Detroit Water and Sewerage Department

Wastewater Master Plan

DWSD Project No. CS-1314

Dewatering of Stored Wet Weather Flows

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Dewatering of Stored Wet Weather Flows

1. Introduction

For the Detroit Water and Sewerage Department's (DWSD) Wastewater Master Plan (CS-1314), capacity to dewater in-system storage, combined sewer overflow (CSO) control basin stored volume, sanitary sewer overflow (SSO) control basin stored volume, and equalization basin stored volume was evaluated. The planned and existing storage volume was estimated to be approximately 881 million gallons (MG) at the time of this analysis. The most recent estimate for planned storage is 950 MG. A breakdown of this storage is provided in Table 1. Dewatering protocol has not yet been established; various strategies are being evaluated by the WWTP Improvement / Regional Operation Plan Work Group under the Long Term CSO Control Plan project.

2. Analyses/Conclusions

These analyses are based on approximately 5 years of historical wastewater treatment plant flow data. Results for various dewatering protocol are presented for discussion. Figure 1 presents a straightforward relationship between dewatering duration and stored volume for various dewatering rates. Three dewatering rates were reviewed: 125 MGD, 250 MGD, and 500 MGD. Given a desired dewatering rate, Figure 2 can be used to assess the "likelihood" of being able to dewater at this rate with some specified limit on WWTP flows. This "likelihood" is a simplified evaluation of available WWTP flow data with accounting of three dewatering rate scenarios. "Likelihood" is the percentage of all data for which flows are less than or equal to a specified WWTP rate, given a specified dewatering rate. A more rigorous approach would be to evaluate period durations where sufficient capacity exists. Despite this limitation, this approach yields a relative indication of which dewatering protocol scenarios are viable.

Figures 3 and 4 provide hypothetical scenarios for dewatering. Figures 3 and 4 are based on the 90% "likelihood" and 65% "likelihood" of available capacity. These scenarios are:

1) Dewater stored volume within the 930 MGD secondary capacity recycle.

2) Dewater stored volume within the 1,700 MGD planned primary capacity for 12 hours, followed by a 930 MGD secondary capacity rate.

3) Dewater stored volume within the 1,700 MGD planned primary capacity for 24 hours, followed by a 930 MGD secondary capacity rate.

4) Dewater stored volume within the 1,700 MGD planned primary capacity.

For example, if a higher degree of certainty in available dewatering is required for the 881 MG within a 48-72 hour period is desired, Figure 3 indicates that Options 2 or 3 (above) would be viable alternatives.

Some other conclusions drawn from this analysis are as follows:

- 930 MGD is not currently achieved for 90% of time during the 5 years of data considered.
- Dewatering 881 MG of stored wastewater within a 48 to 72 hour period, with secondary treatment, is not a viable alternative given the existing 930-MGD secondary capacity and current flows. Since the planned storage has subsequently increased to 950 MG, the
- A continuous simulation is required to evaluate impact of actual sequence of wet weather events on duration and rate of dewatering that would be available.
- Since the planned storage has subsequently increased to 950 MG, the dewatering flow rates would have to increase to dewater stored flows within a 48 to 72 hour period.

Table 1. Planned Storage within the DWSD System

Facility Type	District	Facility	Storage*
CSO Basins	Detroit	Belle Isle	0.3
		Conner Creek	62.1
		Hubbell-Southfield	22
		Oakwood	7.4
		Puritan-Fenkell	10.5
		Seven Mile	5
	Evergreen-Farmington	Acacia	4.5
		Birmingham	9.5
		Bloomfield Village	10.2
	SE Oakland	Twelve Towns (GWK)	95
	NHV/RV	Dearborn Heights	2.1
		Inkster	3.1
		Redford	1.9
		Milk River	24
		Chapaton	36
		Martin	11.6
Screening and Disinfection	Detroit	Baby Creek	30.4
		St. Aubin	2.4
		Leib	9.9
Tunnel	Detroit	Upper Rouge	120
	West Dearborn	West Dearborn	60

	District	Facility	Storage*
In-System Storage	Detroit	Conner Influent Gates	40.4
		Hubbell-Southfield (HUB1)	17.6
		Wyoming Relief (ISD002)	6.1
		Wetherby (ISD003)	3.2
		Upper Livernois Relief (ISD004)	2.4
		Joy (ISD005)	3.6
		Clark Summit (ISD006)	4
		First Hamilton (ISD007)	8.1
		First Hamilton (ISD008)	4.4
		First Hamilton (ISD009)	4
		First Hamilton (ISD010)	4.3
		First Hamilton (ISD011)	1.4
		Conant Mt. Elliot (ISD012)	9
		Six Mile Rd (ISD013)	2.3
		Seven Mile Rd. (ISD014)	3.6
EQ Basins	Farmington	Farmington	8.2
	Evergreen-Farmington	Kendallwood	2.3
		Lathrup	3.5
	NHV/RV	City of Wayne	2.3
		Livonia	2.2
		Middle Rouge	7.8
		Lower Rouge	5.5
Uncontrollable Storage	Detroit	Total	216.3
	Oakland County	Total	33
	GP Park	Total	3.2
	Dearborn	Total	25.7
Total Storage	Entire System		952.3

* The storage volume includes the storage available in the influent systems for the storage devices.

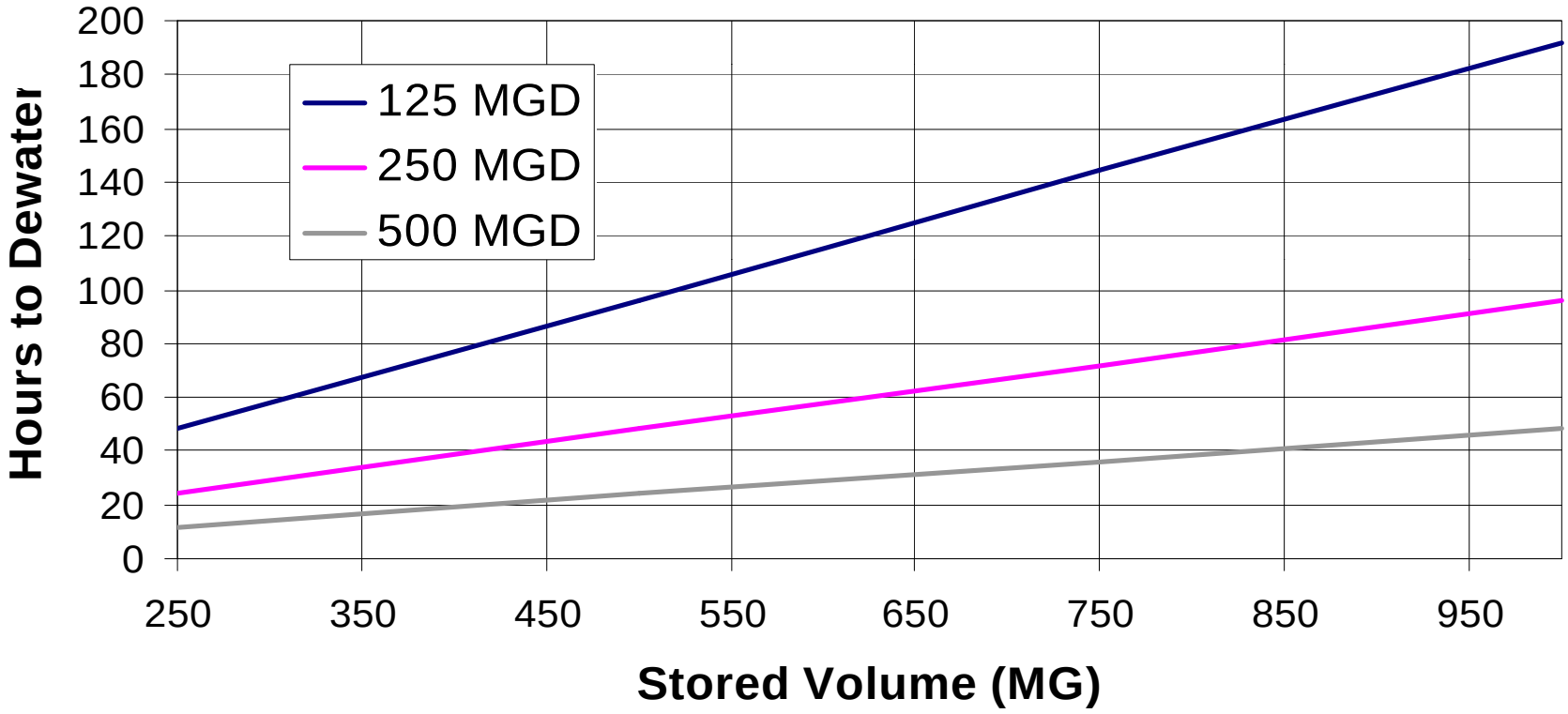

Figure 1. Hours to Dewater for Various Storage Volumes and Dewatering Rates

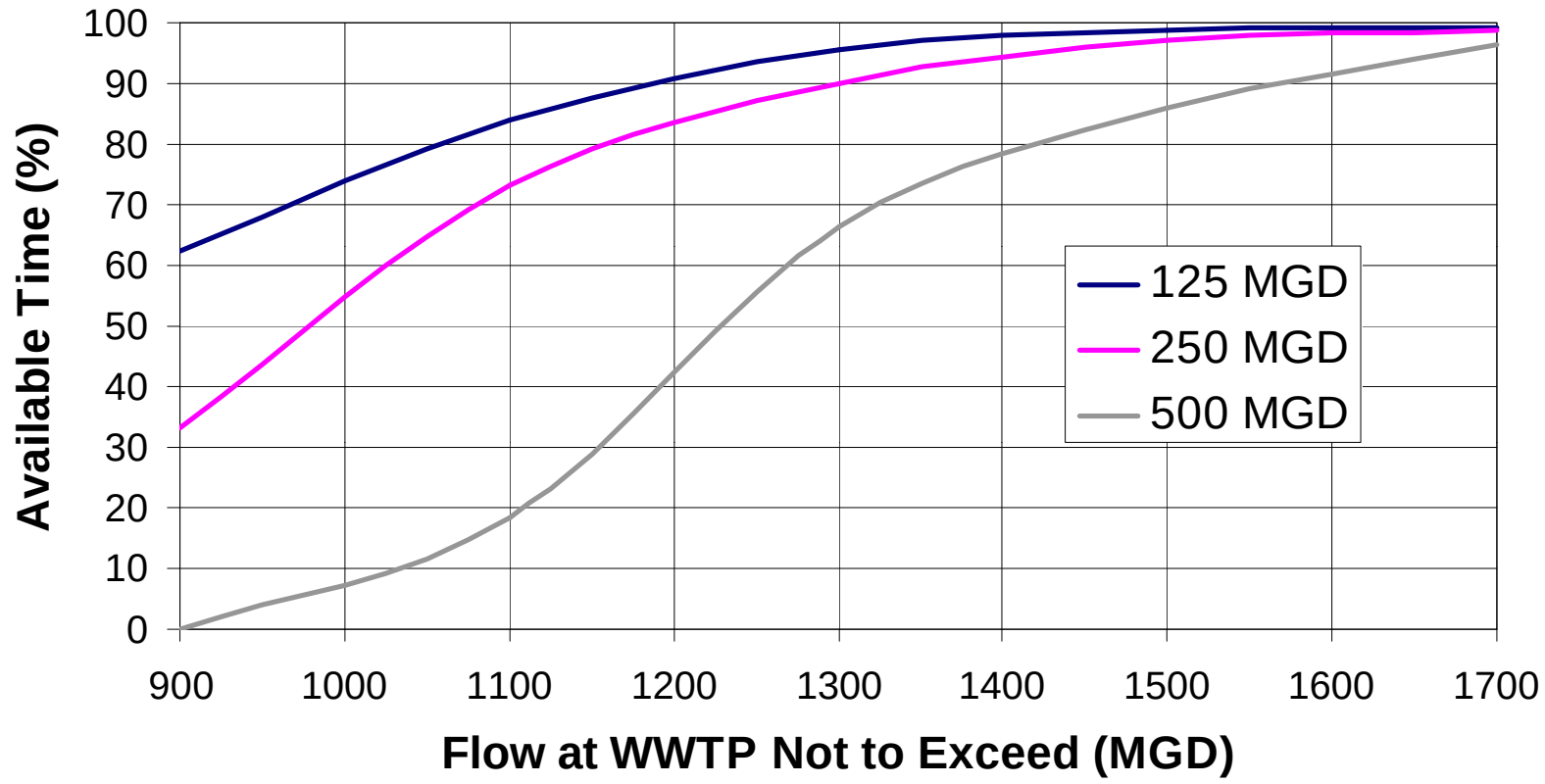

Figure 2. Time Available to Dewater at a Specific Rate given some limit in Pumped Flow at Plan

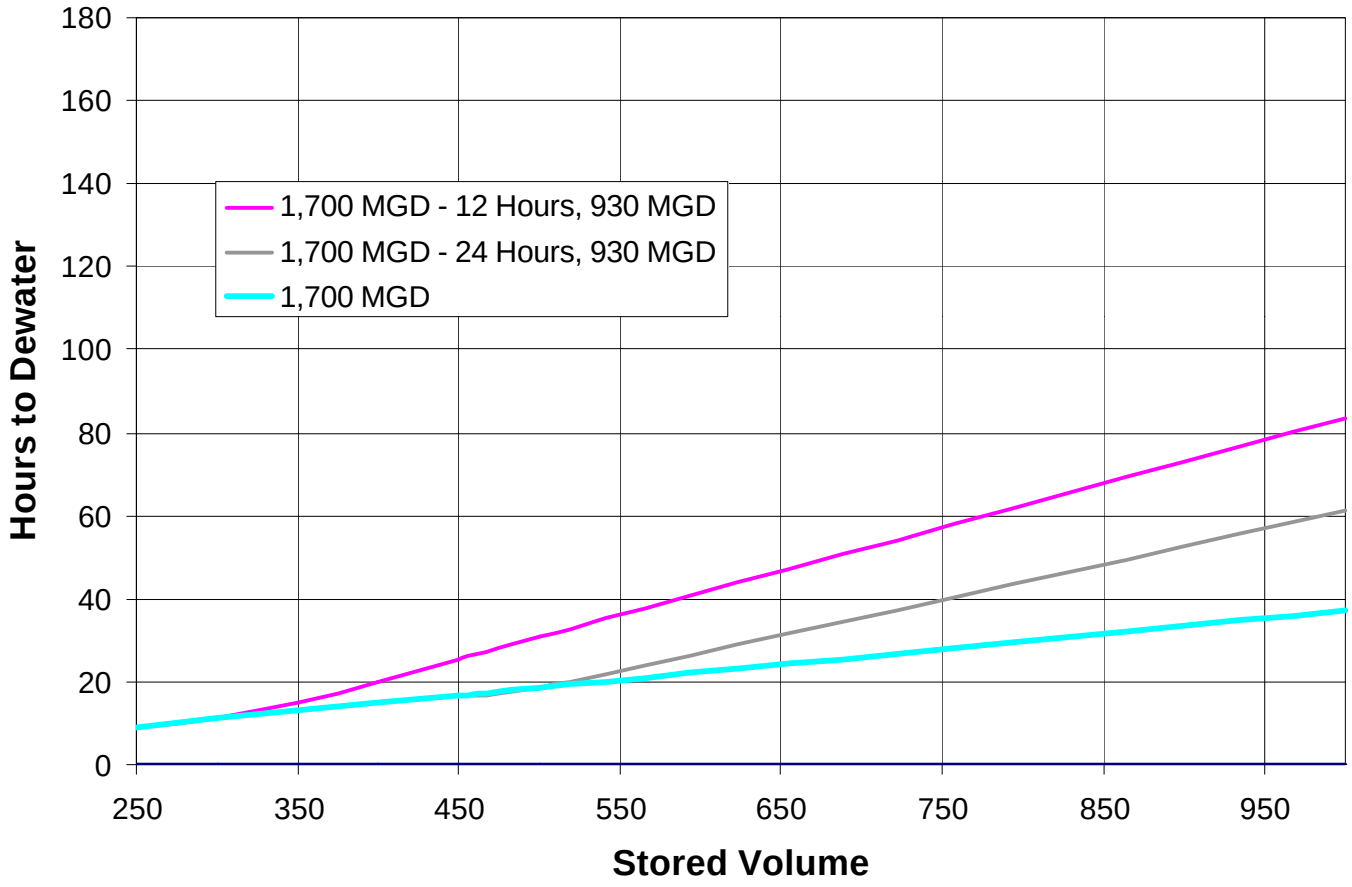

Figure 3. Hours to Dewater for Various Storage Volumes and Plant Flow Management Options (90% of Time w/ Available Capacity)

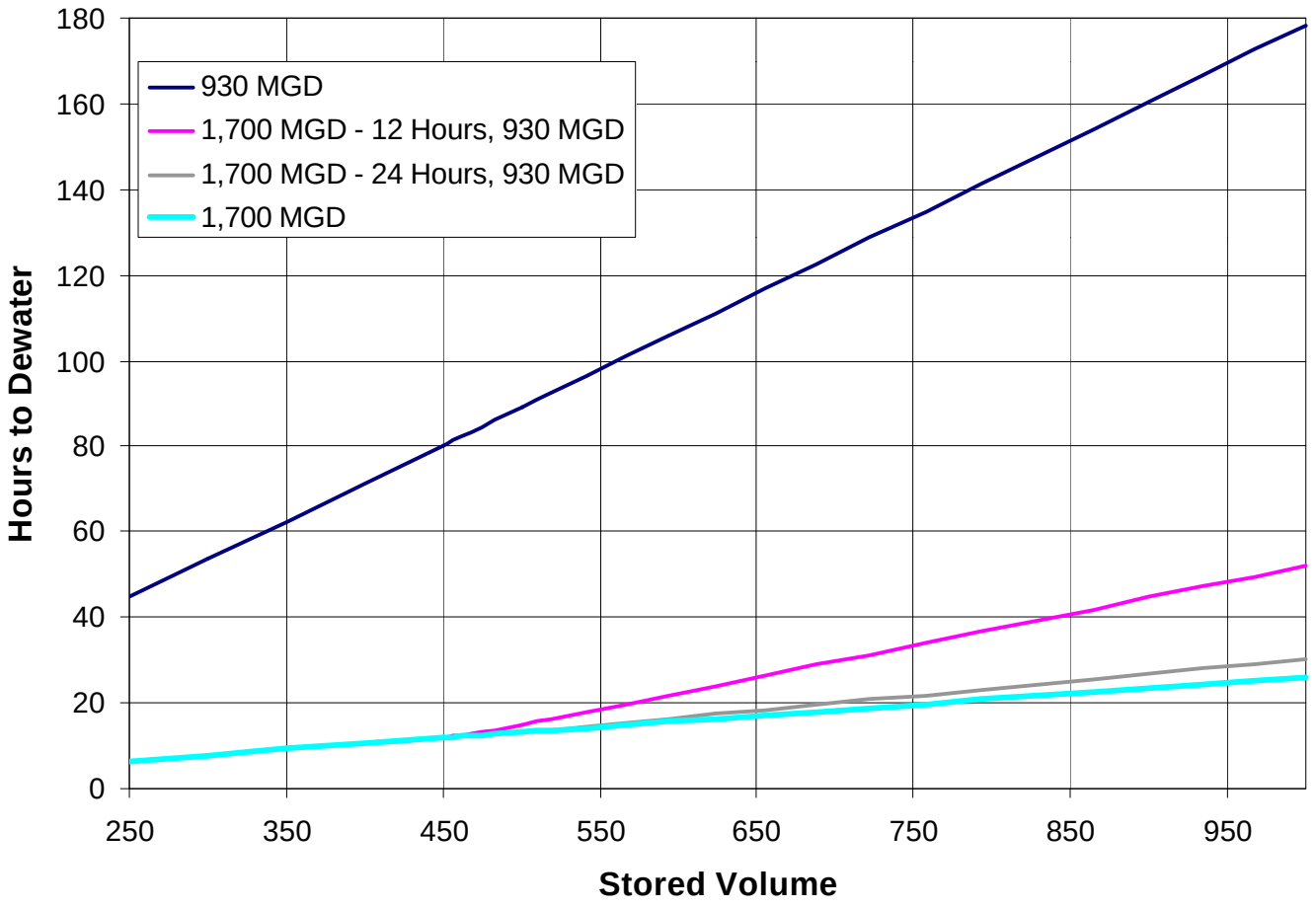

Figure 4. Hours to Dewater for Various Storage Volumes and Plant Flow Management Options (65% of Time w/ Available Capacity)