Chapter 1

Executive Summary

The purpose of this Regional Needs Assessment (RNA) is to identify conveyance system improvement (CSI) projects and costs in order to provide a baseline for conducting benefit/cost analyses of potential Infiltration and Inflow (I/I) reduction projects. Flow monitoring and modeling data and assumptions specifically developed for the I/I Control Program were used to project CSI project needs to allow for an accurate comparison of benefits and costs between CSI projects and I/I reduction projects. As a result, the complete list of CSI projects reported here differs from what is included in the Regional Wastewater Services Plan (RWSP), as updated in 2004. The major difference is that CSI projects identified in this RNA are projected through 2050 rather than 2030 - the planning horizon for the RWSP. Additionally, the more recent and comprehensive flow metering and modeling data used differs from that used during the update of the RWSP. This resulted in some modification of CSI projects expected to be needed by 2030. While some differences exist between the CSI projects identified in this RNA and those in the RWSP, this latest list of needs should not be viewed as a departure from recommendations contained in the RWSP. Rather it should be viewed as providing a baseline for conducting benefit/cost analyses of potential I/I reduction projects using assumptions and data developed specifically for the I/I Control Program.

1.1 Regional Wastewater System

King County's regional wastewater system serves approximately 1.4 million residents within a 420-square-mile service area encompassing portions of King, Snohomish, and Pierce Counties. It is a large, integrated wastewater collection, conveyance, and treatment system operated by the King County and thirty-four cities and sewer agencies. These cities and sewer agencies (collectively known as local agencies) provide direct sewer collection service to residences and businesses. King County owns and operates regional facilities necessary for *wastewater treatment* including treatment plants, major conveyance pipes, regulators, and pump stations. Local Agencies own and operate the facilities necessary for *collecting wastewater* from residences and businesses. Their facilities include collector sewers, laterals, side sewers, and some pump stations.

The system of pipes that collects and conveys wastewater was constructed over many decades. Older pipes, located in most parts of Seattle, are a combined sewer system that collects a combination of stormwater and sanitary sewage. The rest of the region, including some portions of north Seattle, is served by a separated sewer system. Separated systems have separate collection and conveyance pipes for wastewater and storm water. Separated wastewater systems dedicate their capacity to convey and treat wastewater. Stormwater is not supposed to enter the separated wastewater system.

The components that make up the regional wastewater system are:

- 3 secondary treatment facilities (including the Vashon Treatment Plant)
- 335 miles of regional conveyance pipes
- 42 pump stations
- 19 regulator stations
- 2 combined sewer overflow (CSO) treatment plants
- 38 permitted CSO locations.
- 5,100 miles of collection pipes and numerous pump and regulator stations (owned by the local agencies)

System Components Defined

Treatment Plants provide primary and secondary treatment of wastewater before discharging the treat effluent to Puget Sound.

Conveyance Pipes carry wastewater to the treatment plants.

Pump Stations house pumps and other equipment that lift wastewater in pipes to higher elevations so that they can continue to flow by gravity.

Regulator Stations control the flow of wastewater from two or more input pipes to the collection system.

CSO Treatment Plants operate during periods of peak flow following large storm events. They provide primary treatment and disinfection to wastewater diluted by stormwater prior to discharge to Puget Sound.

CSO Control Structures store excess wastewater diluted by stormwater to prevent overflows into surface waters.

1.2 What Drives Capacity Demand

The two factors that drive the need to expand capacity in the conveyance system are regional population growth, and I/I flows within the system.

Growth in sanitary sewerage from residences and businesses, or "base flow," volume over time is driven by changes in population and employment in the service area, septic conversions to sewers, and changes in water use levels through conservation efforts. Based on these factors, base flow in the regional service area is projected to grow from approximately 75-million gallons-per-day (MGD) to over 120 MGD by 2050. Figure 1-1 illustrates the projected growth rate in base flow for the region. Note that the projected growth in base flow through 2010 is relatively flat. This is due to the expected immediate positive influence of water conservation efforts that are currently under way. Projected growth after 2010 assumes that the affects of water conservation will remain constant.

Of the growth factors described above, growth in residential sewered population (from either new development or septic conversions) has the biggest effect on growth in base flow.

I/I is clean stormwater runoff and ground water that enters wastewater collection pipes during periods of rain. Most inflow comes from stormwater; most infiltration comes from groundwater.

I/I significantly affects the capacity of the region's wastewater conveyance and treatment system because it is the largest contributor to wastewater volumes that must be conveyed and treated in the wet season. About 75-percent of the region's peak flows in the separated conveyance system comes from I/I[1]. Figure 1-2 contains a hydrograph that shows how I/I affects regional wastewater volumes that must be conveyed and treated. As can be seen, flow volumes can quadruple during rain events when the conveyance system must handle base flow plus I/I (the blue line in Figure 1-2).

[1] Regional Wastewater Services Plan, Executive's Preferred Plan; April 1998, page 14.

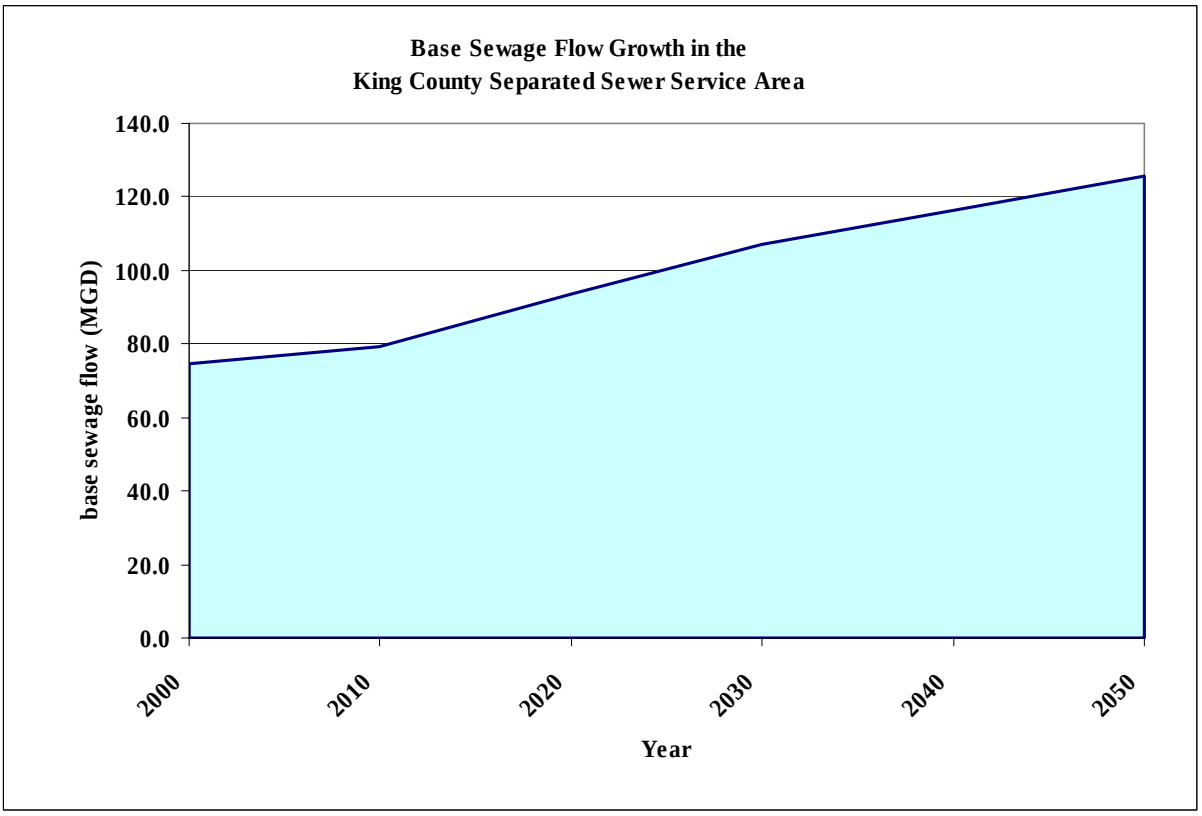

Figure 1-1. Projected Growth in Base Flow

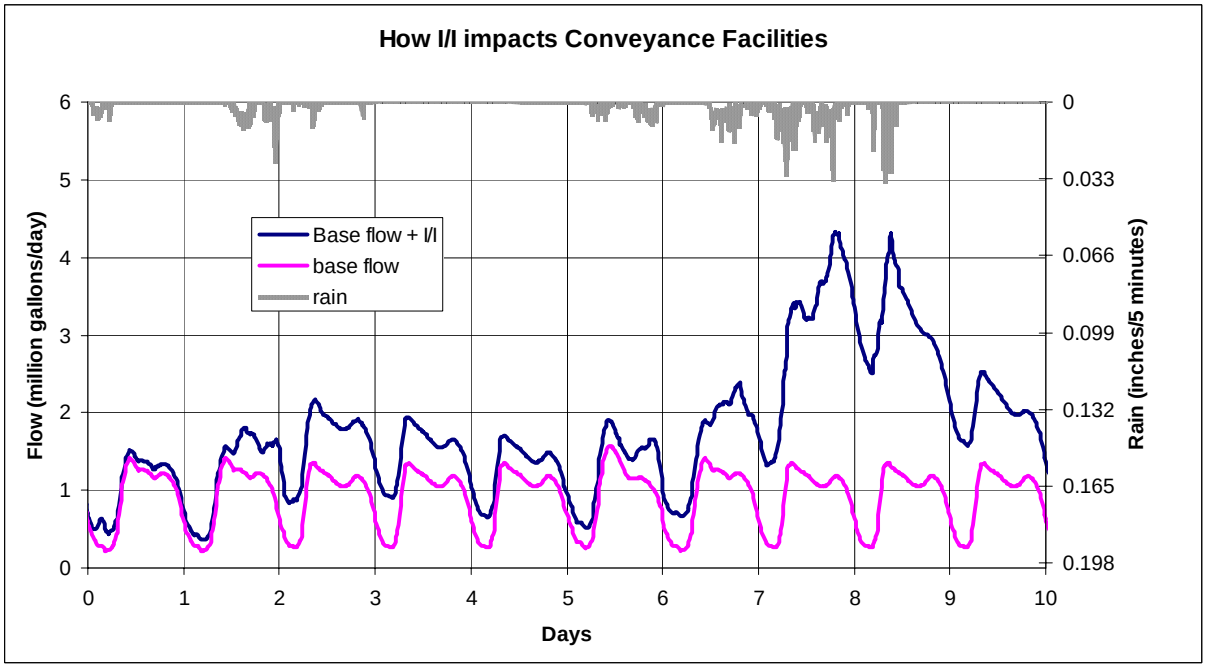

Figure 1-2. Impacts of I/I on Wastewater Flows

1.3 Current Conditions

The regional wastewater conveyance system was developed over the last 40-plus years. Most of the system has the necessary capacity to transmit wastewater flows today and in the future. However, some portions of the system are at or near capacity during periods of peak flow[2]. As the region grows over time, these portions of the system and others will not have adequate capacity to transmit peak wastewater flows to treatment plants. The lack of adequate capacity in portions of the system increases the risk of wastewater back-ups and overflows.

1.4 Estimated Capacity Needs

Sixty-three CSI projects have been identified to meet the region's projected capacity needs through 2050. The projects identified are based on the data gathering and modeling efforts completed for the I/I Control Project as described in Chapter 3 of this RNA. These projects and their estimated costs, discussed in Chapter 4, provide the basis for conducting benefit/cost analyses of potential I/I reduction projects. The list of projects and schedule will be refined further in the coming months as the County and local agencies work together to develop a regional I/I control program. Refinements may lead to revisions in the list of projects.

1.5 Approach to Providing Capacity and Reducing Cost

The capacity needed to convey and treat peak flows in the region can be provided by expanding the capacity of the conveyance system, or by trying first to reduce flows thereby reducing the capital investments necessary to upgrade the conveyance system. The region is investigating the feasibility of the latter approach based on policy direction contained in the adopted RWSP. RWSP Policy I/IP-1 states that the County will: "reduce I/I whenever the cost of rehabilitation is less than the cost of conveying and treating the flow or when rehabilitation provides significant environmental benefits to water quantity, water quality, stream flows, wetlands, or habitat for species listed under the Endangered Species Act (ESA)." Since 2000, the County and local agencies have been working to develop an I/I control program to reduce I/I flows, and reduce the cost for providing adequate conveyance capacity for the region's wastewater through 2050.

This RNA provides the baseline for measuring the costs and benefits of implementing I/I reduction projects to reduce flow volume in lieu of making a capital investment in the conveyance system. The County and local agencies will continue to work together to estimate the costs of I/I reduction projects upstream of identified conveyance improvement projects. The costs of conveyance system improvements identified in Table 4-1 above will be compared with the estimated costs of reducing I/I levels. The goal of the benefit/cost analyses is to provide a cost effectiveness comparison on a project specific basis.

[2] Peak Flow is the highest base flow and infiltration/inflow expected to enter a wastewater system during wet-weather that a treatment plant and conveyance facility(ies) is designed to accommodate.

1.6 Next Steps

Some CSI projects identified in Table 4-1 will be designed and built within the next few years because the conveyance capacity these projects will provide is needed within the next three to five years. I/I projects take approximately that much time to design, build, and test to make sure that I/I levels have actually been reduced. Consequently, the I/I program will be focused on CSI projects needed after 2010.

In 2005, flow and benefit/cost analyses will be conducted to determine if I/I reduction projects can cost-effectively reduce or eliminate the need for adding conveyance capacity. A list of cost-effective I/I projects and their associated cost savings will be included in the Executive's proposed I/I Program Recommendation that is due to the County Council by December 31, 2005.