WAC 173-408-980 Appendix I.

1.0 Calculate Heat Input Capacity

Equation 1

$$Heat\ Input\ Capacity\ \left(\frac{MMBtu}{hr}\right) = Methane\ Gas\ Generation\ (scfm) \times \frac{60\ minutes}{1\ hour} \times Collection\ Efficient \times GHV_{Methane} \times \frac{1MMBtu}{1{,}000{,}000Btu}$$

Where:

Collection Efficiency	=	The landfill gas collection efficiency in percent (%), which is 75 percent.
GHV (Gross Heating Value)	=	Gross heating value of methane, which is 1,012[1] in units of British thermal units per standard cubic feet, or Btu/scf.

[1] Landfill Methane Outreach Program (LMOP) Interactive Conversion Tool

2.0 Methane Gas Generation

CH_4 Generation is calculated using the following equation:

Equation 2

$$CH_4\ Generation\ (Mg) = \left\{ ANDOC_{year-start} \times [1 - e^{-k}] - ANDOC_{deposited-last\ year} \times \left[\frac{1}{k} \times \left(e^{-k \times \left(1-\frac{M}{12}\right)} - e^{-k}\right) - \frac{M}{12} \times e^{-k}\right] + ANDOC_{deposited-same\ year} \times \left[1 - \left(\frac{1}{k} \times \left(1 - e^{-k \times \left(1-\frac{M}{12}\right)} + \frac{M}{12}\right)\right)\right]\right\} \times FCH_4$$

Where:

CH_4 Generation	=	CH_4 generated in the inventory year (Mg of CH_4).
FCH_4	=	Fraction of decomposing carbon converted into CH_4 (Default = 0.5).[2]
$ANDOC_{year\text{-}start}$	=	ANDOC in place at the beginning of the inventory year.
$ANDOC_{deposited\text{-}last\ year}$	=	ANDOC deposited during the previous inventory year.
$ANDOC_{deposited\text{-}same\ year}$	=	ANDOC deposited during the inventory year.

[2] 2006 IPCC Guidelines for National Greenhouse Gas Inventories

3.0 To Convert Methane Generated from Mg of CH_4 to SCFM

Equation 3

$$CH_4\ Gas\ Generated\ (scfm) = \frac{CH_4\ Generation\ (Mg)}{(year)} \times \frac{1\ (year)}{525{,}600\ (minutes)} \times \frac{1{,}000{,}000\ (g)}{1\ (Mg)} \times \frac{1\ (mole\ CH_4)}{16.0426\ (g\ CH_4)} \times \frac{0.83662\ (scf)}{1\ (mole\ landfill\ gas)}$$

4.0 Define ANDOC%

Equation 4

$$ANDOC\% = \sum WIPFRAC_j \times TDOC_j \times DANF_j$$

Where:

$WIPFRAC_i$	=	Fraction of the i^{th} component in the waste in place.
$TDOC_i$	=	Total Degradable Organic Carbon fraction of the i^{th} waste component (Mg of that component/Mg of Total waste in place).
$DANF_i$	=	Decomposable Anaerobic Fraction of the i^{th} waste component, that fraction capable of decomposition in anaerobic conditions (Mg of decomposable carbon for that component/Mg $TDOC_i$ for that component).

5.0 Define ANDOC

Equation 5

$$ANDOC = WIP\ (tons) \times \frac{0.9072\ (Mg)}{(ton)} \times\ ANDOC\%$$

Where:

ANDOC	=	Anaerobically Degradable Organic Carbon, carbon that is capable of decomposition in an anaerobic environment (Mg of carbon).
WIP	=	Waste in place estimate of all the landfilled waste (wet weight) as reported to Ecology's Solid Waste Management Program (tons).

6.0 Calculate $ANDOC_{year\text{-}end}$

Equation 6

$$ANDOC_{year-end} = ANDOC_{year-start} \times e^{-k} + ANDOC_{deposited-last\ year} \times \left[\frac{1}{k} \times \left(e^{-k\times\left(1-\frac{M}{12}\right)} - e^{-k}\right) - \frac{M}{12} \times e^{-k}\right] + ANDOC_{desposited-same\ year} \times \left[\frac{1}{k} \times \left(1 - e^{-k\times\left(1-\frac{M}{12}\right)} + \frac{M}{12}\right)\right]$$

Where:

$ANDOC_{year\text{-}end}$	=	ANDOC remaining undecomposed at the end of the inventory year.
$ANDOC_{year\text{-}start}$	=	ANDOC in place at the beginning of the inventory year.
$ANDOC_{deposited\text{-}last\ year}$	=	ANDOC deposited during the previous inventory year.
$ANDOC_{deposited\text{-}same\ year}$	=	ANDOC deposited during the inventory year.
M	=	Assumed delay before newly deposited waste begins to undergo anaerobic decomposition (Months, Default = 6).
k	=	Assumed rate constant for anaerobic decomposition; k = ln2/ half-life (years); half-life is the number of years required for half of the original mass of carbon to degrade.

Table 1 lists the accepted constant values for the anaerobic decomposition rate ("k").

Table 1: K Values

K for Average Rainfall (Inches/Year)			
Inches Rain	<20	20-40	>40
K Value	0.02	0.038	0.057

[Statutory Authority: Chapter 70A.540 RCW. WSR 24-11-052 (Order 22-15), § 173-408-980, filed 5/13/24, effective 6/13/24.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.