

Technical Memorandum



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To: Rob Amsberry, Joel Komarek, City of Lake Oswego
From: Tim Kraft
Copies:
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Subject: Lake stormwater flow estimates
Project No.: 13747

The City of Lake Oswego's 1992 Surface Water Management Plan used the Army Corps of Engineers (ACOE) HEC-1 hydrologic modeling program to model rainfall/ runoff relationships and to estimate runoff flow rates and volumes from 22 Lake Oswego sub-basins. Since the development of those models land use conditions have changed in the city, sub-basin boundaries have been revised and renamed, and the ACOE has developed a new graphical model to replace HEC-1. In addition, the city has developed new rainfall distributions to be used in modeling and sizing stormwater facilities in the city. To update these models, the following was performed:

- HEC 1 models were converted to HEC-HMS.
- Sub-basin boundaries and names were updated
- Land use information was updated
- New rainfall distributions were added

This memo provides a brief discussion of the revisions to the model, and provides model results for the basins that discharge into Oswego Lake. This information was requested by the City to provide a basis for potential stormwater flows that could enter the lake during lake-drawdown construction of the Lake Oswego Interceptor (LOIS) project.

Model Parameters

The Soil Conservation Service Unit Hydrograph method was used in the HEC-1 models. Inputs required to run this model include total area, land use (type of pervious land use and amount of impervious area), Runoff Curve Number, Lag Time, and rainfall distributions. Each of these is discussed below.

Total Area

Basin delineations were provided by the City for each basin and sub basin in GIS format. Areas were calculated from these delineations.

Land Cover

The type of land cover – impervious area, forest, field, or lawn, was updated in each model. The City has GIS data on land use that was collected in 2002, and this information was used to find the area of land cover in each basin and sub basin.

Runoff Curve Numbers

Factors such as interception, depression storage, and infiltration rate affect how much rainfall runs off the land. The HEC-1 models used the SCS Runoff Curve Number approach to estimating losses due to these factors. Runoff curve numbers are selected based upon soils classifications (what “Hydrologic soils group” the soil is in), antecedent moisture conditions, and land use type. Runoff curve numbers were revised for each sub basin.

Lag Time

Lag time is the time from the center of mass of rainfall to the peak of the hydrograph. Parameters used in estimating lag time include length and slope of channel, and two coefficients related to the mapped impervious area and the type of collection system.

Information on the calculation of the lag time in the original models was not available, and lag times were not revised.

Rainfall Distributions

With development of the Clean Streams Plan the use of two long-duration (72-hour) synthetic design storms developed for CleanWater Services were reviewed for use in Lake Oswego. One design storm contains greater precipitation intensities for short periods during the storm. This storm is recommended for projects where peak discharge is the primary concern and runoff volume is a secondary concern (such as flow-rate based water quality facilities). Design Storm 2 is a “back-loaded” storm with lesser precipitation intensities but with a greater total precipitation volume. This storm should be used for projects where runoff volume is the primary concern, such as detention ponds or volume-based water quality facilities.

Scenarios were created in HEC HMS that use each of the design storms with the 10-, 25-, and 100-year return frequencies.

Model Results

Results for each basin with a HEC HMS model that discharges into Oswego Lake is shown in the following table for the 10-year, 25-year, and 100-year storm events. Boones Ferry Road was not modeled using HEC HMS, but the 25-year results were obtained from an XP SWMM model prepared for that basin. A map labeling the discharge point for each location is attached.

Basin	Drainage Area (acres)	100-year (cfs)	25-year (cfs)	10-year (cfs)
Blue Heron Canal	143	80	64	53
Blue Heron Creek	178	110	88	73
Boones Ferry Road			76	
Country Club	127	33.7	26	21.7
Fernwood	89	50	42	35
Lilly Pond	35	14	11	9
Lost Dog	535	217	161	132
Oswego Canal	565	263	203	164
Palisade Heights	90	51	40	33
Reese Road	118	51	43	35
Springbrook Creek	1214	517	406	332