

SECTION 3 - FLOW PROJECTIONS

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3.1 INTRODUCTION

In order to evaluate the District's existing sewer system and plan for future improvements, it is necessary to estimate the loading, or flows, which the system will be required to carry. Two separate types of flow projections are included in this section: collection system flows and treatment plant flows, each of which are discussed further in this Section. Generally, collection system flows are simple calculations of flows from each of the District's primary drainage basins, based on per capita domestic flows and an assumed infiltration and inflow (I & I) rate. They are presented for the purpose of identifying average and peak flow rates in a basin and provide the basis for preliminary design and local facility sizing. Treatment plant flows are more sophisticated calculations based on diurnal curves throughout the system and are intended to represent the worse case scenario of flows which may reach the treatment plant at a given point in time. These flows are intended to provide the basis for treatment plant and/or regional facility sizing.

All of the flows presented include consideration of both domestic, or base flows, as well as estimated flows resulting from I & I into the system. The flows have been calculated using estimated flow per capita and the projected changes in population and employment outlined in Section 2. Per capita flow data was determined using industry standards for various customer classes and land uses and calibrated to actual water use and flows within the District using historical water use data obtained from water service providers within the District and Midway's treatment plant flow records. As discussed later in this section, consideration was made for the volume of flow expected from various types of users, and higher per capita discharge rates were assigned to the appropriate system connections. The estimated infiltration and inflow has been considered separately and estimated in gallons per acre per day. I & I estimates for collection system flows and treatment plant flows have been calculated differently, as discussed later in this Section. Section 6 provides a discussion on how these projections were used in the system modeling and analysis.

Flow projections associated with Midway Sewer District receiving flows from Sea-Tac Airport, Val Vue Sewer District and Lakehaven Utility District have been obtained

directly from the recent planning documents related to these facilities. Potential flows from Normandy Park have not been specifically addressed in this Plan because no formal proposal or request has been received from the City and flows from the area would not likely have a big impact on the system. Changes in flows and/or land use related to the proposed realignment of State Route 509 have not been specifically addressed in these flow projections but the potential impact that the realignment may have on the timing and nature of proposed projects is addressed in Section 6.

3.2 COLLECTION SYSTEM FLOWS

Using the population and employment forecasts presented Section 3, flow projections comprised of domestic, commercial, specific high users and specific development or redevelopment projects were developed. Table 3-1 presents the flows per capita by population type used in the modeling and flow projections for the system. These estimated average flows were derived from a combination of sources, including actual District flow data, historical water use data, the King County Regional Wastewater Services Plan, Department of Ecology Standards, the Uniform Plumbing Code and engineering experience.

**Table 3-1
Midway Sewer District
Estimated Sewer Flows by Population Type**

| Population Type | Average Daily Flow |
|----------------------|--------------------------|
| Residential | 75 gallons/capita/day |
| Office/Retail | 35 gallons/employee/day |
| Commercial High User | 165 gallons/employee/day |

Note:

Source: State Department of Ecology and District Records (See Appendix A-1).
Average flow rates do not include infiltration and inflow.

The averages listed in Table 3-1 were confirmed with actual District data from 1994 through 1998. Infiltration and inflow is not included in the average flow rates shown in Table 3-1 because it can vary significantly throughout a system and therefore is addressed as a separate flow component, as discussed later in this Section. Potential reductions in water use due to conservation efforts have not been included in these sanitary sewer flow estimates, making these estimates conservative in nature.

Table 3-2 presents estimated existing and projected flows for the District's sewer service area by major drainage basin (and contributing flows from others). These estimates are based on projected population and employment figures presented in Section 2 and average flow rates identified in Table 3-1, with the exception of flow received from Sea-Tac International Airport, Val Vue Sewer District and Lakehaven Utility District. These flows were obtained directly from planning data provided by those agencies. The Pacific Ridge redevelopment project proposed in the City of Des Moines is listed separately and flow projections for this area are based on population and employment estimates supplied by the City of Des Moines.

Four separate flow projections are presented in Table 3-1 and are further explained below:

- Base Flows - Base flows are a simple calculation of average flow rates without consideration of infiltration or inflow. Base flows have been determined by applying average flows per capita (as indicated in Table 3-1) to the population and employment data presented in Section 2.
- Peak Flows are used to estimate domestic flows at peak periods (typically early morning and evenings) and do not take infiltration and inflow into account. A peaking factor 2.0 has been applied to base flows to estimate the peak flows indicated in Table 3-2 (Base Flow x 2.0 = Peak Base Flow).
- Infiltration and Inflow is calculated at an average District-wide rate of 1,200 gpad, without consideration of how infiltration and inflow might be distributed amongst specific problem areas. Please note that additional consideration of high infiltration and inflow areas is provided in Section 6. The average infiltration and inflow rate was determined by comparing average wet weather and average dry weather flows.
- Peak Flows plus infiltration and inflow have been determined by adding the aforementioned I & I rate of 1,200 gpad to the peak base flows. No peaking of I & I has been assumed.

These projections have been developed assuming that no changes will occur to the direction of flow or its ultimate destination for treatment and disposal. The projections included in Table 3-2 also assume an expansion of the service area to include currently unsewered areas within the District's corporate boundary. As discussed in Section 2, the King County Growth Management Act requires planning for service to all areas of the District's corporate boundary and therefore, the projections include the entire area.

Table 3-2
Midway Sewer District
Existing and Projected Sewer Flows

| Drainage Basin | Estimated Base Flow (mgd) | | | | Peak Base Flow (mgd) | | | | Infiltration & Inflow (mgd) | | | | Peak Flow Plus Infiltration & Inflow (mgd) | | | | | | | | |
|------------------------------|---------------------------|------|------|------|----------------------|------|------|------|-----------------------------|-------|------|------|--|------|------|-------|-------|-------|-------|-------|------|
| | 1998 | 2000 | 2006 | 2010 | 2020 | 1998 | 2000 | 2006 | 2010 | 2020 | 1998 | 2000 | 2006 | 2010 | 2020 | 1998 | 2000 | 2006 | 2010 | 2020 | |
| Des Moines Creek | 1.70 | 1.79 | 1.82 | 1.87 | 2.17 | 3.41 | 3.57 | 3.63 | 3.73 | 4.35 | 3.33 | 3.33 | 3.33 | 3.33 | 3.33 | 6.74 | 7.07 | 7.13 | 7.23 | 7.85 | |
| Midway | 1.15 | 1.19 | 1.20 | 1.22 | 1.27 | 2.31 | 2.38 | 2.41 | 2.44 | 2.55 | 1.90 | 1.90 | 1.90 | 1.90 | 1.90 | 4.21 | 4.33 | 4.36 | 4.39 | 4.50 | |
| McSorley Creek | 1.03 | 1.07 | 1.09 | 1.11 | 1.18 | 2.06 | 2.15 | 2.17 | 2.21 | 2.35 | 2.06 | 2.06 | 2.06 | 2.06 | 2.06 | 4.12 | 4.32 | 4.34 | 4.38 | 4.53 | |
| Sea-Tac Airport ¹ | 0.24 | 0.33 | 0.40 | 0.64 | 0.64 | - | - | - | - | - | - | - | - | - | - | 2.30 | 2.40 | 2.50 | 2.70 | 2.70 | |
| Val Vue ² | 0.09 | 0.10 | 0.11 | 0.12 | 0.16 | 0.23 | 0.24 | 0.28 | 0.31 | 0.39 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.38 | 0.39 | 0.43 | 0.46 | 0.54 | |
| Lakehaven ² | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | |
| Pacific | - | - | - | - | 1.01 | - | - | - | - | 2.02 | - | - | - | - | - | - | - | - | - | - | 2.02 |
| Total | 4.31 | 4.58 | 4.72 | 5.06 | 6.53 | 8.31 | 8.64 | 8.79 | 8.99 | 11.96 | 7.64 | 7.64 | 7.64 | 7.64 | 7.64 | 18.25 | 19.01 | 19.26 | 19.66 | 22.64 | |

Notes:

- 1 Projected flows for Sea-Tac from the Draft Sewer System Master Plan for Seattle Tacoma International Airport. All Airport flows include I & I.
- 2 Vue Sewer District flows and Lakehaven Utility District flows obtained from respective District Comprehensive Plans.
- 3 Infiltration and Inflow for Pacific Ridge is included in the calculation for the Midway Basin.

3.3 TREATMENT PLANT FLOWS

The average wet weather and projected peak flows for the Des Moines Creek Wastewater Treatment Plant are presented below in Table 3-3. These flow projections differ from the collection system flows presented in Table 3-2 in that they more accurately represent flows at the treatment plant and provide the basis for unit capacity sizing of treatment plant components and equipment. The average wet weather flows dictate a specific set of criteria used for treatment facility sizing while historical flow records indicate that Midway Sewer District experiences average wet weather flows approximately 1.5 times the base (or dry weather) flow.

The instantaneous flow rates represent the peak flows which might enter the plant at a given point in time. It is critical that capacity for these peak flows be accommodated to avoid overloading the plant but recognized that these flows would not be sustained over a great length of time. Although the instantaneous peak flows presented in Table 3-3 are also based on the growth projections presented in Section 2 and the average flow rates shown in Table 3-1, they were generated by the *Hydragraphics* computer model created for the system and represent a more sophisticated means of calculating both I & I and peak flows. I & I is calculated according to the District wide average of 1,200 gpad but also includes a worse case, instantaneous peak I & I of 2,200 gpad. Additional considerations were made in the modeling process to account for particularly high areas of I & I, and for reduction of I & I in the future. Section 6 provides considerably more detail on how this was accomplished in the computer modeling effort. Peak flows presented in Table 3-3 are calculated based on typical diurnal curves rather than peaking factors. This provides a more accurate view of the magnitude of peak flows and is considered a worse case scenario which assumes a major storm event during a high flow period.

Industrial waste flows from the Port are not included in Table 3-3 and are not treated by Midway. This flow bypasses the treatment plant and enters the Midway system at the treatment plant effluent. Instead, this flow is treated by the Port of Seattle Industrial Waste System (IWS) and the effluent flow travels through a dedicated IWS line to the District's outfall at the effluent side of the Des Moines Creek Treatment Plant. Please note that although the Port may contribute more flows currently, the interlocal agreement between Midway and the Port limits their contribution to the outfall line to a maximum of 3.6 million gallons per day at the point in time where flows in the outfall line reach 90%.

**Table 3-3
Midway Sewer District
Existing and Projected Treatment Plant Flows (MGD)**

| Year | Average Wet Weather Flow | Instantaneous Peak Flow |
|-------------|---------------------------------|--------------------------------|
| 2000 | 6.87 | 18.48 |
| 2006 | 7.08 | 19.67 |
| 2020 | 8.28 | 20.50 |
| 2020P | 9.80 | 26.74 |

Notes:

Detailed information on the treatment plant flows can be found in Sections 6, 7 and 8 of the Plan.
2020P indicates modeled conditions with the proposed Pacific Ridge development.
Additional flow of 3.6 MGD (maximum) from the Port of Seattle IWS system is not included in Table 3-3.
This flow is treated by the Port of Seattle and enters directly into the District's effluent outfall.
