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Central Valley Regional Water Quality Control Board

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SUBJECT: Review of30 July 2014 *Amended Compost Area Leachate Collection Work Plan for Feather River Organics, Recology Yuba-Sutter, Marysville, California*

Purpose

This technical memorandum analyzes the calculations submitted by Recology in the 30 July 2014 *Amended Compost Area Leachate Collection Work Plan* which estimate the volume of leachate generated from the composting area during a 25-year 24-hour precipitation event. This memo formalizes my review completed in early August 2014, and discussed with the Discharger during a 6 August 2014 phone call and a 19 August 2014 meeting.

Background

On 30 July 2014, Recology (Discharger) submitted an evaluation prepared by Golder Associates that estimates the volume of runoff that would be generated by the Feather River Organics Compost area during a 25-year 24-hour storm event. The volume calculation was conducted to evaluate the storage capacity required to achieve compliance with Amended CAO R5-2013-0704-01.

The volume estimate used the EPA Storm Water Management Model (SWMM) method for calculating runoff from the composting area. The SWMM method uses the Natural Resources Conservation Service (NRCS) Curve Numbers (CNs) as an input to approximate runoff. Lower CN values are used for surfaces with low runoff potential while high CN values are used for surfaces with high runoff potential. The SWMM method utilizing NRCS CNs is a widely used method for determining the approximate amount of direct runoff from a rainfall event.

Water Board staff reviewed the volume estimate and agrees with the use of the SWMM method, the magnitude of the 25-year 24-hour storm event (3.16 inches), and the area of the composting pad (11.4 acres). Board staff does however have concerns with the CN values used in the calculations and the method used for averaging CN values to compensate for various surface types within the 11.4 acre composting area. Board staff feels that the total runoff volume of 183,000 gallons calculated by the Discharger severely underestimates the actual amount of runoff that will be generated by a 3.16-inch 24-hour precipitation event. For context, 3.16 inches of rainfall over 11.4 acres equates to approximately 975,000 gallons of water. If the compost area was paved with a relatively impermeable substance such as concrete and had no compost piles, then we would expect that slightly less than 975,000 gallons of storm water would runoff from the area.

Water Board Concerns

Water Board staff identified three major concerns with Recology's volume calculations: 1) the CN value used for the impermeable area not covered with compost, 2) the CN value used for the area covered by compost, and 3) using a weighted average CN value in the calculation. Each of these concerns is discussed further below.

CN Used for the Impermeable Area
The CN value used for the impermeable area was too low, based on the requirement of CAO R5-2013-0704 that Recology install a compost area pad with a permeability not to exceed $1X10^{-6}$ cm/sec.

For purposes of determining the CNs used in the EPA SWMM model, soils are classified into four hydrologic soil groups (A, B, C, and D) depending on the soil's ability to infiltrate water after prolonged wetting. Group C soils are generally classified as having a slow infiltration rate when saturated with a final infiltration rate of between 0.05 in/hr and 0.15 in/hr (or roughly $3.5X10^{-5}$ to $1.1X10^{-4}$ cm/sec). Group D soils are generally classified as having a very slow infiltration rate when saturated with a final infiltration rate of less than 0.05 in/hr (or roughly less than $3.5\ X10^{-5}$ cm/sec). [1]

The Discharger's volume calculations assumed that the hydrologic soil group of the soil in the impermeable compost pad to be a Group C soil, consisting of a low permeability, clayey soil intermixed with either aggregate base or crushed, recycled concrete. Assuming the soil to be Group C, the CN for this soil was assumed to be 87 for the runoff volume calculation.

However, based on the CAO requirement to have an impermeable compost area pad with an infiltration rate of less than $1X10^{-6}$ cm/sec, the soil is more likely a Group D soil and the CN value of 87 used in the calculations likely under predicts the runoff volume from these areas. For reference, a CN value of 87 would be typical of a ¼-acre residential lot with Group D soils with 38% of the area being impervious (rooftop, driveway, etc) [1], not for an engineered impermeable surface. A CN value of between 92 and 97 would be more appropriate.

CN Used for the Area Covered with Compost
A CN value of 1 was used for the areas that are covered by the compost windrows. Using a CN value of 1 for these areas assumes that essentially all precipitation that falls on the compost windrows infiltrates and no runoff will be generated by these areas, regardless of the magnitude of the rainfall event. Water Board staff acknowledges that a certain amount of rainfall will be absorbed by the compost; however, to assume that essentially no leachate would be generated by these areas regardless of the magnitude of a rain event is not realistic. If no leachate could be generated by compost piles places on impermeable surfaces, there would be no need to regulate leachate and control runoff from these types of operations.

Because the compost windrows are placed on top of an impermeable ground surface, any rainfall that is not absorbed and held by the compost will eventually infiltrate through the compost pile and hit the impermeable surface. Once the compost is saturated, runoff of leachate from the piles would begin. CN values are not readily available for this type of ground surface; however, a CN value of 1 does not reflect the volume of leachate that would be generated from this type of ground cover.

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[1] United States Department of Agriculture (1986). *Urban hydrology for small watersheds.* Technical Release 55 (TR-55) (Second Edition ed.). Natural Resources Conservation Service, Conservation Engineering Division.

Use of a Weighted Average CN Value in the Calculation
The Discharger's volume calculation uses a weighted average CN value of 52.6 to approximate the CN value for the entire site. The weighted average assumes that 60% of the area is not covered by the compost and has a CN value of 87 with the remaining 40% of the area covered with the compost piles and has a CN value of 1.

The runoff for watersheds having more than one hydrologic soil cover can be estimated in either of two ways: 1) A weighted average (by area) CN value can be calculated and used to calculate the amount of runoff (Q) generated by a rainfall event, or 2) The Q can be calculated using the CN value for each individual area then a weighted average Q (by area) can be calculated. The weighted CN method is a simpler calculation and when CN values are similar or close in value, the weighted CN method gives similar results to the weighted Q method. Conversely, when CN values are further apart or not as similar in value, the weighted Q method yields more accurate results. The weighted Q method always gives correct results (in terms of data given) but requires more work than the weighted CN.[2] In this case, the CN values were not similar (1 and 87) and using the weighted CN method underestimated the volume of runoff generated.

Conclusion

Board staff recalculated the volume of runoff using the weighted Q method and the CN values used by the Discharger, (which Board staff feels are lower than reality). Using the weighted Q method instead of the weighted CN method results in approximately twice the volume calculated by the Discharger's calculation, which Board staff still feels is lower than what would be generated during an actual 3.16-inch 24-hour rain event due to the inappropriate CN values used by the Discharger.

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[2] United States Department of Agriculture (2004). *Chapter 10 - Estimation of Direct Runoff from Storm Water.* Part 630 Hydrology – National Engineering Handbook. Natural Resources Conservation Service.