

LAKEHAVEN UTILITY DISTRICT
King County, Washington

Resolution No. 2006-1061

A RESOLUTION of the Board of Commissioners of the Lakehaven Utility District, King County, Washington, adopting Amendment No. 4 to the General Comprehensive Plan for the sewer system and amending Resolution No. 99-888.

WHEREAS, the Board of Commissioners is required, pursuant to R.C.W. 57.16.010, to adopt a general comprehensive sewer plan before ordering any improvements to the sewer system or submitting to vote any proposition for incurring indebtedness for such improvements, and

WHEREAS, the Board has previously so adopted a wastewater system comprehensive plan and subsequent amendments thereto, and

WHEREAS, the staff has developed a further amendment to the wastewater system comprehensive plan to provide for the description of additional sewer basin service requirements, and

WHEREAS, the Board having reviewed the same and believing that the amendment meets the present and future needs of the District and its customers;

NOW, THEREFORE, **BE IT RESOLVED** as follows:

1. The Board of Commissioners hereby adopts "Amendment No. 4 to the Lakehaven Utility District Comprehensive Wastewater System Plan", a true and correct copy of which is attached hereto as Exhibit "A" and incorporated by reference herein.
2. District staff is hereby authorized and directed to submit "Amendment No. 4" to the Lakehaven Utility District Comprehensive Wastewater System Plan" to the appropriate legislative bodies for approval as required by statute.
3. Resolution No. 99-888 is hereby amended in part to conform to the adoption of "Amendment No. 4 to the Lakehaven Utility District Comprehensive Wastewater System Plan" herein.
4. This Resolution shall be effective on the date of adoption set forth below.

ADOPTED by the Board of Commissioners of Lakehaven Utility District, King County,

Washington, at an open public meeting this 9th day of February, 2006.

ATTEST:

Donald L. Mills ✓
President and Commissioner Yea Nay Abstain

Beverly J. Twedde ✓
Vice President and Commissioner Yea Nay Abstain

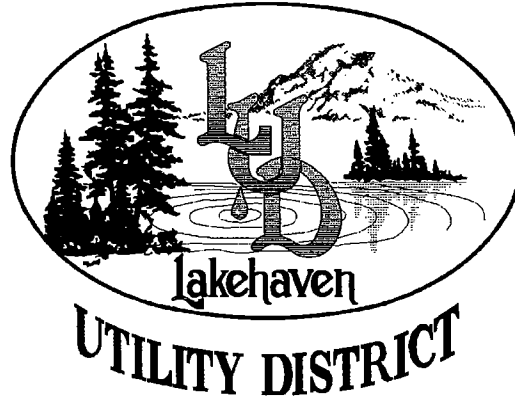
Thomas M. Jovanovich ✓
Secretary and Commissioner Yea Nay Abstain

[Signature] ✓
Commissioner Yea Nay Abstain

Paul L. Stewart ✓
Commissioner Yea Nay Abstain

Approved as to form:

[Signature]
General Counsel



LAKEHAVEN UTILITY DISTRICT
COMPREHENSIVE WASTEWATER SYSTEM PLAN

APPENDIX K

AMENDMENT NO. 4

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Commissioners

Tom Jovanovich
Dick Mayer
Don Miller
Ed Stewart
Beverly Tweddle

District General Manager

Donald T. Perry, P.E.

**LAKEHAVEN UTILITY DISTRICT
COMPREHENSIVE WASTEWATER SYSTEM PLAN
APPENDIX K
AMENDMENT NO. 4
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**LAKEHAVEN UTILITY DISTRICT
COMPREHENSIVE WASTEWATER SYSTEM PLAN
ENGINEER'S CERTIFICATION**

The technical material and data contained in this report was prepared by PACE Engineers, Inc. under the supervision of the below listed individuals. Those responsible staff members who are registered professional engineers are licensed in the State of Washington.

Anne C. Symonds, P.E.
Executive Vice-President

Susan E. Boyd
Associate

K-1 INTRODUCTION

This document has been prepared as Amendment No. 4 to Lakehaven Utility District's 1999 Comprehensive Wastewater System Plan (hereinafter referred to as the "1999 Plan"). It was prepared for the purpose of addressing future service to a specific area of the District. In particular, Amendment No. 4 (hereinafter referred to as "this Amendment") addresses provision of public sanitary sewer service to the Adelaide Beach neighborhood. This Amendment is Appendix K of the original document. As such, certain information contained in the 1999 Plan has been updated and is discussed in this Appendix. Information that has not been changed from the original plan and other Amendments has not been repeated in this Amendment.

Authorization for this Amendment was provided through a contract amendment with PACE Engineers, Inc.

The scope and objective of this project is development of Amendment No. 4 to the 1999 Plan to address provision of sanitary sewer service to the unsewered Adelaide Beach neighborhood of the District. In the 1999 Plan and subsequent Amendments, this area was shown as being served by a new District central pump station and force main located along the Puget Sound shoreline. This planned service would be problematic due to the difficulty in obtaining permits for a collection system and force main within the shoreline area.

There has been considerable discussion with property owners in the area regarding the likelihood, timing and location of potential sewer connection and development. This Amendment has been developed with the benefit of this additional information and has been prepared to provide District staff and elected officials with the information required to respond to requests for extension of service in this area.

K-2 SUB-BASIN REALIGNMENT

The information utilized in the 1999 Plan has been used for this Amendment to the Plan. The physical features of the District area, including topography, soils, surface waters and sensitive areas are unchanged from the 1999 Plan.

Lakehaven Utility District's entire corporate area includes approximately 34 square miles of land located in the southwesternmost part of King County, Washington. The study area is located in Drainage Sub-Basin 16, on the northeast corner of the Lakota Sewer Service area, and includes approximately 0.23 square miles extending from Puget Sound south to SW 304th Street, between 16th Avenue SW and 29th Avenue SW.

Figure K-1 shows the study area addressed herein. The proposed modifications include adding an area to be served by pressure sewers, some flowing to Pump Station 36, some flowing to the new Lakota Beach pressure sewer system, and some flowing to the south to Sub-Basin 18 gravity sewers. The proposed changes are based on topography, the ability to use existing Pump Station 36 capacity and pressure sewers to eliminate the cost and challenges to construct a new central pump station and force main along the shoreline.

K-3 POPULATION AND FLOW PROJECTIONS

The 1999 Plan developed population and employment forecasts for use in projecting flows for wastewater system modeling. These forecasts were developed using information from the comprehensive land use plans of the various land use jurisdictions within which the District operates. This Amendment uses the same projections used in the 1999 Plan for continuity and consistency.

The adopted comprehensive land use plans and other supporting comprehensive planning data were used to prepare overlays of population and land use.

Future land use was determined by comprehensive land use plan designations and corresponding zoning classifications. Land capacity is determined by comprehensive land use plan designations and zoning classifications as well as the availability of vacant and redevelopable land that is not constrained by physical features.

Table K-1 shows the population projections for the study area. Analysis for this Amendment included analysis of the system under ultimate buildout conditions as this is the worst case for population and flow. The population was calculated based on the percentage of area in each TAZ in each area. The total TAZ population was calculated as reported in the 1999 Plan.

Table K-1		
Sub-Basin 16 Population Projections At Buildout		
	Population Land Capacity	Area (acres)
Pressure Sewer Area Tributary to PS 36¹	399	64.8
Pressure Sewer area Tributary to Subbasin 18²	442	71.8
Gravity Service Area³	1085	176.2
Total	1926	312.8
¹ This Pressure sewer area is a "sub-area" within Sub-Basin 16 that is collected initially through a pressure sewer system and transmitted via the existing gravity system to Pump Station 36. ² This Pressure sewer area is a "sub-area" within Sub-Basin 16 that is collected initially through a pressure sewer system and transmitted to the south via the existing gravity system in Sub-Basin 18. ³ This sub-area is collected via gravity sewers and transmitted to Pump Station 36.		

Using the population forecasts prepared above, flow projections comprised of domestic, commercial and industrial wastes, groundwater infiltration and surface water inflow have been developed. The flows were developed using a computer model of the system.

Table K-2 shows the flow projections from Sub-Basin 16 both inside and outside the revised Pump Station 36 service area. The timing of the extension of service to unsewered areas is critical in developing accurate flow projections. For this analysis, it was assumed that for ultimate development conditions the entire area would be served by public sanitary service.

TABLE K-2 SUB-BASIN 16 BUILDOUT CONDITION FLOW PROJECTIONS (IN CFS)				
	Flows to Pump Station 36			Pressure Sewer Area Flows to Sub-Basin 18
	Pressure Sewer Area⁸	Other Tributary Area	Total	
Avg. Base Sanitary Flow¹	0.033	0.11	0.143	0.037
Avg. Dry Weather Flow² (ADWF)	0.034	0.112	0.146	0.038
Peak Month Flow (PMF)^{3,6} Peaking Factor⁷ =1.22	0.041	0.137	0.178	0.046
Peak Day Flow (PDF)^{4,6}	0.108	0.41	0.518	0.127
Peak Hour Flow (PHF)^{5,6}	0.507	0.486	0.993	0.153

1. Average base sanitary flow as predicted by Hydrographics model.
2. ADWF estimated by using peaking factor based on 1997 ADWF to predicted average sanitary flow ratio. ADWF includes average sanitary flow and average dry weather I & I.
3. PMF estimated by using peaking factor based on PMF to ADWF ratios from 1992 to 1997.
4. PDF as predicted by Hydrographics model (sum of average base sanitary and I & I).
5. PHF as predicted by Hydrographics model (sum of peak base sanitary and I & I).
6. I/I for new pressure sewers 740 gpad, for other areas 1100 gpad.
7. Peaking factors are assumed to remain the same for all model years.
8. This is a "sub-area" within P.S. 36's drainage basin that is collected via a pressure sewer system and transferred to P.S. 36 via existing gravity sewers.

K-4 COLLECTION SYSTEM ANALYSIS

The Lakehaven Utility District sewer service area is divided into six primary drainage basins (with the West Hylebos and East Hylebos basins considered as one primary basin). The two largest basins are the Redondo and Lakota Drainage Basins. These basins drain to the District's two secondary wastewater treatment plants (WWTP) that are located near the shores of Puget Sound. The Adelaide Beach area is tributary to the Lakota Treatment Plant. The Lakota Drainage Basin is not entirely developed. The majority of the developed area, more than 60%, is zoned and developed as single family (40%) and multi-family residential (20%).

Lakehaven Utility District's preference is gravity systems and trunk pipelines. However, in some cases, low-pressure sewer systems and central pump stations may be the most cost effective means of providing sewer service. Alternative collection systems are sometimes necessary due to topography of the District in relation to the location of the treatment plants. In these instances it is necessary to utilize central pump stations to

transport the collected flow to the major gravity trunk pipelines. In some situations, life-cycle costs support construction of non-gravity local sanitary sewer systems, such as low-pressure sewer systems (with individual grinder pump systems serving each property). These low-pressure sewer systems (with individual grinder pump systems serving each property) may also have the least environmental impact, and can better preserve an “open space” feel.

This section describes the analysis of the collection system’s ability to meet the needs of the existing and projected population of this Amendment’s sewer service area. In order to perform this analysis, the computer model, which was developed for the Lakehaven Utility District sewer system and used for the 1999 Plan, was used to evaluate the proposed revisions to the collection system. The computer software used in modeling the system is Hydrographics by Pizer Engineering Software, Inc. of Seattle, Washington.

The 1999 Plan included development of computer models for 1997/Existing, 2007, 2017 and for fully developed (buildout) conditions. This Amendment used the same model and modified the service area and connection location of the flows. The model for fully developed conditions was run as the “worst case” condition. Table K-3 shows the Pump Station 36 capacity versus the model-calculated buildout condition peak flow.

TABLE K-3 LAKEHAVEN UTILITY DISTRICT CAPACITY AND FLOW PROJECTIONS FOR PUMP STATION 36						
Pump Capacities		Measured Station Capacity with all Pumps in Service		Measured Station Capacity with largest Pump Out of Service		Future Peak Design Flow to the Station
GPM	MGD	GPM	MGD	GPM	MGD	MGD
275	0.40	495	0.713	367	0.528	0.398

At fully developed conditions, Pump Station 36 has sufficient capacity to handle the projected flows. The downstream force main and gravity system were also examined and operated within design standards at fully-developed conditions.

The purpose of this Amendment is to detail the future collection system recommendations for the Adelaide Beach neighborhood. Figure K-1 and the Comprehensive Wastewater System Plan Map show recommended future collection pipelines from the pressure sewer areas. For the areas closest to Puget Sound, sanitary sewer service shall be provided by low-pressure sewer systems (with individual grinder pump systems serving each property), with a combined public pressure force main discharging to the existing public gravity collection system terminating in the 1400 block of SW 296th Street. The flow from this area would travel through the existing gravity collection system to Pump Station 36, located near 12th Avenue SW and SW 296th Street. Pump Station 36 discharges through a force main eventually leading to the Lakota Wastewater Treatment Plant.

The areas within Sub-Basin 16 farthest from Puget Sound, as shown on Figure K-1, would be served by low pressure sewers (with individual grinder pump systems serving each property), with a combined public pressure force main discharging to the existing public gravity collection system at SW 304th Street and 24th Avenue SW and 25th Avenue SW.

The unannexed area immediate west of the Adelaide Beach area, if annexed, would be served by low pressure sewers (with individual grinder pump systems serving each property), with a combined public pressure force main discharging to the existing Lakota Beach public pressure force main located in Marine View Drive just west of 28th Avenue SW.

The existing Pump Station 36 capacity is sufficient to accept the flow from the proposed service area under the projected buildout condition. The downstream force main for Pump Station 36 is 8 inch diameter and also has sufficient capacity, with a buildout velocity of 1.76 feet per second. The downstream gravity system to the treatment plant is also able to accept the flow generated by the sewer system contemplated by this Amendment without surcharging. The influent gravity sewer main to Pump Station 36 is capable of accommodating the flow from this area without surcharging. The gravity sewer systems south of SW 304th Street have sufficient capacity to accommodate the additional flow from the upland portions of Sub-Basin 16.

K-5 SUMMARY

This Amendment has reviewed potential sanitary sewer service to the Adelaide Beach neighborhood. Drainage Sub-Basin and Pump Station service area/drainage basin boundaries were reviewed, the population and flow projections were used based on the 1999 Plan, and a collection system analysis was performed. Based on that analysis, recommended collection facilities were developed.

The Pump Station 36 service area/ drainage basin boundaries were modified as shown in Figure K-1. The boundaries were changed as the natural topography and proposed method of service dictated.

The existing and potential future collection systems were modeled using the same model and flow and population data used in the 1999 Plan. An analysis of the existing and future systems was performed for the ultimate buildout condition.

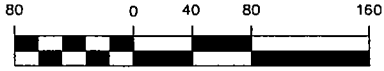
The model was run to confirm the size of the collection facilities. The existing system was checked for capacity. Pump Station 36 has sufficient capacity to accommodate the modified service area. The force main and gravity system upstream downstream of the Pump Station also have sufficient capacity to accept the modified service area flows for buildout conditions. The 2017 model was not run, because the buildout condition had sufficient capacity, and the fully developed condition is the worst case.

K-6 FIGURES AND MAPS

The Comprehensive Wastewater System Plan Map (Wall Map) has been modified to reflect the service area and proposed collection system modifications proposed in this Amendment. Figure K-1 has also been prepared to show this study area in more detail.



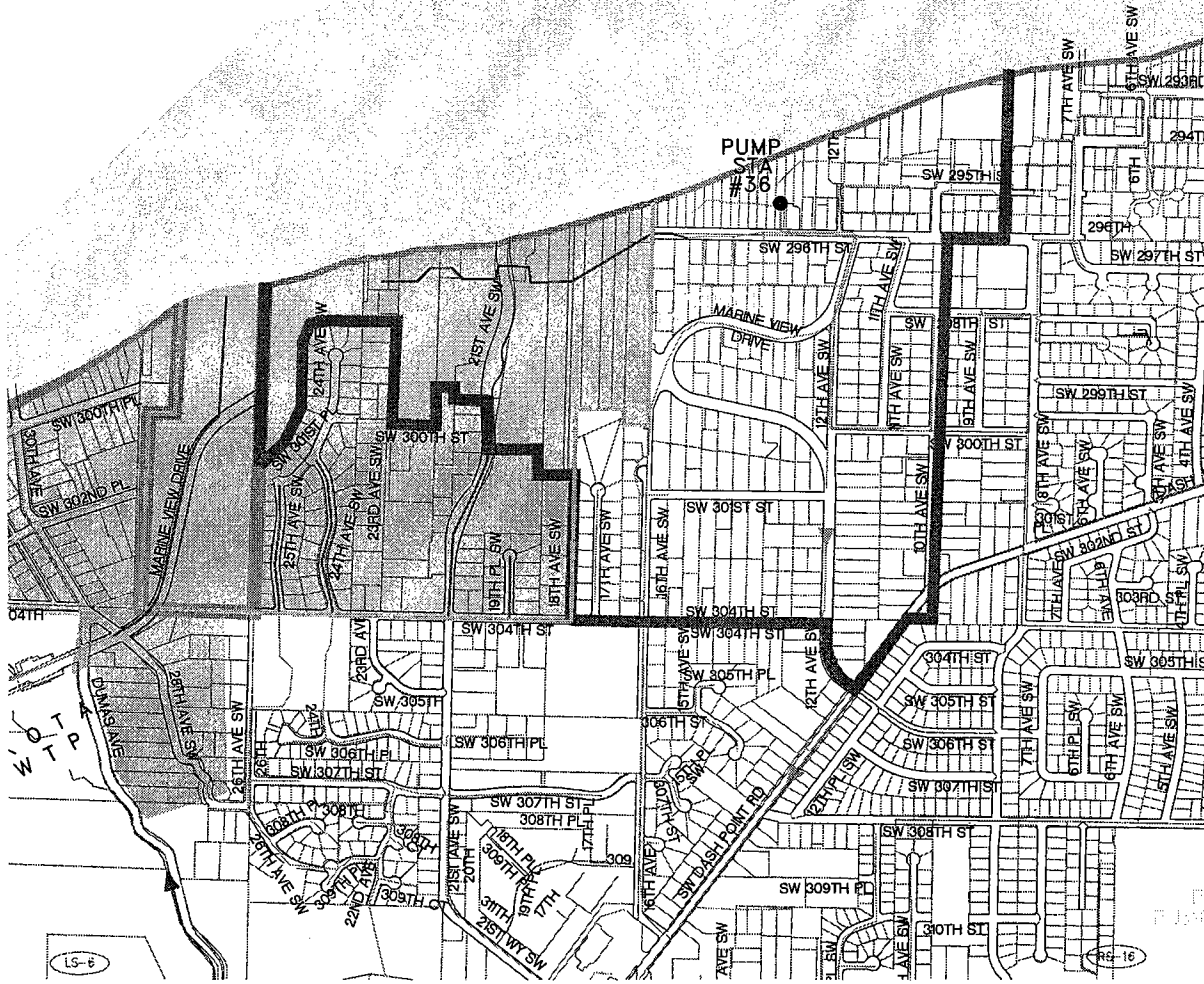
GRAPHIC SCALE



(IN FEET)

1 inch = 80 feet

Puget Sound



LEGEND

- CORPORATE BOUNDARY
- EXISTING SEWERS & FORCE MAINS
- PUMP STATION 36 SERVICE AREA
- BOUNDARY OF STUDY AREA
- NEW COLLECTION SEWER
- LAKOTA SEWER PROJECT NO. 25
- REDONDO SEWER PROJECT NO. 25
- PROPOSED SERVICE USING INDIVIDUAL PUMP SYSTEMS
- WATER BODY AREA