

Sewerage Authority	Design Storm Used for SSO Improvements (rainfall event or other basis as noted)	Notes
City of Mobile, Alabama (population ~300,000)	Consent decree contains detailed rain event data that can be used for a Force Majeure defense, but it is not used as a basis of design for wet weather improvements. Mobile is currently renegotiating the rainfall events. ¹	To date, the city has no guidance or committed acceptance on design storm events used for planning wet weather improvements.
Montgomery Water Works and Sanitary Sewer Board, Montgomery, Alabama (population ~225,000)	1-year, 24-hour storm ²	
Encina Wastewater Authority, Carlsbad, California (service population ~250,000)	10-year event ³	
Vallejo Sanitation and Flood Control District, Vallejo, California (service population ~120,000)	5-year flow event ⁴	
City and County of Honolulu, Hawaii (population ~900,000)	2-year storm (~5-year flow recurrence) "force majeure" flow consideration ^{5,6}	Cost-benefit analysis was performed to identify the appropriate design storm. Primary water quality issue was pathogens since water contact sports occur year round and are a major tourist attraction.
City of Baltimore, Maryland	20-year, 24-hour storm event ⁷	City is required to determine predicted peaks for 3-month storm having duration equal to time of concentration of the sewershed, the 20-year, 24-hour storm and five intermediate storm events, one of which will be the 10-year, 24 hour event.
Charlotte-Mecklenburg Utilities, Charlotte, North Carolina	Used a 5-year 24-hour design storm for a basin plan ⁸ A storage facility designed for 2 year event ⁹	In near term – system will contain a 10-year event. Also considering a 10-year event design criteria in future.
City of Salem, Oregon (population ~143,000)	5-year, 24-hour in winter and 10-year recurrence in summer ¹⁰	Order with ODEQ.
Allegheny County Sanitary Sewer District (ALCOSAN), Pennsylvania	Use gal/cap/day concept Intent to eliminate SSOs with storage ¹¹	Peak flow used = 700 gal/cap/day Design standard for peak sewer capacity = 250 gal/cap/day Service area water consumption= 92 gal/cap/day

Sewerage Authority	Design Storm Used for SSO Improvements (rainfall event or other basis as noted)	Notes
Knoxville, Tennessee (population ~174,000)	2-year, 24-hour ¹²	One-hour peak flows.
City of Houston, Texas	5-year, 6-hour ¹³	
King County, Washington	20-year ¹⁴	Phased approach with lower frequency level.
LOTT Alliance, Olympia, Washington	10-year flow event ¹⁵	Sizing for collection system alternatives.

LOTT Alliance = Wastewater district for cities of Lacey, Olympia, and Tumwater and Thurston County

Sources:

- 1) City of Mobile, Alabama Consent Decree filed on January 24, 2002, in the matter of United States of America, the State of Alabama, and Mobile Bay Watch, Inc. v. the Board of Water and Sewer Commissioners of the City of Mobile, Alabama, U.S. District Court for the Southern District of Alabama, Southern Division, Civil Action No. 02-0058-CB-5 [Internet] notice available at <http://www.epa.gov/compliance/resources/decrees/civil/cwa/mobile-cd.pdf>
- 2) Holmberg, D., Rowe, R., Agbodo, M., O'Leary, "How to Establish Peak Flows in a Collection System Using a Watershed Planning and Permitting Approach," presented at the WEFTEC 2001 Conference, Atlanta, GA (October 2001, Water Environment Federation)
- 3) Hogan, M., Bushee, P., Giguere, P., "Wet Weather Flow Modeling and Risk Analysis Facilitate Development of EWA's Cost-Effective Peak Flow Management Plan," presented at the WEFTEC 2000 Conference, Anaheim, CA (October 2000, Water Environment Federation)
- 4) Dent, S., Ohlemutz, R., Wright, L., Sathyanarayan, P., "How Effective is Collection System Rehabilitation?" presented at the WEF Collection Systems Conference 2004: Innovative Approaches to Collection Systems Management (2004, Water Environment Federation)
- 5) City and County of Honolulu, Hawaii Consent Decree filed October 13, 1994 in the matter of United States and State of Hawaii v. City and County of Honolulu, U.S. District Court for the District of Hawaii, Civil No. 94-00765DAE; [Internet] notice of lodging the decree available at <http://www.epa.gov/fedrgstr/EPA-GENERAL/1994/October/Day-18/pr-30.html>
- 6) City and County of Honolulu, Hawaii, Sewer Rehabilitation and Infiltration & Inflow Minimization Plan, Force Majeure Report, May 1997, Prepared by Fukunaga and Associates, Inc. p. E-2.
- 7) City of Baltimore, Maryland Consent Decree filed April 26, 2002 in the matter of United States, et al., v. Mayor and City Council of Baltimore, Maryland, United States District Court for the District of Maryland, Civil Action No. 02-1524 JFM, [Internet] available at http://www.ci.baltimore.md.us/government/dpw/images/Consent%20Decree_final.pdf
- 8) Hamid, R., Hannan, P., Czerr, D., "Reduce Flow or Install Bigger Pipes – A Utility Dilemma" presented at the WEF Collection Systems Conference 2004: Innovative Approaches to Collection Systems Management, (2004, Water Environment Federation)
- 9) Carrier, R., Crowley, J., Dubin, A., Howard, T., "Collection System Flow Equalization Saves \$25 Million" presented at the WEF Collection Systems Conference 2004: Innovative Approaches to Collection Systems Management, (2004, Water Environment Federation)
- 10) City of Salem, Oregon, Salem Wastewater Management Master Plan, Prepared by CH2M-Hill, Final Draft (August 1996) p.1-4, [Internet] available at <http://www.cityofsalem.net/export/departments/spubwork/pwengin/publications/masplans/index.htm>
- 11) Allegheny County Sanitary Sewer District (ALCOSAN), Pennsylvania, Third Party Review of the Regional Long Term Wet Weather Control Concept Plan, [Internet] available at http://www.alcosan.org/Directory/third_party.htm
- 12) Knoxville Utility Board, Knoxville, Kentucky Consent Decree filed November 5, 2004 in the matter of U.S. Environmental Protection Agency, Tennessee Department of Environment and Conservation, the Tennessee Clean Water Network v. the City of Knoxville, U.S. District Court for the Eastern District of Tennessee, Civil Action No. 3:03-CV-497, [Internet] decree available at http://www.tcwn.org/pdf/Consent_Decree.pdf further information available at http://www1.kub.org/newsite/epa_docrep.shtml
- 13) City of Houston, Texas, NPDES Permit No. TX0105058: City of Houston, Sims Bayou South Wastewater Treatment Plant (December 28, 1994, USEPA District 6)
- 14) King County, Wastewater Treatment Division, Conveyance System Improvement Program, Technical Memorandum, Regional Conveyance System Needs, December 20, 2005, p. 1-6. [Internet] available from <http://dnr.metrokc.gov/wtd/csi/csi-docs/RegionalConveySysNeeds/index.htm>
- 15) Merrill, M., David, M., Lukas, A., Topolski, B., "Determination of the Impact of Rehabilitation of Different Components of the Sewer System on I/I Reduction," WEF Specialty Conference 2000: Collection Systems Wet Weather Pollution Control, May 2000, Rochester, New York, Water Environment Federation



Likelihood of Rainfall Depths for Different Timeframes

Table 1
NOAA Atlas 14 Rainfall Depths - Southeast Michigan

Average recurrence interval (years) - rainfall depths in INCHES

<i>Duration</i>	1	2	5	10	25	50	100
5 minute	0.31	0.36	0.46	0.54	0.65	0.74	0.83
10 minute	0.45	0.53	0.67	0.79	0.95	1.08	1.21
15 minute	0.55	0.65	0.82	0.96	1.16	1.32	1.48
30 minute	0.75	0.89	1.12	1.32	1.60	1.82	2.05
1 hour	0.96	1.14	1.44	1.70	2.07	2.37	2.67
2 hour	1.16	1.39	1.76	2.08	2.54	2.91	3.29
3 hour	1.29	1.53	1.95	2.31	2.83	3.24	3.68
6 hour	1.53	1.79	2.25	2.65	3.25	3.73	4.24
12 hour	1.80	2.06	2.53	2.95	3.58	4.11	4.68
24 hour	2.08	2.36	2.86	3.31	4.00	4.57	5.18

