .0279 Q}{S^{1/2}}} = 6.58"\ I.D.$ → 8" pipe

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PROJECT _____

TITLE _____

CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SCALE _____ SHEET NO. _____ OF _____

Area South of Service Road

2. $Q = CiA$ $\quad C = .35,\ i = 1.9,\ A = 3.56$ Ac

$Q = (.35)(1.9)(3.56) = 2.37$ cfs

$2.37 \frac{ft^3}{s} \times \frac{7.481 gal}{ft^3} \times \frac{60 s}{min} = 1063$ gpm

- Size the pipe: $\quad I.D. = \frac{2.67 \sqrt{.0327 Q}}{S^{1/2}}$

where $Q = 1.063$ & $S = 7.7\%$

$I.D. = 6.11''$ ⟶ go to 8" pipe

3. Sedimentation:

Detention time $\quad T_D = \frac{V}{Q}$

1) Total flow $Q = 4.02$ cfs $+ 2.37$ cfs $\equiv 6.39$ cfs

6.39 cfs $\times \frac{3600 s}{hr} = 23,000$ ft³/hr

2) Volume of Proposed pond:

Trapezoidal cross sections ½H ⟷ W ⟷ ½H, so take average widths:

$65' \times 137' \times 5' d = 44,525$ ft³

3) Detention time*: $\quad T_D = \frac{44,525 ft^3}{23,000 ft^3/hr} = 1.94$ hours

or 1 hr 56 min

* During peak flow of 25yr. storm.

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PROJECT _____

TITLE _____

CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SCALE _____ SHEET NO. _____ OF _____

CIRCLE 4-Ranch F.H.T.

LOWER SILTATION POND

Drainage Basin Area, into catch basin, excluding ditchwater from upper pond: 4.78 Ac

$Q = CiA$ Calculate flow from this drainage:

C = .35 for pasture land, rolling to hilly

i = 1.9 inch/hr travel time ± 25 yr storm

A = 4.78 Ac

$Q = (.35)(1.9)(4.78) = 3.18$ c.f.s.

Flow into the lower catch basin & pipe into pond is total of flows from lower drainage area plus flows from upper pond:

(3.18 cfs) + (4.02 cfs) + (2.37 cfs) = 9.57 c.f.s.

Size pipe from "catch basin" into lower pond:

(from "Diskpipe System Design" Catalog) $I.D. = \frac{2.67\sqrt{.032 \cdot 79 Q}}{S^{1/2}}$

Q = 9.57 cfs and (from the plans, slope ≈ 22.5%) S = .225

I.D. = 9.26"; but to allow for sediments, self-cleaning, etc., go with an 8" pipe, same as others on upper pond.

ROSS PETROW ENGINEERING INC.
P.O. Box 501
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PROJECT
TITLE
CALCULATED BY DATE
CHECKED BY DATE
SCALE SHEET NO. OF

Lower Pond Detention Time

$$T_D = V/Q$$

Volume of pond: Ave width → 84+24÷2 = 54'

Ave length → 164+104÷2 = 134'

Depth → = 10'

$(54')(134')(10') = 72,360$ ft³

$$T_D = \frac{72,360 \text{ ft}^3}{9.57 \text{ ft}^3/\text{s}} \times \frac{1 \text{ min}}{60 \text{ sec}} = 126 \text{ min or } 2 \text{ hrs, } 6 \text{ min}$$

Appendix C

GAS SYSTEM CALCULATIONS

RUSS FETROW ENGINEERING INC.

P.O. Box 501
Salem, Oregon 97308
Phone: (503) 363-8760
FAX: (503) 588-7716

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FAX: (503) 672-5310

PROJECT Circle C Landfill
TITLE Gas Generation Data
CALCULATED BY Maxwell Mrock DATE 3-7-90
CHECKED BY _____ DATE _____
SCALE _____ SHEET NO. ____ OF ____

Existing Landfill Waste Material

Type	
Stumps / Brush	44%
Demolition and Roofing	10%
Asbestos	6%
Inert Industrial	28%
Sheetrock - New Construction	12%

The organic content is mostly composed of wood fiber, which tends to decay slowly especially when the water content is low.

Estimated Density of material $\cong$ 1500 lb/yd^3

Estmated gas generation $\cong$ .041 $\frac{\text{standard cubic feet}}{\text{lb.}}$ / yr

These are conservative estimates actual production will probably be lower, especially after closure and the reduction of water infiltration.

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Roseburg, Oregon 97470
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FAX: (503) 672-5310

PROJECT Circle C Landfill
TITLE Gas generation Data
CALCULATED BY M Mick DATE 3-7-90
CHECKED BY _____ DATE _____
SCALE _____ SHEET NO. ____ OF ____

Existing fill = 400,000 yds — per Topo.

$$400{,}000\ yds \times 1500\ \frac{lbs}{yd} \times 0.041\ \frac{scf}{lb\,yr} =$$

$$= 24{,}600{,}000\ \frac{scf}{yr}\ \text{Total landfill gas}$$

Estimated composition 55% CH_4
45% CO_2

$$24{,}600{,}000\ \frac{scf}{yr} \times .55 = 13{,}530{,}000\ \frac{scf}{yr}\ \text{of } CH_4$$

$$\frac{24{,}600{,}000\ \frac{scf}{yr}}{365\ \frac{days}{yr}} = 67{,}397\ \frac{scf}{day}$$

$$67{,}397 \div 1440\ \frac{min}{day} = 46.8\ \frac{scf}{min}$$

New fill is estimated at 100,000 yd^3

that will add 25% more gas to the existing system

or $\frac{46.8}{84} = 11.7\ \frac{scf}{min}$ Total estimated gas generation

$= 46.8 + 11.7 = 58.50\ \frac{scf}{min}$

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PROJECT Circle C Landfill
TITLE Gas generation Data Pipe sizing
CALCULATED BY MMick DATE 2-7-90
CHECKED BY _____ DATE _____
SCALE _____ SHEET NO. ____ OF ____

Pipe Sizing

4" pipe Area = πr^2 r = .17 ft

$\pi \times .17^2 = .09$ ft

1 ft^3 of pipe volume = 11.1 ft. of pipe

6" pipe Area = πr^2 r = .25 ft

$\pi \times .25^2 = .2$

1 ft^3 of 6" pipe volume = 5 ft.

60 scf = 300 ft/min

30 scf = 150 ft/min (reasonable)

8" pipe Area = πr^2 r = .37

$\pi \times .37^2 = .35$

= 2.86 ft

60 scf = 60 × 2.86 = 171.43 ft/min (reasonable)

Appendix D

SOILS DATA

NORTHWEST TESTING LABORATORIES, INC.

5405 N. Lagoon Avenue
P.O. Box 17126
Portland, Oregon 97217-0126
Phone: (503) 289-1778

CONSTRUCTION INSPECTION
MATERIALS INSPECTION
CHEMICAL ANALYSIS
PHYSICAL TESTING
NON-DESTRUCTIVE TESTING
WELDING CERTIFICATION
SOIL TESTING
ASSAYING

December 14, 1988

RECEIVED
DEC 14

Circle C Corporation
31313 Paradise Park Road
Ridgefield, Washington 98642
Attn: Carl Carlson

RUSS FETROW ENGINEERING, INC.
P.O. BOX 501, Salem, OR 97308

IMPORT Subject: Analysis and tests performed on one (1) clay sample submitted 10-25-88

Report:

Gradation Analysis: Land Fill Sample AASHO T-11, 27

Sieve Size	% Retained	% Passing
3/8"	0	100
#4	0	100
#10	0.2	99.8
#20	0.5	99.3
#40	0.6	98.5
#60	1.1	97.4
#120	9.0	88.4
#200	15.4	73.0
#-200	73.0	

Atterburg Limits:

Liquid Limit	33
Plastic Limit	23
Plastic Index	10

Permeability:

Maximum Density AASHTO: T-180	114.4
Optimum Moisture	15.1
Density, pct., Dry	106.4
Compaction, % of T-180	93.5
Coeffiecient of Permeability, cm/sec	*

*Samples were saturated with a water pressure head exceeding 25 feet for 30 days with no visible indication of permeability.

Respectfully,
NORTHWEST TESTING LABORATORIES, INC.

Dennis Cody, Supervisor
Field Operations
Portland and Salem

Report Number 85930B

Russ Fetrow Engineering Inc.
GeoEnvironmental Division Office

2535B Prairie Road, Eugene, Oregon 97402
(503) 689-8110 Fax (503) 689-1524

June 15, 1990

Mr. Thomas Barton
Director of Environmental Health
Southwest Washington Health District
P.O. Box 1870
Vancouver, WA 98668

RE: CIRCLE "C" CORPORATION
CLOSURE/POST-CLOSURE PLAN

Dear Mr. Barton:

Transmitted with this letter are two copies of the revised closure/post-closure plan for the existing cell at Circle "C" Landfill. You should receive two bound copies of the plan narrative and two full size sets of engineering drawings. The plan is intended to fulfill Condition WDOE 3 of the Circle "C" variance. An additional copy of the plan and drawings were mailed today to Mr. Kirk Cook of the Washington Department of Ecology Southwest Regional Office. Please do not hesitate to call if we can be of further assistance.

Sincerely,

RUSS FETROW ENGINEERING, INC.

Nick Van Kleeck
Regulatory Specialist

cc: Kirk Cook, WDOE SW Region
Carl/Caren Carlson, Circle "C" Corporation
Carl Mason, Mason and Associates

circle01/clospln.let

Southwest Washington Health District
SERVING CLARK, KLICKITAT AND SKAMANIA COUNTIES

August 27, 1990

Mr. Carl Carlson
Ms. Caren Carlson
Circle "C" Corporation
31313 Paradise Park Rd.
Ridgefield, WA 98642

RE: Closure/Post Closure Plan

Dear Mr. and Ms. Carlson:

With the resolution of elevation and contours during our meeting with representatives of Russ Fetrow Engineering and the Washington State Department of Ecology on Friday, August 24, the Closure/Post Closure Plan submitted on June 15, 1990, can be approved with the following conditions:

1. The 280' maximum contour grade will be modified to join the dedicated asbestos disposal area located at the northwest portion of the fill site as discussed during last Friday's meeting.

2. The top cap must include at least an 18 inch topsoil layer over the entire fill site.

3. Gas monitoring should be conducted quarterly rather than semi-annually.

4. Groundwater flow directions and rates, as well as elevations, should be documented over an entire water year rather than annually to provide specific information, especially for shallow groundwater.

Some of the above comments are referenced from the Washington State Department of Ecology letter dated August 10, 1990. A map of the under drain system was shown, and a copy of the final approved financial assurance document sent to the Washington State Department of Ecology.

ADDRESS REPLY TO APPROPRIATE OFFICE:
ADMINISTRATIVE OFFICE
VANCOUVER/CLARK COUNTY HEALTH CENTER
P.O. BOX 1870 — 2000 FORT VANCOUVER WAY
Vancouver, WA 98668
(206) 695-9215

STEVENSON/SKAMANIA COUNTY HEALTH CENTER
.96L MILE POST - 2nd ST. EXT. - P.O. BOX 162
Stevenson, WA 98648
(509) 427-5138

WHITE SALMON/KLICKITAT COUNTY HEALTH CENTER
170 N.W. LINCOLN - P.O. BOX 159
White Salmon, WA 98672
(509) 493-1558

GOLDENDALE/KLICKITAT COUNTY HEALTH CENTER
228 WEST MAIN STREET
Goldendale, WA 98620
(509) 773-4565

All other activities of the Closure/Post Closure Plan, as submitted by Russ Fetrow Engineering, including the Erosion Control Plan, are approved and should be administered with the above additions and changes.

Please call me at 696-8428 regarding closure fund approvals or if you have any further questions.

Sincerely,

Gary Bickett

Gary Bickett
Environmental Health Specialist

GB/ct

cc: Kirk Cook
Chris Mathews
Russ Fetrow
Nick Van Kleeck
Brian Carlson

EHS\CIRCLE.C

9203240143

Southwest Washington Health District

SERVING CLARK, KLICKITAT AND SKAMANIA COUNTIES

ADDRESS REPLY TO
APPROPRIATE OFFICE

CLARK COUNTY
P.O. Box 1870
2000 Fort Vancouver Way
Vancouver, WA 98663
(206) 695-9215
FAX (206) 696-8424

SKAMANIA COUNTY
P.O. Box 162
2nd Street Extension
Stevenson, WA 98648
(509) 427-5138

WEST KLICKITAT COUNTY
P.O. Box 159
170 N.W. Lincoln
White Salmon, WA 98672
(509) 493-1558

EAST KLICKITAT COUNTY
228 West Main Street, Suite 130
Goldendale, WA 98620
(509) 773-4565

March 24, 1992

Mr. Carl Carlson
Ms. Caren Carlson
Circle "C" Corporation
31313 N. W. Paradise Park Road
Ridgefield, Washington 98642

RE: Circle C Landfill

Dear Mr. and Ms. Carlson:

The Southwest Washington Health District has received the following items regarding the closure of the Circle C Landfill:

1. Approved closure plan signed by a professional engineer registered in the State of Washington with modification to represent as-built charges.

2. Certification by the owner and operator that the site has been closed in accordance with the approved closure plan.

3. Certification by James F. Nims, a professional engineer registered in the State of Washington that the site has been closed in accordance with the approved closure plan.

4. Certification from Donald R. Melnick, a professional engineer registered in the State of Washington, that the site has been closed in accordance with the approved closure plans. Mr. Melnick is affiliated with R. W. Beck and Associates.

Based upon the information, the Southwest Washington Health District has concluded that the Circle C Landfill has been closed in accordance with the specifications of the approved closure plan and the closure requirements of WAC 173-304-407.

423

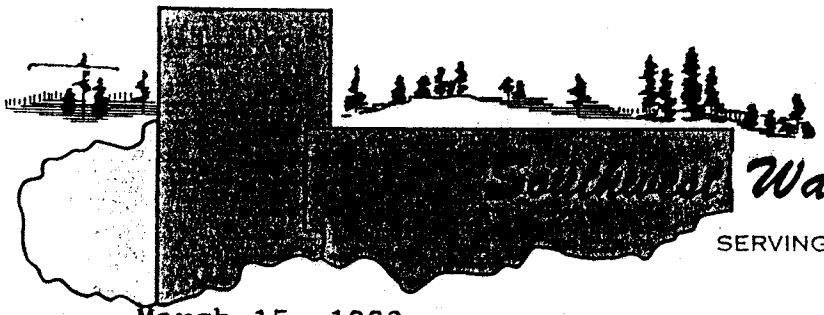
Effective October 1, 1991, post-closure activities have begun. This letter is written to you both pursuant to WAC 173-304-407(5)(e).

Sincerely,

Thomas L. Milne,
Executive Director

cc: Department of Ecology, Olympia, WA.
Ben Shafton, Attorney
Tom Barton, Director, EHS
Gary Bickett, EHS
Kaye Masco, Board of Health Chair
George Stillman, Clark County

np/N-1



Washington Health District

SERVING CLARK, KLICKITAT AND SKAMANIA COUNTIES

March 15, 1993

Caren Carlson
Circle C Landfill
31313 Paradise Park Road
Ridgefield, WA 98642

Re: Post Closure Monitoring

Dear Caren:

The Health District can approve your request to modify the Post Closure Monitoring Plan from quarterly sampling of groundwater and surface water monitoring points to semiannual sampling. The data collected so far reveals no significant concentrations of groundwater contaminants at the point of compliance. Since the post closure fund has limited resources, reducing the frequency of water sampling to twice yearly will allow continued long term monitoring of this site. This approval is subject to concurrence from the Washington State Department of Ecology.

Sampling must take place during spring (March/April) and fall (September/October). The consultant can specify exact times of optimal wet and dry subsurface conditions based on past experience and data. The suction lysimeters located around the perimeter of the underdrain liquid treatment area should also be sampled during each semiannual monitoring event. The initial sampling will be conducted by Brown and Caldwell Consultants.

Your concern for proper post closure maintenance is appreciated.

Sincerely,

Gary Bickett

Gary Bickett
Environmental Health Specialist

cc: Brian Carlson, Clark County Solid Waste Engineer
Cris Mathews, Department of Ecology

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proud past, promising future
CLARK COUNTY
WASHINGTON

June 23, 2003

Caren Carlson
Circle C Corporation
31313 Paradise Park Road
Ridgefield, WA 98642

Re: Circle C Landfill

Ms. Carlson:

The proposed changes for post closure monitoring requirements regarding Circle C Landfill as described in Mr. Dykes letter dated 3-31-03 is approved by the Clark County Health Department. The Department of Ecology has also reviewed the proposed changes and concurs with the Health Department's approval. The proposed changes include the following:

- Reduce groundwater analytical parameters to chloride, sulfate, nitrate manganese, TOC and COD eliminating coliform nitrite, ammonia, iron and zinc.
- Monitoring well MW-4 and the underdrain will be analyzed for the above parameters plus arsenic, chromium, selenium and mercury eliminating barium, cadmium, lead, silver as well as VOC's.
- Limit surface water analytical parameters to Chloride, sulfate, nitrate, manganese, TOC, COD and turbidity.
- Lysimeter analysis at the irrigation area will be chloride, nitrate, pH, specific conductance and manganese discontinuing iron.
- Soil analytical parameter will include arsenic, chromium, selenium, mercury, pH, nitrate, phosphorus, cation exchange capacity, and organic matter. Ammonia and TKN will be eliminated.
- A background soil sample will be taken at a location west of the irrigation area and tested for metals providing reference data.
- Semi-annual sample results and analysis will be compiled in the Annual Report to be sent to the Health Department. It is understood the Health Department will be notified immediately upon any significant increase in groundwater or surface water contamination or gas migration as a result of landfill releases.

Contrary to what may have been implied before, Circle C Landfill will continue to be regulated under Chapter 173-304 WAC. 173-350 WAC applies only to currently operating or future solid waste handling facilities.

P.O. Box 9825 • Vancouver, WA 98666-8825 • tel: [360] 397-8428 • fax: [360] 397-8084 • www.clark.wa.gov

Regarding landfill gas production, the solid waste rules require that landfill gas must be managed. This includes containment, collection and treatment if necessary. It also implies acquiring a permit from the local Clean Air Authority if required.

The Health Department agrees the proposed changes will not significantly affect Circle C Landfill's ability to adequately monitor for releases of contaminants or gas. I can be reached at 360-397-8061 if you have any questions.

Sincerely,

Gary Bickett

Gary Bickett
Program Manager

C: Dennis Dykes, Bright Fields Groundwater, Inc.
Cris Matthews, Department of Ecology
Chuck Matthews, Department of Ecology

SOUTHWEST WASHINGTON HEALTH DISTRICT

PERMIT

SOLID WASTE HANDLING

ID# 388

Circle C Landfill
31313 Paradise Park Rd
Ridgefield, WA 98642

Owner: Circle C Corporation
Contact Person: Caren Carlson

Closed LP Landfill

Valid for **Circle C Corporation**
who is granted permission to conduct solid waste handling activities specified in accordance with local and state ordinances, rules and regulations thereof.

EFFECTIVE DATES: 03/01/2002 TO 02/28/2003

Karen R. Steingart MD

Karen R. Steingart, MD, MPH, Health Officer

(Post in a Conspicuous Place)