City Water, Light & Power
FGDS Development Unit 2 Landfill
Springfield, Sangamon County, Illinois

Run-on and Run-off Control System Plan for FGDS Development Unit 2 Landfill

July 2025

Prepared for:
City Water, Light & Power
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APPENDICES

1. INTRODUCTION

City Water, Light and Power (CWLP) Flue Gas Desulfurization Sludge (FGDS) Development Landfill was issued Permit No. 1995-243-LFM on November 9, 1995. The active areas of Unit 2 Landfill (Unit 2) have been developed and operated pursuant to the initial permit and subsequent permit modifications. USEPA has indicated to CWLP that Unit 2 is a coal combustion residuals (CCR) landfill.

The Surface Water Drainage Plan of Unit 2 is included as part of the Landfill Permit No. 1995-243-LFM. Andrews Engineering, Inc. (AEI) prepared and submitted the Initial run-on and run-off control system plan in October 2016. AEI has completed a review of this plan for compliance with the requirements under 40 CFR Part 257.81.

> *257.81(c)(4)* ***Frequency for revising the plan.*** *The owner or operator of the CCR unit must prepare periodic run-on and run-off control system plans required by paragraph (c)(1) of this section every five years. The date of completing the initial plan is the basis for establishing the deadline to complete the first subsequent plan. The owner or operator may complete any required plan prior to the required deadline provided the owner or operator places the completed plan into the facility's operating record within a reasonable amount of time. In all cases, the deadline for completing a subsequent plan is based on the date of completing the previous plan. For purposes of this paragraph (c)(4), the owner or operator has completed a periodic run-on and run-off control system plan when the plan has been placed in the facility's operating record as required by § 257.105(g)(3).*

Unit 1 landfill, which was filled to capacity and certified closed in February 1993, is not included in this report. Since the landfill ceased receiving CCR prior to October 19, 2015, the above items are not applicable to the Unit 1 landfill as specified under 40 CFR Part 257.50(d).

AEI performed the review of available information, which included the following documents:

- Application for Significant Modification to Permit (dated September 1994 – Log No. 1995-243)
- Report of Stability Analysis (dated September 1994 – Log No. 1995-243)
- Historical Aerial Photographs (April 1995 – July 2023)
- Annual Inspection Report for Coal Combustion Residuals Landfill (January 2025)

2. CCR UNIT INFORMATION

The Design and Construction Plan of the Application for Significant Modification to Permit, prepared by AEI in June 1995 contains a Section covering “Surface Water Drainage” with subsections on “Off-site Run-on Diversion,” “On-Site Runoff Collection,” and “Runoff Collection Ditches and Culverts.” The “Surface Water Drainage” section text on pages 19 through 22 of the aforementioned Design and Construction Plan has been revised and attached to address the 1,000-year storm event for the approximately 3.5-acre closed landfill. The Surface Water Drainage Section of the Design and Construction Plan revision is enclosed (see Appendix A).

Stormwater run-on is addressed in the "Surface Water Drainage" section and states that run-on is prevented by the presence of perimeter berms around the site.

Stormwater run-off is addressed in the "Surface Water Drainage" section and states that stormwater run-off from the landfill is collected in perimeter ditches and will outlet to the evaporation pond to the east. Stormwater will also be pumped out of any excavated or fill area to the evaporation pond. Temporary ditches will be constructed to convey flow from completed portions of the landfill to the permanent perimeter ditches as needed.

Provided in Appendix B is a revised Stormwater Runoff Control Plan, which was previously included as Attachment 20 in the Application for Significant Modification to Permit. The revised Stormwater Runoff Control Plan includes engineering calculations discussed in the Design and Construction Plan. Also included in the revised Stormwater Runoff Control Plan is an "newly graded landfill," which discusses the design and use of temporary drainage structures to manage stormwater run-off prior to the placement of the final cover, and contains the pertinent design calculations.

In order to cease all CCR and Non-CCR waste streams from entering Dallman Ash Pond, a new section of double-walled leachate conveyance line from leachate manhole L303 was installed in August 2022 to route the leachate south towards the Clarification Pond. The discharge from the evaporation pond line was connected to the leachate line at the southwest corner of Unit 2. The combined flows of leachate and evaporation pond water are now conveyed directly into the Clarification Pond through the buried double-walled pipe for discharge into Sugar Creek in accordance with NPDES permit conditions.

After review, AEI has determined that the Surface Water Drainage Plan for Unit 2 meets all of the requirements of 40 CFR Part 257.81, which pertain to the revising the Run-on and Run-off Control System Plan.

3. STATEMENT

This Run-on and Run-off Control System Plan for Coal Combustion Residuals Unit 2 Landfill was completed for CWLP by Andrews Engineering, Inc. in accordance with the requirements under 40 CFR Part 257.81.

Signature: Karl W. Finke

Illinois P.E. No.: 062.068571

Date: 07/11/25

License Expiration: 11/30/25

APPENDIX A

Design and Construction Plan

SURFACE WATER DRAINAGE

Currently, surface water from Unit 2 generally drains to the low areas on-site. The water that does not infiltrate or evaporate is pumped to the Dallman Ash Pond west of the landfill.

In conjunction with the landfill, a surface water control system will be provided which will consist of a means for off-site run-on diversion, on-site run-off collection and the NPDES sampling of all discharges of run-off from disturbed areas to waters of the State. Each of these components of the surface water control system are described in greater detail below:

Off-site Run-on Diversion

Most off-site run-on is prevented by the presence of perimeter berms around the entire site. A minor amount of run-on is received from the north face of Unit 1 until the existing grade is reached.

On-site Run-off Collection

Stormwater run-off from disturbed areas on and immediately adjacent to the landfill will be collected in the perimeter ditches, which exist around the landfill periphery. The perimeter ditches will outlet to the Dallman Ash Pond to the west. The outfall locations are shown on the accompanying set of drawings.

Stormwater will also be pumped out of any excavated or fill area to the ash pond. Leachate will also be disposed by discharging to the ash pond. Minor seepage of groundwater into an excavation will be pumped to the force mains as needed, and the volume of this seepage is expected to be insignificant compared to any run-off generated by a storm. Temporary ditches will be constructed to convey flow from completed portions of the landfill to the permanent perimeter ditches as needed.

Run-off Collection Ditches and Culverts

Run-off from disturbed areas on the landfill will be collected in run-off collection ditches which will be provided around the entire periphery of the unit. These ditches and any associated culverts are designed to carry the run-off without scouring or erosion from the 1,000-year, 24 hour storm when the site is active (disturbed areas present). The sizing is based upon run-off generation estimates using the rational method and assuming final grades are achieved (which tends to maximize tributary drainage area and average watershed slope). Furthermore, for active site conditions, it is generally assumed the first two acres of any tributary area is freshly-graded bare ground and the remaining acreage is poorly vegetated.

All permanent ditches are to be vegetated channels. As necessary, where ditches discharge into existing waterways, riprap, clean broken concrete, or other suitable erosion control measures shall also be employed. Based upon these lining materials and protective measures, these ditches and any receiving channel should be adequately protected from erosion and scouring.

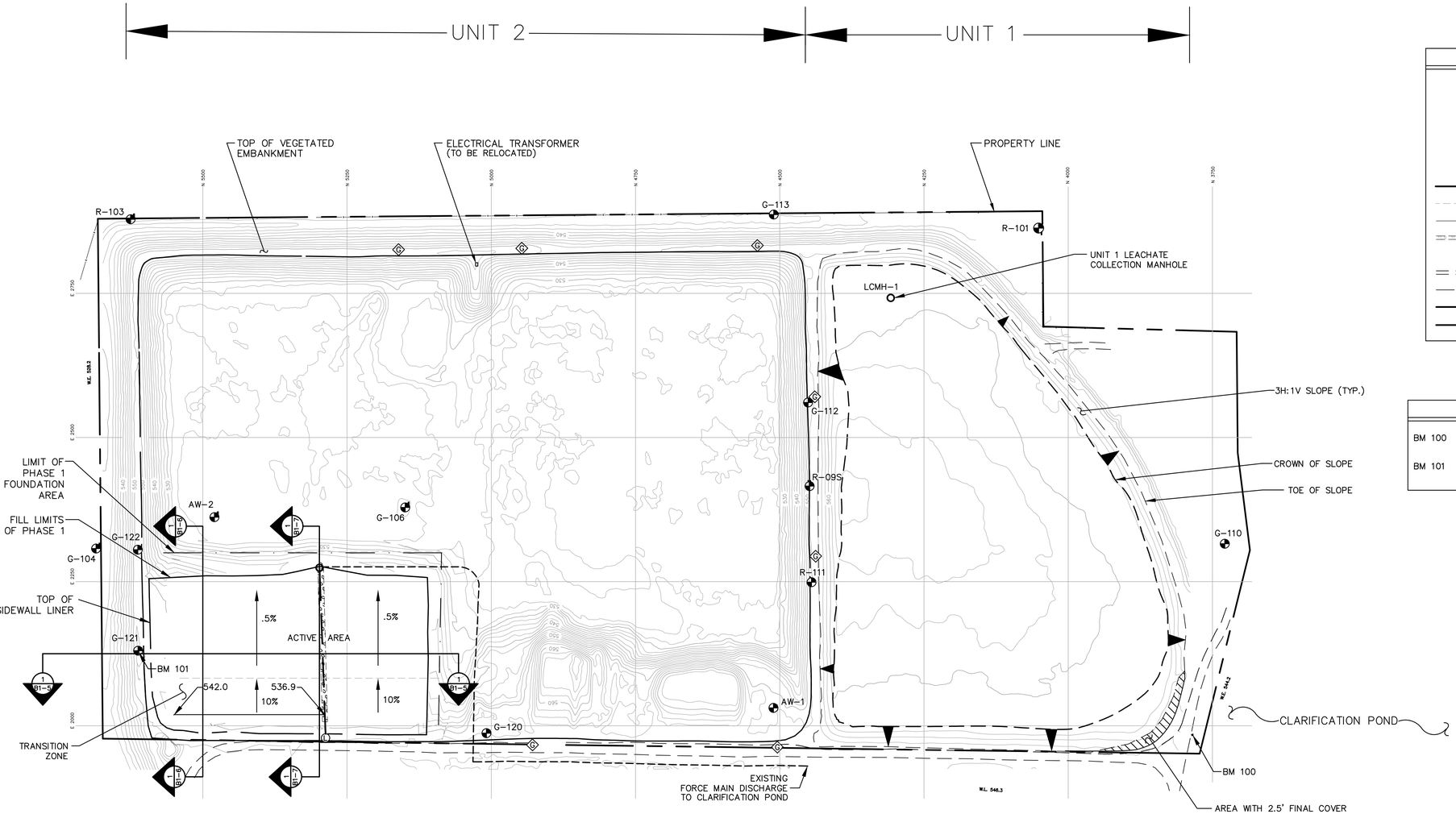
The run-off collection ditching shall be operated as described above until at least such time that the final cover is placed and erosional stability is provided by the vegetation or other approved means over their tributary area. Design calculations for the ditches and ditch outlets are included in the Stormwater Run-off Control Plan, attached to the Run-on and Run-off Control System Plan for FGCS Development Unit 2 Landfill.

Based upon the facility's geometry around the perimeter and physical setting of the landfill, buffer zones shall be left between the sludge placed above grade and the perimeter berm/sidewall liner. This buffer zone will be needed to accommodate the placement of the final cover in the immediate area of the toe of slope of the final cover.

These perimeter buffer zones will also function as drainage swales to remove contaminated water to the landfill's advancing face, where it will be collected as leachate, thus keeping it inside the unit. Given the simplicity of the buffer zone, the temporary nature, incremental construction and the excessive hydraulic capacity of the buffer zone we are not proposing that these buffer zones/drainage swales be included in the Construction Quality Assurance Officer's responsibility. Please refer to the Development drawings and Stormwater Run-off Control Plan.

APPENDIX B

Stormwater Runoff Control Plan



LEGEND

BM-0	BENCHMARK (SEE DESCRIPTION THIS SHEET)
	GROUNDWATER MONITORING WELL (EXISTING)
P	PIEZOMETER (LONG TERM)
	CULVERT
	LEACHATE COLLECTION MANHOLE
L	LEACHATE CLEANOUT RISER
	LEACHATE COLLECTION LINE
	TRENCH INVERT GRADE BREAK POINT
x	FENCE
	FOUNDATION UNDERDRAIN LATERAL
G	FOUNDATION UNDERDRAIN COLLECTION RISER
	ROADWAYS
	STREAM, DITCH OR WATERWAY
	PROPERTY BOUNDARY
	UNIT 2 WASTE BOUNDARY

BENCHMARK DESCRIPTIONS

BM 100	SET RAILROAD SPIKE IN CUT OFF POWER POLE: POWER PLANT COORDINATES N. 3785.14 E. 1984.37 – ELEVATION 554.731
BM 101	CUT CHISELED SQUARE IN CONCRETE 6 INCHES WEST OF MW G-121: POWER PLANT COORDINATES N. 5612.06 E. 2129.53 – ELEVATION 552.364

NOTES:

1. THE CONTOURS SHOWN FOR THE SURROUNDING AREA OF THE LANDFILL WERE GENERATED FROM LIDAR DATA PROVIDED BY HANSON PROFESSIONAL SERVICES, INC. DATED MAY 2023 MERGED WITH TOPOGRAPHIC SURVEY PERFORMED BY ANDREWS ENGINEERING, INC. DATED MARCH 11, 2024.
2. THE PROPERTY LINE LOCATION WAS SUPPLIED BY CWLP, BASED UPON SUBSEQUENT FIELD SURVEYING AND THE ORIGINAL LEGAL DESCRIPTION PREPARED BY MOSS, JOHNSON, SANDOVAL AND ASSOC. LTD.
3. FOR CLARITY NOT ALL SITE FEATURES ARE SHOWN.
4. MONITORING WELL(S) OR PIEZOMETER(S) PLUGGING SHALL BE IN ACCORDANCE WITH THE REGULATIONS, REQUIREMENTS AND/OR GUIDELINES OF THE IEPA AND/OR ILLINOIS DEPARTMENT OF PUBLIC HEALTH.
5. DURING THE OPERATION OF THE FACILITY, THE OPERATOR SHALL COMPLY WITH THE SAFETY STANDARDS PURSUANT TO THE FEDERAL OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970, INCLUDING ALL SUBSEQUENT AMENDMENTS.
6. WHERE THE FOUNDATION UNDERDRAIN SYSTEM DISCHARGES INTO A FORCE MAIN, THE UNDERDRAIN PIPING SHALL BE EQUIPPED WITH AN APPROPRIATE CHECK VALVE TO PREVENT BACKFLOW.
7. UNIT 1 AND UNIT 2 WERE RECOGNIZED AS TWO INDEPENDENT WASTE DISPOSAL ENTITIES BY SUPPLEMENTAL PERMIT NO. 1993-486-SP DATED JANUARY 7, 1994.
8. ACCESS TO THE FACILITY WILL BE CONTROLLED BY THE EXISTING TOPOGRAPHY, LOCKABLE GATES AND FENCING, LOCATED ALONG EAST LAKE SHORE DRIVE, ADJACENT TO THE FACILITY.
9. THE DESIGN SHOWN ON THE DRAWINGS ARE MEANT TO INDICATE A GENERAL DESIGN CONCEPT FOR THE FACILITY. ADJUSTMENTS MAY BE MADE IN THE FIELD BY THE CQAO FOR CONDITIONS ENCOUNTERED. AS APPROPRIATE, ANY ADJUSTMENTS SHALL BE REFLECTED ON THE RECORD DRAWINGS TO BE SUBMITTED TO THE AGENCY FOR OPERATING AUTHORIZATION IN NEWLY DEVELOPED AREAS.
10. WHERE POROUS MATERIALS ARE USED FOR FOUNDATION REPAIR THEY SHALL BE CONNECTED TO THE FOUNDATION UNDERDRAIN SYSTEM, WHERE PRACTICAL, TO FACILITATE ADDITIONAL SUBGRADE DRAINAGE.
11. CWLP OWNS THE SURROUNDING PROPERTY AROUND THE LANDFILL EXCEPT TO THE EAST.

UNIT 1 MONITORING WELL LEGEND
PHASED – 95-469

WELL I.D.	SCREEN MATERIAL	GRADIENT DESCRIPTION
R-101	PVC	UP
G-110	S.S.	UP
R-111	S.S.	UP
G-112	S.S.	UP

UNIT 2 MONITORING WELL LEGEND

WELL I.D.	SCREEN MATERIAL	GRADIENT DESCRIPTION
G-113	PVC	UP
G-120	PVC	UP
G-121	PVC	DOWN
G-122	PVC	DOWN
AW-1	PVC	UP
AW-2	PVC	DOWN
RW-3	PVC	DOWN
G-104	PVC	DOWN
R-103	PVC	DOWN
G-106	PVC	DOWN
R-09S	PVC	DOWN

N

0 100 200 400

SCALE: IN FEET

NO.	DATE	REVISION DESCRIPTION	BY
4	07/2025	REVISED NOTE 2	MPN
3	09/2024	REVISED SITE DEVELOPMENT PLAN, NOTES, AND DATE	MPN
2	12/1995	REVISED MONITORING WELL LABELS	RWH
1	06/1995	REVISED WELL LOCATION AND DATE	VJM

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APPROVED BY: KWF | DESIGNED BY: DWM | DRAWN BY: MPN

SITE DEVELOPMENT PLAN

PLANS PREPARED FOR
CITY WATER, LIGHT, AND POWER
FGDS DISPOSAL FACILITY
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: JULY 2025

PROJECT ID: 230339/0030

SHEET NUMBER: B1-2

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Stormwater Run-off Control Plan

Stormwater calculations for the 1,000-year, 24-hour storm are provided below and in the attachments to this plan. The Unit 2 Landfill is 2.4 acres in area with a final cover utilizing a 4 to 1 slope. The designed terrace berms for routing stormwater to the letdown structure are triangular with a 4 to 1 slope on the final cover half and a 3 to 1 slope with a 2-foot effective height on the terrace side and a ditch slope of 0.004 feet per feet. The letdown structure is trapezoidal with a 10-foot bottom width with 3 to 1 slopes and a 2-foot effective height for the channel berms. The details of these stormwater conveyance structures are on Sheet Number B1-8.

The run-off curve numbers for the newly graded landfill and vegetated landfill will not change but the 24-hour rainfall and runoff quantities will change. The curve number calculations are attached. For the newly graded landfill, the runoff quantity is calculated using 8.38-inches for the 1,000-year, 24-hour storm multiplied by the curve number of 94 equals 7.88-inches of run-off. For the vegetated landfill, the curve number is 74 and equates to 6.2-inches of run-off. The time of concentration for the final cover conditions are 9.37 minutes with the calculations attached to this plan.

The rational method is used for the peak discharge from the 1,000-year storm for both conditions, the newly graded landfill and the vegetated landfill.

$$Q = CIA$$

C = Curve Number

I = Rainfall Intensity (4.2 inches/1-hour for the 1,000-year storm)

A = Drainage Area (2.4 acres)

For the newly graded landfill, the peak discharge is calculated below:

$$Q = 0.94 \times 4.2 \times 2.4$$

$$Q = 9.48 \text{ cfs}$$

For the vegetated landfill, the peak discharge is calculated below:

$$Q = 0.77 \times 4.2 \times 2.4$$

$$Q = 7.76 \text{ cfs}$$

The Manning Formula for open channel flow is used to determine if the capacity of the ditches are adequate to convey the peak discharges calculated above from the rational method.

$$Q = (K \times A \times R^{2/3} S^{1/2})/n$$

Q = Flow Rate

A = Cross-Sectional Area of Flow

R = Hydraulic Radius

S = Slope of the Channel

n = Surface Roughness

K = Unit Dependent Constant (1.49)

The open channel flow calculation for the terrace ditches on the final cover with 1.25 feet of water in them are provided below:

$$Q = (1.49 \times 5.469 \times (0.6005)^{2/3} \times (0.004)^{1/2})/0.035$$

$$Q = 10.48 \text{ cubic feet per second}$$

The open channel flow calculation for the letdown structure on the east final cover with 0.1 feet of water in it is provided below:

$$Q = (1.49 \times 1.03 \times (0.0969)^{2/3} \times (0.25)^{1/2})/0.035$$

$$Q = 46.24 \text{ cubic feet per second}$$

This open channel flow is adequate to convey the peak discharge for either condition, newly graded landfill or vegetated landfill and for all conveyance structures.

APPENDIX A:
Curve Number Calculations

COMPOSITE RUNOFF CURVE NUMBER (*CN*)

PROJECT: CWLP - Unit 2 Landfill **PERMIT NUMBER:**

LOCATION: Springfield, Sangamon County **DATE:** 7/2/2025

TYPE OF AREA (SELECT WITH DROP-DOWN)

___ DETAINED AREA ___ MAJOR STORMWATER SYSTEM

___ UNRESTRICTED AREA ___ OTHER:

X UPSTREAM AREA

CONDITION (SELECT WITH DROP-DOWN)

X PROPOSED CONDITION ___ EXISTING CONDITION

RUNOFF CURVE NUMBER

Surface Description	Hydrologic Soil Group (HSG)	CN	Area (acres)	Product (CN)(Area)
Clay Cap	Newly Graded, No Veg.	94	2.00	188.00
Clay Cap	Open Space, Poor Cond.	89	0.40	35.60
TOTALS:			2.40	223.60

COMPOSITE RUNOFF CURVE NUMBER

$$\text{Composite CN} = \frac{\text{Total Product}}{\text{Total Area}} = \frac{223.60}{2.40} \rightarrow \textbf{Composite CN} = \textbf{93.17}$$

COMPOSITE RUNOFF CURVE NUMBER (*CN*)

PROJECT: CWLP - Unit 2 Landfill **PERMIT NUMBER:**

LOCATION: Springfield, Sangamon County **DATE:** 7/2/2025

TYPE OF AREA (SELECT WITH DROP-DOWN)

___ DETAINED AREA ___ MAJOR STORMWATER SYSTEM

___ UNRESTRICTED AREA ___ OTHER:

X UPSTREAM AREA

CONDITION (SELECT WITH DROP-DOWN)

X PROPOSED CONDITION ___ EXISTING CONDITION

RUNOFF CURVE NUMBER

Surface Description	Hydrologic Soil Group (HSG)	CN	Area (acres)	Product (CN)(Area)
Vegetative Soil	Native Plantings	77	2.40	184.80
TOTALS:			2.40	184.80

COMPOSITE RUNOFF CURVE NUMBER

$$\text{Composite CN} = \frac{\text{Total Product}}{\text{Total Area}} = \frac{184.80}{2.40} \rightarrow \textbf{Composite CN} = \textbf{77.00}$$

APPENDIX B:
Time of Concentration

NRCS TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

PROJECT: CWLP - Unit 2 Landfill **PERMIT NUMBER:**

LOCATION: Springfield, Sangamon County **DATE:** 7/2/2025

CONDITION (SELECT FROM DROP-DOWN)

X PROPOSED CONDITION ___ EXISTING CONDITION

SHEET FLOW

1. Segment ID		Sheet					
2. Surface description		Dense Grass					
3. Manning's roughness coefficient, *n*		0.24					
4. Flow length, *L* (≤ 100 ft)		50	ft				
5. 2-year, 24-hr rainfall, P_2		2.93	in				
6. Land slope, *s*		0.250	ft/ft				
7. Travel time, T_t	$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}s^{0.4}}(60)$	3.12	+		=	3.12	min

SHALLOW CONCENTRATED FLOW

8. Segment ID		Concentrated					
9. Surface description (drop-down list)		Unpaved					
10. Flow length, *L*		25	ft				
11. Watercourse slope, *s*		0.250	ft/ft				
12. Average velocity, *V*		8.07	fps				
13. Travel time, T_t	$T_t = \frac{L}{60V}$	0.05	+		=	0.05	min

OPEN CHANNEL FLOW

14. Segment ID		Terrace					
15. Cross-sectional flow area, *A*		10.72	ft^2				
16. Wetted Perimeter, P_w		12.75	ft				
17. Hydraulic radius, *R*		0.84	ft				
18. Flow Length, *L*		890	ft				
19. Channel slope, *S*		0.004	ft/ft				
20. Manning's roughness coefficient, *n*		0.035					
21. Average velocity, *V*	$V = \frac{1.486}{n}R^{\frac{2}{3}}S^{\frac{1}{2}}$	2.39	fps				
22. Travel time, T_t	$T_t = \frac{L}{60V}$	6.20	+		=	6.20	min

TIME-OF-CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

23. Time-of-Concentration, *Tc,* or Travel Time, *Tt*	$T_c, T_t = \sum T_t$				=	9.37	min