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King County

# Roads Maintenance Facilities Study

## Final Report

**June 23, 2008**

**King County**

## Roads Maintenance Facilities Study

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# Executive Summary

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## A. Introduction

The King County Road Services Division (RSD) is the direct service provider of maintenance, repair, operations, management, capital planning, design, and construction for the county's road system that spans the 1,755 square miles of unincorporated King County. This large area includes 1,676 square miles, or over 95% of rural land and 79 square miles of urban land. Within the unincorporated rural and urban areas, the RSD is responsible for 1,768 centerline miles of roadway and 185 bridges.

Of the 2,126 square miles that comprise the whole of King County, the 39 incorporated cities occupy a combined total of about 388 square miles or about 18%. The RSD is an effective partner with nearly all of the 39 cities through the provision, on a contract basis, of an array of public works services. Of these, eight cities covering 270 square miles (about 13%) or 700 centerline miles of roadway, purchase ongoing road maintenance services from RSD while eleven cities, covering 303 square miles (over 14%) or 1,011 centerline miles, contract for traffic maintenance or engineering services on an on-going basis. Those cities which purchase significant on-going roads maintenance services from RSD also receive full emergency and storm response services from RSD. Other contract services include bridge inspection and repair, wetland restoration, soils and materials laboratory analysis, pavement overlay, and small construction projects.

Road Services Division, through its contractual services, is also a vital partner with other county agencies in maintaining, repairing, and building critical infrastructure and in providing response and recovery efforts on the ground during and following weather and other emergency events. For example, county bridges located in parks and the county's regional trail system are regularly inspected and at times repaired by RSD. RSD provides maintenance and repair for King County Water & Land Resources Division (WLRD) managed levees and retention ponds and performs small construction projects. The recently created Flood Control Zone District relies heavily upon RSD for construction and maintenance of the smaller levee projects contained within its initial 10-year work program.

Over the coming decades, the RSD will continue to respond to and plan for the evolving needs of the rural area and remaining pockets of urban areas for which it is the roadway infrastructure and services direct service provider. While the rural area will see far less growth than the urban areas, new development is expected to add over 10,000 new units in the rural area over the next 20 years. [1] This may result in up to 164,000 residents depending upon the ability of the county's system of roadways to link them to work, school,

[1] 2008 King County Benchmarks Land Use Report – page 2

recreation, goods and services. [2] The demands of aging infrastructure, along with significant increases in truck and auto traffic on roads built for the reduced traffic needs of 50 years ago, have become more challenging to address in the face of substantial constraints and declines in revenues available to the county to fund its roads infrastructure.

As a result of these and other factors, the RSD's Roads Maintenance Section will experience changes in the amount, location, and type of work that it will be called upon to perform over the next 20 years. Annexations and incorporations of the remaining approximately 79 square miles of urban unincorporated land within the Urban Growth Area (UGA) will continue to shift the focus of the Roads Maintenance Section's direct service provision to the remaining rural unincorporated 1,676 square miles, concentrated mostly in the eastern part of the county. Vashon-Maury Island, a 37 square mile island located in Puget Sound, will also continue to rely upon the county for its local roads' needs. Increased environmental regulation, shifting demographics, changing business practices in support of Roads Capital Improvement Program (CIP) and WLRD, and changes in the nature of contract work purchased by cities and other agencies will affect the Roads Maintenance Section's future work.

The current configuration of the Roads Maintenance Section's operating facilities was established in the 1930s through 1960s and met the county's needs prior to the surge in incorporations and annexations that began in 1990 and the consequent decrease in the county's road inventory. The long ago established type, size, and location of roads maintenance facilities does not reflect the service and business needs of the future. Additionally, many roads maintenance facilities are beyond their useful life and do not conform to current-day structural, functional, and operational standards and best practices. Many are in disrepair – buildings built in the 1930s through the early 1960s are at the point where decisions must be made to undertake major rehabilitation and remodeling, replacement, and consolidation of some smaller facilities at more regionally efficient locations.

## B. Future Roads Maintenance Work

### Geographic Distribution of Work

- Annexations and incorporations of land within the UGA are shifting the focus of direct service provision within the remaining unincorporated area to the eastern, rural part of the county with the exception of Vashon-Maury Island which is planned to remain rural.
- Certain contract work with suburban cities is in decline as recently incorporated cities mature and assume generalized road maintenance responsibilities. Simultaneously, there is a trend for cities and other agencies to seek to contract with the Roads Maintenance Section for larger scale maintenance projects and small capital construction projects work for which they do not have the resources or expertise.

[2] 2007 Annual Growth Report – page 117

## Volume of Work

By 2012, the county anticipates the remaining urban unincorporated area will incorporate or be annexed by neighboring cities. The resulting loss of road miles from the unincorporated roads system is the single largest factor responsible for the projected decline in direct local roads maintenance services provided by the county, except to the extent that the annexing or newly formed cities continue to contract with the county for such services. The county may see a loss of 38% of the current system of unincorporated area road miles by 2028. *Yet reducing the unincorporated King County direct service area geographically does not equivalently reduce the workload of the Roads Maintenance Section due to the following factors*:

- Cities choose which areas to annex and when to annex them. Generally those areas where the roads and other infrastructure are in good condition and the property values are higher are annexed sooner. As a result, over the next decade, the urban roads remaining in the county's unincorporated inventory on average will be the ones in older communities, with aged and outdated infrastructure, that require a higher frequency and extent of maintenance and repairs.
- Vehicle Miles Traveled (VMT) by autos and trucks on remaining county unincorporated roads is projected to increase by about 30% by 2028.[3] This substantial increase will result in markedly greater wear and tear on the county's road system and will require more frequent and extensive maintenance and repairs.
- New road standards, largely established to comply with new state and federal requirements, have increased maintenance workload per mile. An example is in the requirements for more intensive installation of enclosed stormwater conveyance systems with water quality treatment features (e.g. catch basins, vaults, treatment ponds). These water quality structures must be monitored and maintained regularly to ensure they function within ranges acceptable to regulatory agencies.
- Work potentially available from WLRD is anticipated to decrease by about 25% over the next 20 years because of the shrinkage of the county's Surface Water Management Utility fee revenues due to the annexations and incorporation of the unincorporated urban areas.
- Conversely, the new King County Flood Control Zone District, recently approved by the King County Council, has already resulted in construction work now being performed by Roads Maintenance crews on some flood control features such as levees and revetments. It is expected this work will increase and then stabilize as the Flood Control Zone District ramps up its aggressive ten-year program.
- Environmental regulations will increase workload especially with respect to improving and maintaining water quality and fish barrier removal within the county's road rights-of-way.

[3] Puget Sound Regional Council. "Puget Sound Trends: Vehicle Miles Traveled." August 2007

- The Snoqualmie Valley and other eastern rural areas are prone to seasonal flooding and there is disproportionately more snow and ice removal work and post storm repairs necessary in these parts of the county.

In addition to the above known conditions, it is predicted that winter storms will increase in intensity and frequency over the next twenty years due to the impacts of climate change.

Analysis indicates that the net impact of changes facing the Roads Maintenance Section in the coming decades will potentially result in a reduction in workload equivalent to 25 to 35 FTEs by 2028. This analysis accounts for the forecasted, increased work effort that will be necessary to provide the same level of service per mile in 2028 as is currently provided in 2008. For example, paving and patching asphalt is a routine maintenance activity that is performed to preserve the life of a road and to provide a safe, smooth surface for road users. The level of service, the outcome from the work performed, is measured by pavement condition, namely a smooth road. Due to the factors listed above: increased VMT, severe storms, age of the road structures, and environmental regulation, the amount of work required to provide the same level of service is greater on the county's rural road inventory, after all incorporations and annexations of the urban roads has occurred. More importantly, the remaining rural road inventory, due to its location, topography, and age is more affected by the factors increasing the workload.

The Roads Maintenance Section is working to update the maintenance management system that will provide current data based on the measured effort required to perform maintenance work and the application of newer best management practices to the maintenance work. This can be used to refine estimates of the labor, equipment, and materials required to meet King County's maintenance level of service standards on the reduced road miles.

## C. Roads Maintenance Operating Facilities

Most of the county's ten existing roads maintenance operating facilities were built during the 1930s through the 1960s and were located to serve a roads system that existed prior to the boom in incorporations and annexations that occurred in the 1990s. These facilities form the operating base which supports the Roads Maintenance Section's day-to-day ongoing maintenance work and routine services to contract cities, and from which it launches its critically important response to seasonal storms and other emergency events. The facilities are widely spread across the 1,755 square miles of unincorporated King County, including the isolated Skykomish area and Vashon-Maury Island. With most facilities between 40 and 70 years of age, the building structures remain largely unchanged from their original construction and are woefully inadequate in terms of today's industry standards and practices. Today, the Roads Maintenance Section's workforce includes an increasing number of women performing the entire spectrum of job duties alongside their male counterparts. The existing outdated facilities never contemplated this eventuality and consequently, restroom and locker spaces are not able to accommodate female workers adequately.

As might be expected, the age of these facilities and the cost of substantially rehabilitating or replacing them has resulted in a large backlog of deferred facility improvement needs; many sites are in need of major renovation to improve employee safety and to enhance structural integrity. Most of the facilities are not able to properly garage maintenance equipment which affects equipment costs and out-of-service time. It will take a major financial investment to maintain and modernize the operating facilities infrastructure that is necessary to support the county's roads maintenance responsibilities into the future. Roads maintenance operating facilities realignment should be evaluated and considered concurrent with consideration of facilities renovations or consolidations because some costly repairs may be avoided as buildings or locations are deemed obsolete or ill sited for short and long-term business needs, as part of a Facilities Master Plan.

The primary business driver for the consolidation of roads maintenance operating facilities is efficient access to the road system for which the Roads Maintenance Section is responsible both during normal working conditions and during emergency events. Secondary drivers include: the economies of scale in the maintenance and use of equipment, more flexibility in the management and deployment of crews, and other operational efficiencies that arise from consolidation.

Based on locating facilities to provide accessibility to work sites within a 30-minute drive time to most of the roads served by a given facility, this study recommends that the Roads Maintenance Section consolidate its current ten widespread sites to three regional roads maintenance facilities, with one smaller site to the east (in the vicinity of Preston) and one to the west (Star Lake) and two satellite facilities (Skykomish and Vashon-Maury Island). The regional roads maintenance operating facility locations would include the current Roads Maintenance Section headquarters at Renton, and north and south crew facilities. The Star Lake crew facility should be retained depending on workload associated with Burien and the North Highline PAA.

Most Roads Maintenance facilities are old and in need of major repairs. This situation provides an opportunity to evaluate and plan for future needs and update or relocate crew sites to match changing service area requirements and meet current standards. The following report provides a description of current Roads Maintenance operations, estimates workload over the next 20 years, and makes recommendations for facilities realignment and consolidation.

# I. Introduction and Study Purpose

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At the request of the King County Department of Transportation Road Services Division, Dye Management Group, Inc. has prepared an accelerated analysis of the future volume and location of the Roads Maintenance workload and the implications for the potential realignment of maintenance crew facilities. This document presents the results of this analysis and provides preliminary recommendations that will eventually inform the broader Roads Operational Master Plan (ROMP) and Facilities Master Plan (FMP) of the King County Road Services Division.

## A. Background

Declines in workload and changes in the geographical distribution of operations necessitate a realignment of the Road Service Division's maintenance crew facilities. The term "crew facility" is used by Roads Maintenance to mean any facility that is permanently staffed.

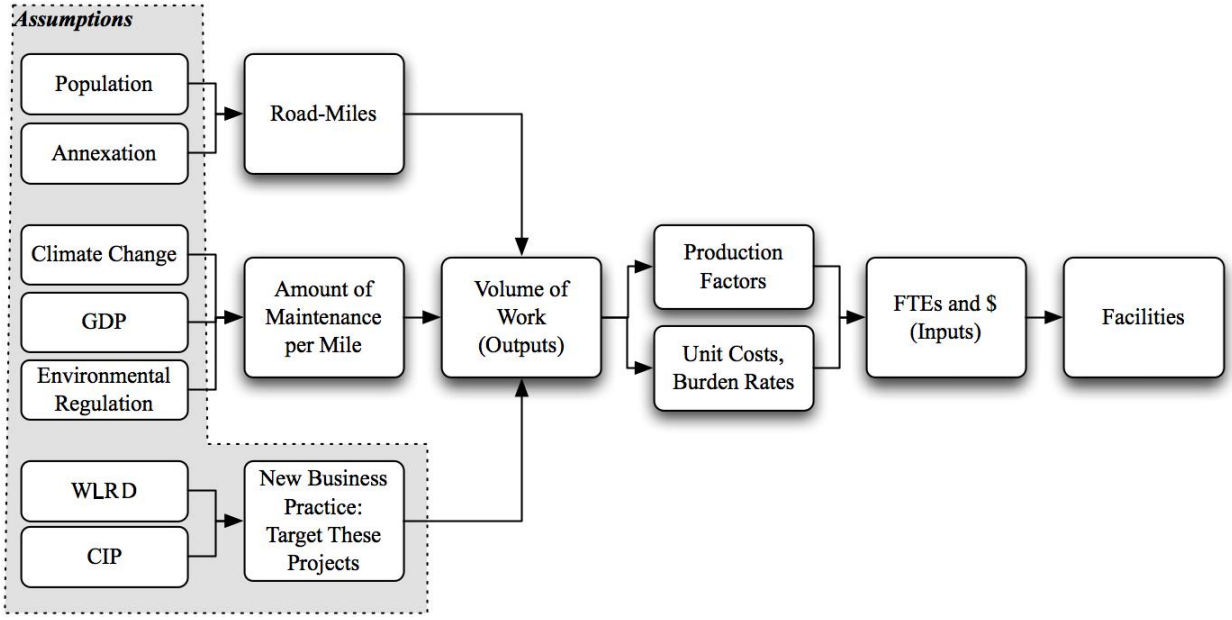
Crew facilities are currently distributed into four geographic planning units (maintenance divisions) with Renton acting as headquarters for Special Operations and Administration. Roads Maintenance currently has ten crew sites including: Brugger's Bog, Cadman, Diamond, Fall City, Issaquah, Renton, Skykomish, Star Lake, Summit, and Vashon. Vashon and Skykomish serve as remote satellite facilities because of the relative geographic isolation of the areas they serve. This alignment was ideal when Roads Maintenance operations covered more road miles and included service to the western more urban part of the county but will not serve Roads Maintenance after planned annexations are complete. A smaller number of crew facilities will be required to provide service efficiently to the remaining county service area. (For a map of unincorporated King County roads pre-1989, please refer to Appendix B, Exhibit B-4.) In addition to suboptimal locations, many of these facilities are in obsolete physical condition and in need of major renovation.

## B. Approach

This report builds on data from the Roads Maintenance 2008 budget and discussions with staff. Roads Maintenance is in the process of updating their performance standards – these are measures that relate budget expenditures, labor, materials, and equipment to the maintenance work performed. Given the expedited time frame for this report, Dye Management Group, Inc. used the performance standards from the 2008 budget as the basis for forecasting future Roads Maintenance productivity. These standards date back to 2003 and likely underestimate the labor required to perform many activities. Further, they likely understate the amount of work on specific activities that is required to provide the current level of service. For example, due to increases in traffic volume, the need for flagging has increased. In addition, service levels for sweeping and culvert work, among other activities, have also increased. Roads Maintenance is updating such production standards as part of work to implement a new maintenance management system. When these data are available they can be used to refine the analysis presented here.

The general approach of this study was to make estimates and assumptions about the future volume of workload in unincorporated King County including an analysis of population trends, annexation schedules, employment and traffic growth, increased environmental regulation, and changing Roads Maintenance support to WLRD and Roads CIP. To the degree possible, the potential impacts of climate change and the King County Executive's energy initiative are also taken into consideration. Dye Management Group, Inc. projected future trends onto the current volume of Roads Maintenance work culminating in an analysis of staffing impacts. This business analysis informs facility needs because it identifies changes in the type of work, the volume of labor, and its distribution between major categories of work. These staffing needs were then considered in the larger context of geographical distribution of future workload to recommend potential crew facility realignment. Exhibit I-1 provides a summary of the analysis approach.

**Exhibit I-1: Summary of Approach**




# C. Organization of the Report

This report is divided into four main sections and two appendices:

**Section I. Introduction and Study Purpose.** This section provides a background introduction to the project and introduces the project approach.

**Section II. Current Roads Maintenance Operations.** This section provides an overview of the county roadway assets that Roads Maintenance maintains as well as services provided to contract cities, Roads CIP, WLRD, and other outside entities. Section II discusses the main functions, services, responsibilities and resources of the Roads Maintenance Section.

**Section III. Quantification of Future Roads Maintenance Workload.** This section uses the results from Section I as well as Appendix A to provide a quantitative assessment of the future workload by type of work.

**Section IV. Facility Realignment Recommendations.** This section presents findings and recommendations regarding crew facility realignment.

**Appendix A. Trends Affecting Future Roads Maintenance Workload.** This section provides projected trends in the county that will affect the volume and geographical distribution of Roads Maintenance work including annexations, changes in business practices, changes in the physical environment, as well as changes in environmental regulation.

**Appendix B. Data Sources.** This appendix, available under separate cover, provides detail on the data sources used in this analysis.

# II. Current Roads Maintenance Operations

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## A. Summary

Maintenance of the roadway infrastructure is performed by two units in the Road Maintenance Section: Division Maintenance and Special Operations. The Division Maintenance Work Unit is responsible for maintaining, repairing, and cleaning roadway features. The Unit is divided into four geographic areas with nine crew facility sites. Division staff responds to inclement weather and other emergencies 24 hours a day, seven days a week. Some of the Unit's responsibilities include:

- Road Surfaces (pothole patching and surface repair)
- Shoulders (mowing and grading)
- Drainage systems (cleaning and repair)
- Ditches (cleaning)
- Slopes within the public right-of-way (mowing and stabilization)
- Emergency response
- Support to contract cities

Whereas the Division Maintenance Work Unit generally performs routine annual ongoing maintenance tasks, the Special Operations Work Unit performs more unique project-related tasks such as paving, bridges, river control, facilities management, and storm water retention/detention. The Special Operations Unit's construction, maintenance, and stabilization activities are performed throughout the county on the following:

- Roadways and shoulders
- Culverts and drainage systems
- Landscape maintenance
- Asphalt surface of roadways
- Bridges
- Guardrails
- Facilities
- Riverbank stabilization and seawall construction
- Support to Roads CIP and WLRD
- Major system failure repairs (roadways, drainage, slides, etc)

- Support to Division staff during emergency response events

Special Operations crew facilities are consolidated at the Renton headquarters site and are divided into five countywide Planning Units as follows:

1. **Rivers Management** specializes in the construction and repair of many different types of wall construction such as: rock, geo-fabric, shot-crete, gabion, and J-walls depending on the project's specific needs.
2. **Drainage** construction projects are performed in compliance with state and federal environmental regulations and permitting requirements. Many larger projects must be completed within the fish window, often to improve fish habitat. Smaller projects that are not deemed environmentally sensitive may be performed throughout the year.
3. **Paving** is responsible for large paving projects, the installation of speed bumps, and islands as requested by the Traffic Engineering Section. The Paving Unit is also responsible for the Coordinated Reduction of Waste (CROW) program.
4. **Bridges, Guardrail, Concrete & Facilities** is responsible for the maintenance of 185 bridges as well as for various types of concrete work (curbs, sidewalks, ADA ramps), guardrail installation, and maintenance of crew facilities.
5. **Vegetation Management** includes mowing, vegetation control, and minor maintenance of Roads retention detention facilities. Vegetation control is performed using multiple methods including mowing, spraying, and hand pulling. The Unit is also responsible for the danger tree program to remove trees within the right-of-way that may pose a danger to the public.

In summary, the Roads Maintenance Section is responsible for:

- Routine and major maintenance, as well as emergency response and repair of all components of roads and streets within the county-owned rights-of-way
- Support to the Flood Control Zone District and WLRD for the routine and emergency maintenance and repair of surface water management assets
- Support to Roads CIP, contract cities, and other agencies as requested
- Environmental rehabilitation in the roadway, such as the removal of fish passage barriers (major culvert replacement)
- Clearance, damage control, and repair of maintenance assets in extreme weather conditions
- Design, engineering, and construction of some of these assets

To fulfill these responsibilities, the field crews, engineers, and management staff undertake over 400 different maintenance tasks that we group, with some simplification, into these categories:

- *Roadway Surfaces and Shoulders:* paving and patching asphalt; gravelling and grading roads and their shoulders; street sweeping, snow and ice control; and litter control

- *Drainage*: cleaning, replacing, and repairing the ditches, culverts, catch basins, and pipes that make up the road drainage system; and maintaining stream banks and flood control devices in the county's rivers and creeks
- *Bridges and Facilities*: inspection and repair of the structural and electrical components of bridges, guardrails, ADA ramps, pumphouses, storage buildings, and other specialized facilities
- *Roadside Vegetation:* slope and shoulder mowing, hand brushing, herbicide application, noxious weed control, and dangerous tree removal
- *Recycling and Waste Processing/Handling:* the Coordinated Reduction of Waste (CROW) program includes stockpiling and separating waste materials into recyclable components for temporary storage until quantities are large enough to haul efficiently to vendors and treatment sites. Materials include brush, tires, asphalt, concrete, lumber, litter, catch basin solids, street sweeping material, scrap metal, and other mixed waste. In addition, the Street Waste Alternatives Program (SWAP) includes hauling, screening, sorting, and processing street sweeping material and catch basin solids in order to allow bioremediation to remove contaminants. Clean material, after passing sampling thresholds, is either recycled or used as fill and topsoil in site reclamation

## B. Responsibilities

Roads Maintenance has the following broad areas of responsibility:

- Maintenance and repair or replacement of county road assets
- Emergency response and related operations
- Contract maintenance work with cities
- Work on Road Services Division CIP projects
- Services to Water and Land Resources Division (WLRD)
- Maintenance of facilities used in support of the above
- Other county work

Each of these is described below.

### 1. Ongoing Maintenance on County Road Assets

Roads Maintenance is responsible for the maintenance of all assets within the right-of-way. The assets Roads Maintenance is responsible for as of 2008 are summarized in Exhibit II-2 below. A complete list of the Roads Maintenance inventory of assets is in Appendix B.

**Exhibit II-2: Summary of Roads Maintenance Assets**[4]

| County Assets Under Management of Roads Maintenance | | |
|---|---|---|
| **Description** | **Measure** | **Quantity** |
| All Roadway Surface | SQ YD | 22,890,417 |
| All Paved Roadway | Lane Miles | 3439.6 |
| Gravel Roadway | Lane Miles | 104.7 |
| Curb and Gutter | Lineal Feet | 3,314,634 |
| Catch Basin and Manhole | Each | 30,505 |
| Paved Ditch and Gutter | Linear Feet | 77,729 |
| Open Ditch | Linear Feet | 6,233,462 |
| Enclosed Drainage System | Linear Feet | 3,963,524 |
| Planter Strips | SQ YD | 90,633.5 |
| All Shoulder Miles | Road Miles | 2,456.1 |
| Mowable Slope | SQ YD | 5,127,161.4 |
| Retaining Walls | SQ YD | 59,868 |
| Bridges | Each | 181 |

An annual cycle of maintenance and rehabilitation provides safe and efficient conditions, as well as optimal performance of county roads. It is in Roads Maintenance's best interest, and the interest of the public, to not fall behind in the Division's general maintenance responsibilities. Avoiding deterioration reduces the need for major reconstructions, extends the working-life of these assets, minimizes costs, and reduces risk and liability. Typical maintenance duties include: bridge maintenance, dangerous tree removal, litter control, ditch cleaning and restoration, drainage construction and maintenance, guardrail construction and maintenance, illegal dumping cleanup, mowing, grading, pothole repairs, road closures, seawall repair and construction, snow and ice removal, storm drain maintenance and vactor disposal, sweeping, and weed and vegetation control.

## 2. Emergency Response and Related Operations

Roads Maintenance provides 24-hour emergency response in unincorporated King County as well as emergency response to contract cities. This can include removing down trees, unblocking culverts, flood response, snow and ice removal, and addressing roadway failures among other activities. Roads Maintenance is typically the first on-the-scene and is responsible for assessing the emergency situation and making judgments about road closure.

[4] Source: King County Department of Transportation Maintenance Management System (MMS) 2008 Budget Unincorporated King County Base. The above table has been adjusted to reflect the recent annexations of Lea Hill, West Hill, and Benson Hill.

Because it is not possible to predict with accuracy when major storm events will occur, Roads Maintenance budgets only minimally for unscheduled and emergency events such as snow and ice control, flood response, and slide removal. Funding levels for these activities are based upon historical expenditures in non-event years. The past 10 years have had abnormally active storm seasons. Since these events were not budgeted for, Roads Maintenance had a significant budget shortfall and had to request supplemental funding appropriated by the King County Council. During emergency events, road maintenance crews must be diverted from their typical duties to storm response. This creates a backlog of deferred maintenance work which over time adversely impacts the condition of the county's roadway assets and increases the work required to maintain them. The 2008 budget includes $ 210, 246 in deferred maintenance costs which is only a small proportion of the overall deferred maintenance need.

## 3. Contract Maintenance Work with Cities

The extent of Roads Maintenance responsibility within the contract cities varies and is on a contract-to-contract basis. Historically, Roads Maintenance support has been a function of length of time since a city has incorporated, although some cities continue to contract with Roads Maintenance long after incorporation. King County currently contracts with ten cities. This adds an additional 763 road miles to the maintenance inventory; however, information on contract city miles can be misleading since cities may have partial to full service contracts for road maintenance services. The largest contract is with the City of Burien.

Beginning in 1990, many cities within King County began to incorporate and progressively annex contiguous land within the Urban Growth Area (UGA). When cities first incorporate they do not have the expertise, equipment, or facilities to provide their own road maintenance services and initially depend on King County Roads Maintenance for continued routine maintenance and support. The Interlocal Cooperation Act of 1967 (RCW 39.34) enables cities to contract with the county with the understanding that avoiding costly bidding processes and providing services in-house benefits all parties and the public.

Typical contract work performed by Roads Maintenance for cities includes mowing, sweeping, vactoring, and emergency support. Historically, as newly incorporated cities mature, they take over routine maintenance operations and are more likely to contract with Roads Maintenance for technically specialized work such as hydroseeding or bridge repair, equipment intensive maintenance, and supplemental emergency response.

The chart below shows the difference in the contract city cost per mile with the range from $17,767 for Burien to $22 for Newcastle. Expenditures per mile vary depending on the type of work performed on each road mile with some cities contracting with Roads Maintenance for the entire extent of services, such as Burien, and others contracting for a limited range of services, such as Newcastle. For this reason, decreased roadmiles with contract cities does not necessarily represent a proportional decrease in workload.

**Exhibit II-3: Maintenance Expenditures by Mile in Contract Cities[5]**

| | Road Miles | 2007 Expenditures | Expenditure per mile |
|---|---|---|---|
| BURIEN | 99 | $ 1,758,979.35 | $17,767.47 |
| SAMMAMISH | 145 | $ 327,176.87 | $ 2,256.39 |
| COVINGTON | 50 | $ 76,190.20 | $ 1,523.80 |
| WOODINVILLE | 40 | $ 51,926.34 | $ 1,298.16 |
| KENMORE | 57 | $ 69,615.77 | $ 1,221.33 |
| SEATAC | 82 | $ 90,970.14 | $ 1,109.39 |
| LAKE FOREST PARK | 45 | $ 43,208.41 | $ 960.19 |
| SHORELINE | 167 | $ 63,314.44 | $ 379.13 |
| MAPLE VALLEY | 47 | $ 11,517.38 | $ 245.05 |
| NEWCASTLE | 31 | $ 687.04 | $ 22.16 |
| TOTAL | 763 | $ 2,493,585.94 | $ 3,268.13 |
| | Average Exp/Mile Excluding Burien | | $ 1,001.73 |

In the past four years, there has been an increasing trend of project work for non contract cities and other entities including Seattle Public Utilities (SPU) and King County Solid Waste, among others. This is often technically specialized work which is seasonal and equipment intensive.

## 4. Work on Roads Division CIP Projects

Road Maintenance crews provide support services to Road Services Division CIP projects. This work is usually on smaller scale construction projects in support of Roads CIP such as drainage projects, culvert replacements, ADA ramps, and the Non-Motorized Pathways Program.

## 5. Services to Water and Land Resources Division (WLRD)

Roads Maintenance has considerable expertise in the repair and maintenance of surface water management assets which it provides to WLRD by agreement. WLRD primarily utilizes Roads Maintenance Special Operations staff for projects in several areas: 1)Capital Projects and Open Space Acquisition (CPOSA), 2) Stormwater Services, and 3) Flood Control Zone District (FCZD). Support to these functions includes cleaning catchbasins and ponds, removing sediment, repairing and replacing pipes, levee/revetment repair, bank stabilization, mowing, retrofitting ditches and swales, hand and mechanical brushing, noxious weed control, bioswale, hydroseeding,

[5] 2007 Actual Expenditures

slide removal, stream restoration, levee repair and reconstruction, and other emergency services.

Maintenance, repair, or improvements within watersheds where salmon spawn, must be conducted during the "fish window" in compliance with the Endangered Species Act (ESA) to minimize disruption to salmon habitat. The "fish window" is the brief period of time when salmon are not present in freshwater river systems and can be as short as 45 days. WLRD projects on salmon-inhabited rivers must be completed during this abbreviated time-frame. This uneven distribution of labor makes it challenging for Roads Maintenance to staff specifically for WLRD support.

## 6. Other County-Wide Activities

In addition to providing facilities for operations, employees, materials, and equipment storage, other critical Roads Maintenance activities take place at crew sites. These are listed below.

### a. Coordinated Reduction of Waste (CROW)

The Coordinated Reduction of Waste program facilitates energy efficiency and recycling of waste while helping to deal with large amounts of road maintenance debris and waste material generated during slide repair, asphalt grinding, storm debris cleanup, ditch digging, and culvert replacement. The CROW program sorts and consolidates waste which is eventually recycled as fill or hauled to vendors for reuse. Twenty-three Roads Maintenance sites house CROW program stations.

### b. Street Waste Alternative Program (SWAP)

The Street Waste Alternative Program is a bioremediation program which manages street waste generated from sweeping and storm water drainage system cleaning. The SWAP annually treats roughly 11,000 tons of solids at Summit from unincorporated King County, contract cities, Washington State Department of Transportation (WSDOT), and private entities.[6] Street sweepings and catch basin solids from county pit sites are hauled to Summit where they are processed, bioremediated, sampled and tested, and eventually reused for site reclamation.

### c. Mining and Filling

Roads Maintenance has gravel mining and filling operations at several sites throughout the county. Mining activities provide sand and gravel and also create space for clean fill as part of the site reclamation process.

[6] King County Transportation Today "County 'SWAPS' Litter and Debris for Clean Soil." June 12, 2007.

Over 100,000 cubic yards of fill are generated annually through vactor decant and street sweeping bioremediation, slide removal, and other maintenance activities. Roads uses the holes left by extraction of mined resources as places to permanently store fill. In comparison to vendor tipping fees which average over $14 per cubic yard, Roads Maintenance is able to save about $1.4 million per year in the disposal of fill material at county operated sites.

**d. Fueling**

Several roads maintenance sites include fueling stations. These stations enable county-owned vehicles from a variety of departments (Public Safety, Parks and Recreation, Department of Development and Environmental Services, Public Health Seattle and King County, and Road Services) to fuel from reserves at a wide variety of locations providing a time and cost savings to the public. These sites are essential during emergencies when private fueling stations are crowded or closed due to lack of electricity and when prices are potentially elevated. Fleet Administration estimates that county fueling stations can provide savings of up to 8% compared with retail. In 2007, 583,408 gallons of unleaded gas and 314,393 gallons of diesel were distributed at Road Maintenance facilities. Based on an average price of $3.00 per gallon, savings total $215,472.

**e. Other**

Other activities that take place at Roads Maintenance sites include: equipment repair performed by Fleet Administration, temporary hazardous waste storage, and the housing of scales which enable Roads Maintenance to bill for debris brought in and processed at facilities.

# C. Activities and Resources

Slightly over half of the 601 FTEs in the Road Services Division 2008 budget are allotted to the road maintenance activities described above. The 316.5 FTEs in the Roads Maintenance workforce can be grouped as follows:

## 1. Section FTEs by Budget and Work Unit

King County maintains a uniform organization hierarchy, in which *divisions* are composed of *sections* which are, in turn, composed of organizational *work units*. The Maintenance Section, which is part of the Road Services Division, is made up of six work units: Management, Administration, Human Resources & Technical Support, Engineering/Environmental, Division Maintenance, Special Operations, and Utility Inspection. Exhibit II-4 provides a summary of FTEs by budget and work unit.

**Exhibit II-4: Summary of Road Maintenance FTEs***

| | |
|---|---|
| Administration | 16.3 |
| Engineering & Environmental | 36.5 |
| Utility Inspection | 11.0 |
| Roads CIP Support | 24.5 |
| Contract Cities | 19.0 |
| WLRD Support | 40.1 |
| Other Support | 11.1 |
| Division and Special Operations | 158.0 |
| **Total** | **316.5** |

*Work Crew Positions are Shaded

The field work crews that make up 252.7 of these FTEs are organized into geographical areas. Division crews perform most of the annual ongoing maintenance on the roadway inventory and provide maintenance support to contract cities. Division crews, assigned to specific areas, report to facilities located throughout the county. Special Operations crews, based in Renton, perform more specialized functions with regard to countywide paving, drainage, vegetation management, surface water management assets, bridges, and facilities. These Special Operations crews also handle most of the construction and rehabilitation of assets that the Section undertakes for Roads CIP, WLRD, and other county agencies on a reimbursable basis.

## 2. Movement of Staff among the Field FTE Allocations

In the Road Maintenance budget, FTEs are distributed by organization unit, type of work, and budget source. These are FTEs of effort, in which one FTE of effort is not necessarily performed by one person in one year. The seasonal nature of Roads Maintenance work, support to other organizations, and the variations forced upon the section by emergency responses to weather events, result in the cross-utilization of field crews between Divisions and Special Operations units depending on the demand for resources. For example, as many as 64 FTEs from Special Operations that support Roads CIP and WLRD in the summer and fall months are available for emergency response during the stormy months of the winter and spring. Alternatively, during the construction season, Division crews provide additional support to Special Operations to complete projects constrained by the "fish window".

### a. WLRD Work

The 2008 budget for maintenance and capital work is the equivalent of about 40 FTEs for WLRD. The effort varies throughout the year, requiring as many as 80

or more people in the summer and fall to as few as 15 people in the winter and spring. As this workload is countercyclical to emergency storm response, people who perform WLRD construction and maintenance work in the summer and fall are also deployed for emergency response road maintenance in the winter and spring. If the work required by WLRD declines then the number of Roads Maintenance FTEs declines and the section loses some of its emergency response capability.

### b. Roads CIP and Contracted City Maintenance

Similar to the WLRD programs, Roads Maintenance field crews that work on Roads CIP in the summer and fall are available to clear snow and repair flood damage in the winter and spring. The 2008 budget contains about 24.5 FTEs of effort on road-related capital construction.

King County provides minimal maintenance services equivalent to 3 FTEs of effort, to cities that do not have recurring annual contracts with King County Roads Maintenance. Support to cities with annual contracts requires 16 FTEs for a total of 19 FTEs within city boundaries.

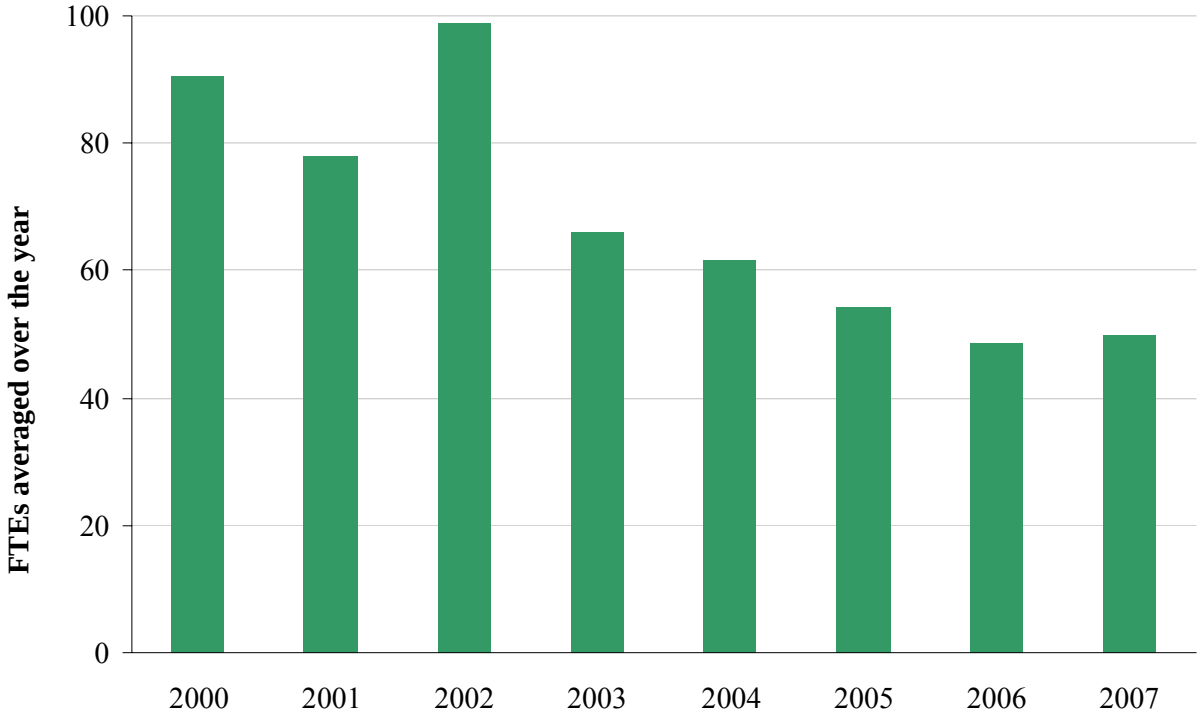
The City of Burien has relied on King County Roads Maintenance for a full range of services since incorporation in 1993. Currently the Burien account comprises more than one-third of Roads Maintenance contracts with cities. In dollar terms, this contract has ranged from a low of $673,275 in 2000 to $1,758,979 in 2007.

The City of Burien shares its northern border with the North Highline Potential Annexation Area (PAA); the PAA also shares borders with the cities of Seattle, Tukwila, and SeaTac. On October 3, 2007, the Growth Management Planning Council (GMPC) adopted a motion to show North Highline as an overlap or contested interim potential annexation area in the countywide Planning Policies. Because of this overlap, it is unclear which areas of North Highline will be annexed by which cities and annexation is likely to be delayed beyond the current January 2009 annexation date until territory disputes are resolved.

If Burien, as opposed to Seattle, annexes North Highline, Burien's contract with King County Roads Maintenance could be expanded further to include the annexation area. Alternatively, if Seattle annexes North Highline, the City of Seattle would eventually assume Roads Maintenance's responsibilities but in the short term, could contract with the county.

In summary, Exhibit II-5 below illustrates the declining FTEs dedicated to city maintenance, WLRD, and Roads CIP since 2000.

**Exhibit II-5: Road CIP, WLRD, and City Maintenance FTEs**




The decline in loan out support work is due principally to decreasing city maintenance work, although reductions in Roads CIP work have also contributed to the overall decline.

## 3. Weather Events

Significant storm events disrupt the regular maintenance work of the Roads Maintenance section. Because Roads Maintenance budgets minimally for emergencies, all staff members must be mobilized to respond to emergency situations as they arise. Storm repair projects can also monopolize staff time. Routine maintenance operations can be considerably postponed depending on a storm's duration and intensity as crews are pulled to respond to emergencies and work on storm repair projects. For example, the winter 2006-2007 storm season included four Federal Disaster declarations and generated 120 new projects at an estimated cost of $20.7 million including construction contracts and county force expenditures.[7]

Decreases in staffing due to loss of city contracts, Roads CIP, WLRD support, and annexation-driven reductions in routine workload could affect how Roads Maintenance responds in emergency situations. The department has a responsibility to dedicate

[7] King County Department of Transportation Roads Services Division "A Season of Storms: November 2006-February 2007 Damage Report" September 2007.

employees to emergency events affecting contract cities. However, unincorporated areas have priority for Roads Maintenance employees during emergencies since contract cities do not support the full spectrum of the Roads Maintenance budget. As a general rule, during a countywide event, Roads Maintenance provides support to contract cities equal to the number of FTEs funded by the city contract. For example, if the city budget supports 3 FTEs, then the equivalent of 3 FTEs would be available for the city during a major storm or emergency event.

In 2008, 75.6 FTEs can be made available from WLRD, Roads CIP, and other loan out support programs to bolster the 158 regular maintenance FTEs who are already available to respond to major storms. In all, there are 252.7 field FTEs available to:

- In *heavy rains and windstorms*: close flooded roads, clear debris, clear drainage systems, remove slides, and repair bridges, washouts, roads, dikes, levees and other structures
- In *snow and ice storms*: plow, sand and de-ice roads, clear fallen trees, and free up frozen drainage systems, frost heaves, and potholes
- In *other natural disasters or emergencies:* provide emergency response for events such as earthquakes

Roads Maintenance designates certain roads as "priority routes" during inclement weather. These routes, because of location, traffic volume, and safety issues, are the first to be sanded or plowed during snow and ice events. Only after these routes are cleared are non-priority routes cleared. Priority routes are often cleared multiple times before non-priority routes are cleared, depending on the severity of a winter storm event and Roads Maintenance staffing resources.[8]

[8] King County Department of Transportation Road Services Division Roads Maintenance Section "2007-2008 Snow and Ice Response Plan."

# III. Quantification of Future Roads Maintenance Workload

■

This section provides some quantification of future Roads Maintenance workload and draws out the implications for facility realignment recommendations. Appendix A describes in detail the projected trends in the county that will affect the volume, type, and geographical distribution of work performed by Roads Maintenance through 2028. The trends addressed in Appendix A include: annexations, changes in business practices, changes in the physical environment, as well as changes in environmental regulation. The impact of these trends is summarized in the exhibit below.

**Exhibit III-1: Summary of Changes in Staffing from 2008 to 2028**

| Year | Unincorp Road Miles | Routine Maintenance | Partner City Contracted Work FTEs | Roads CIP FTEs | WLRD FTEs | Other Loan Out Support FTEs | Emergency Response Increase FTEs | Other Trends | Total FTEs |
|---|---|---|---|---|---|---|---|---|---|
| **2008** | **1768.3** | **158.0** | **19.0** | **24.5** | **40.1** | **11.1** | | | **252.7** |
| 2028 | 1090 | 105.7 | 26.7 | 24.5 | 30.0 | 11.1 | 15.0 | 5 to15 | 218 to 228 |
| Staff Change | | (52.3) | 7.7 | 0.0 | (10.1) | 0.0 | 15.0 | 5 to 15 | (25 to 35) |

Note: For a more complete breakdown of 2008 Baseline FTEs by division, please see the FTE Spreadsheet in Appendix B. Subsections A-F below detail the staffing impacts and effects on workload summarized in Exhibit III-1, above. Subsection G details location implications of reductions in FTEs.

## A. Routine Maintenance Work

Unincorporated area road miles subject to maintenance by Roads Maintenance may decrease by about 38% due to annexations and incorporations, from 1768 road miles in 2008 to 1090 road miles in 2028. There will be a loss of roughly 52 FTEs directly associated with loss of road miles in the unincorporated area, or a 33% reduction in staffing. The reduction in FTEs was calculated using the road maintenance management system, MMS, based on the roadway feature inventory within the geographic boundaries of the Potential Annexation Areas using current performance standards and service levels.

## B. Contracted Work for Cities

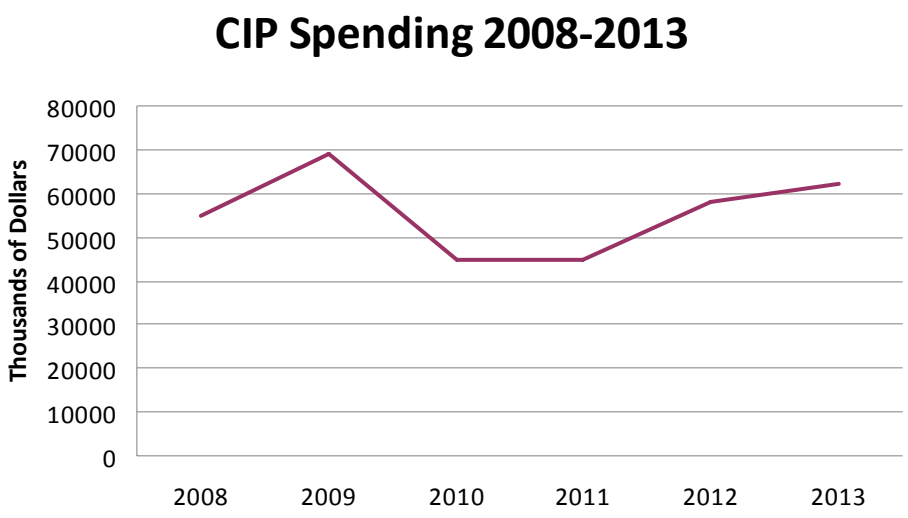
There is a lag between the time a city incorporates and the amount of road maintenance work they are able to assume and contract with Roads Maintenance while they develop their own capabilities. Further, small cities cannot achieve the economy of scale possible in larger organizations. As a result, they may contract for specialized work with Roads Maintenance. Therefore, although King County Roads Maintenance unincorporated road miles will decrease, there is a potential for these roads to remain under county maintenance through contracts with incorporated cities.

Cities continue to contract with Roads Maintenance for technical and specialized services even after they have established their own road maintenance division. As a result, King County Roads Maintenance should plan on increasing contract work with cities and for this work to become more specialized and technical. Roads Maintenance projects that support to contracted cities will increase staffing to 26.7 FTEs through 2028 from the 2008 level of 19 FTEs based on the assumption that the county will continue supporting Sammamish and Burien including the North Highline PAA. Fairwood is assumed to incorporate and contract with the county for road maintenance services.

## C. Roads CIP

Taking annexations into consideration, Roads Division CIP and Planning Section has projected needs until the horizon year 2022 based on modeling done by the Puget Sound Regional Council (PSRC). Roads CIP is updated every year as part of King County's annual budget process. The CIP project spending plan in the near term is illustrated in Exhibit III-2.

**Exhibit III-2: Roads CIP Spending 2008-2013**




The Roads CIP Section anticipates a change in the type of projects in the plan: declines in major widening projects, and increases in smaller projects such as culvert replacement and pedestrian pathway projects. In other words, the mix of work that CIP does will change to favor smaller-scale projects for which Roads Maintenance has, in the past, been the preferred supplier. Therefore although the number of road miles in unincorporated King County will decrease, our analysis predicts that through 2028, Maintenance Section support work on CIP projects will remain equivalent to 24.5 FTEs.

## D. WLRD

WLRD foresees a decrease in Stormwater Services and Capital Projects and Open Space Acquisition (CPOSA) Sections work due to annexations and incorporations, and an increase in work due to climate change and FCZD work. Overall, Road Maintenance anticipates a net decrease of 10 FTEs from the 2008 budget level associated with support to WLRD projects over the next 20 years.

## E. Other Loan-Out Support

Other loan-out support includes any work unrelated to contracted work for partner cities, WLRD, or Roads CIP. Typically, support is provided to Solid Waste, Parks, Fleet, Animal Control and Public Safety among others. Roads Maintenance has provided consistent support to Parks and Solid Waste, and this assistance is projected to remain constant through 2028 at 11.1 FTEs of support.

## F. Emergency Response Workload

The post-annexation road mileage requires disproportionately more emergency response effort than the current mileage. Our analysis finds that there are many factors, discussed below and in Appendix A, that are increasing the volume of emergency response work. Therefore, for facility planning purposes we recommend planning based on a 50% increase in emergency response related work.

The emergency response workload does not decrease proportionately with loss of road jurisdiction for the following reasons:

- As a result of annexation, a larger percentage of roads will be in high-snow and flood areas which are particularly vulnerable to severe weather[9]
- Increased density of traffic on unincorporated county roads, arising from a 30% increase of VMT and a 10% increase in road miles associated with new development and road construction will highlight concerns related to the need for a higher standard of plowing and sanding frequency than the Section's current standard of once per shift[10]
- Changing precipitation patterns will impact workload associated with culverts, drainage and road closures due to increased flooding and slides

[9] Changon, S.A. *Frequency Distributions of Heavy Snowfall from Snowstorms in the United States*. Journal of Hydrologic Engineering, Vol 11. No. 5. 2006

[10] Zwaheln, H.T. *The Use of Average Traffic Speeds to Indicate Level of Roadway Snow and Ice Control Operations.* Transportation Research Board, 85th Annual Meeting. 2006

- As the average residential density of unincorporated areas of the county increases, the ability of the natural drainage system to absorb intense rainfall will diminish, putting an added strain on open ditch, enclosed ditch, and riverine drainage systems[11]
- Increased storm intensity and frequency due to climate change

Due to the above factors, operational and facility plans should be based on a projected increase of 15 FTEs in work directly related to emergency response events by 2028. The 15 FTEs results from the following: analysis of the budget finds the equivalent of 52 FTEs in emergency response work, the reduction in work load based on current budgeting is accounted for under the routine maintenance reductions, and we could assume it is at about 30 to 34 FTEs, therefore assuming at least a 50% increase in work, for the reasons listed above, we estimate 15 FTEs of extra work related to emergency response.

When considering emergency response workload and its impacts on Roads Maintenance it is important to note that:

- Significant storm events disrupt the regular maintenance work of the Roads Maintenance Section. Because Roads Maintenance as a policy does not staff for emergencies, all staff members must be mobilized to respond to emergency situations as they arise. Routine maintenance operations can be considerably postponed depending on a storm's duration and intensity.
- Decreases in staffing due to loss of contracts and annexation could impact how roads maintenance responds in emergency situations. The Road Services Division has a responsibility to dedicate employees to emergency events with contract cities should they arise. Unincorporated areas have priority for Roads Maintenance employees during emergencies since contract cities do not support the full spectrum of the Roads Maintenance budget.

With VMT traffic density increasing by at least 30% on those roads, sand and plowing once per shift may become an unacceptable standard. Roads Maintenance would do well to recruit to a higher level and be more proactive in its pursuit of small projects in the Roads CIP and other non-seasonal work to ensure a minimum staffing requirement during emergencies.[12]

## G. Other Trends Effect on Future Workload

While the number of unincorporated area road miles may decrease by 38%, the cumulative impact of the trends described in detail in Appendix A will increase the volume of work required to meet the county's level of service standards for scheduled maintenance. *The reduction in road miles does not equivalently reduce Road Maintenance staffing.* These assumptions are driven by concluding that the work required to provide the same level of

[11] Alfelor, R.M. *Weathering the Storm*. Public Roads, Vol 69, No. 3. 2005.
[12] Dlesk, R.J. & Bell, L.C. Outsourcing Versus In-House Highway Maintenance: Cost Comparison and Decision Factors. 2006. Clemson University, South Carolina Department of Transportation and Federal Highway Administration.

service will increase in rural areas and that some of the work standards have changed and/or will change requiring more labor.

A range of potential staffing impacts between 5 and 15 FTEs accounts for the inherent uncertainty in projecting the impacts of the following trends:

- *Vehicle Miles Traveled (VMT) on county roads will increase by about 30%*; Increased VMT affects the labor required for flagging. It also triggers the requirement for small projects and the addition of items to the maintenance inventory. In addition, increases in heavy vehicle use impacts pavement management requirements.
- *New development and road construction will continue to increase road miles within the unincorporated area.* Roads Maintenance projects an increase in roughly 114 new road miles between 2008 and 2028. Since roughly 1 FTE is required to maintain every 10.3 miles of roadway, Roads Maintenance projects an additional 11 FTEs in staff to maintain the unincorporated King County base by 2028.
- *More work is required per unit to meet level of service standards in the unincorporated areas.* County maintenance managers' experience indicates that it is easier to maintain inventory that has been annexed because cities have generally taken areas with the fewest maintenance problems.
- *Environmental regulation may double some requirements with respect to stormwater.* Roads Maintenance will continue to comply with the Endangered Species Act, the Clean Water Act, and environmental Best Management Practices (BMPs). Implications are acutely pertinent to rural and unincorporated King County which has a high concentration of critical areas requiring more BMPs, monitoring, and habitat restoration to complete major projects. Road Maintenance will still be required to update fish blocking culverts, largely located in rural areas.
- *Winter storms have the potential to double in intensity and frequency.* In addition to needs for emergency response, intense precipitation can cause significant degradation of shoulder and the roadway base. Periods of intense rain can cause micro size washouts of shoulders that are graded to current standards. Ditches may be scoured and culvert systems undersized resulting in urban flooding.
- *Demands on the SWAP program will not decrease proportionately to the loss of road miles.* This program supports the entire county including unincorporated areas, contract cities, and private sector vendors. Furthermore, new road standards must comply with the Clean Water Act, requiring increased street sweeping, catch basin cleaning and vactoring.

Although not required for facility consolidation recommendations, a more data driven assessment of the resources required to meet level of service standards on the road system after annexation will enable King County to better plan for future maintenance staffing and budget levels.

# H. Location Implications

The quantitative analyses in the section above estimate that Roads Maintenance field crew FTEs will fall from about 252.7 FTEs in 2008 to between 218 and 228 FTEs in 2028, depending on the range of impacts from environmental regulation, climate change, increased road miles, and VMT. (See summary FTE Exhibit III-1) Within that overall conclusion are some more specific conclusions that have implications for the locations at which these FTEs may be based over the next twenty years.

- As the Roads Maintenance Section workload changes in future years, the proportion of work may shift from general unincorporated area road maintenance to the more specialized work required to support loan out projects which is performed by Special Operations crews primarily based in Renton
- The emergency response workload will increase and the FTEs expended on emergency response will increase
- The emergency response effort will be most concentrated in the flood prone areas and higher elevations in the county
- During snow and ice events, emergency response efforts to deploy labor and equipment are more effectively mounted from a small number of large locations while raw materials such as sand and salt are more easily distributed in the field from multiple locations
- Crews can be more easily deployed from a larger pool of staff reporting into one base

# IV. Facilities Realignment and Consolidation Recommendations

■

## A. Summary

The ten existing Roads Maintenance crew facilities are located to serve a pre-annexation workload and road network. Nearly all sites are in need of substantial renovation to ensure employee safety and to guarantee structural integrity. Current Roads Maintenance crew facilities are in decline and disrepair.

Roads Maintenance should consolidate to three primary crew facilities (north, south, and central) with two smaller sites (east and west in the vicinity of Preston and Star Lake respectively) and maintain satellite facilities at Skykomish and Vashon. The future sites should be newly constructed or retrofitted to meet Roads Maintenance needs as well as LEED™ standards.

Over the coming decades, Roads Maintenance will face changes to the geographical distribution of work, the volume of work, and the type of work for which they will be responsible. The following are the primary changes in the volume, type, and location of work that necessitate consolidation and realignment of crew facilities:

- 38% reduction in unincorporated area road network
- Geographical redistribution to the east and rural part of unincorporated King County
- Projected reduction of 25 to 35 FTEs by 2028 for unincorporated area road maintenance considering both a decrease in road miles and routine maintenance and an increase in compliance with environmental regulation and potential increase in emergency weather events

The primary business drivers for the consolidation of crew facilities are:

- Efficient access to county road miles during normal working conditions and during emergency events. This is because the time it takes for crews and equipment to reach the job site is part of the cost. This study uses an assumption of a 30 minute drive time as the criterion for this driver
- Crew supervision and management. A smaller number of facilities with a consolidation of crews allows for more efficient assignment and allocation of labor to projects
- Efficient deployment of and access to equipment. The productive utilization of specialized equipment can be enhanced through consolidation

- Reduced carbon emissions. LEED™ certified buildings are energy efficient and have reduced carbon footprints compared with older, inefficient crew facilities
- Lower Operating Costs. Reducing redundant and surplus facilities directly reduces maintenance and engineering costs associated with facilities operations
- Lower equipment life-cycle costs. Most facilities are not able to properly garage maintenance equipment which affects equipment costs and out-of-service time

# B. Consolidation Criteria

## 1. Efficient Access to County Road Miles

Exhibit IV-1 is a map that overlays the current Roads Maintenance crew facilities onto county maintained roads (*after all annexations*). Some city roads may continue to be maintained by the county under contractual agreements. Exhibit IV-2 then shows the current distribution of employees between maintenance facilities. Fewer lane miles and decreased work performed by fewer staff are the main drivers behind redundant and surplus facilities.

## Exhibit IV-1: Roads After All Annexations

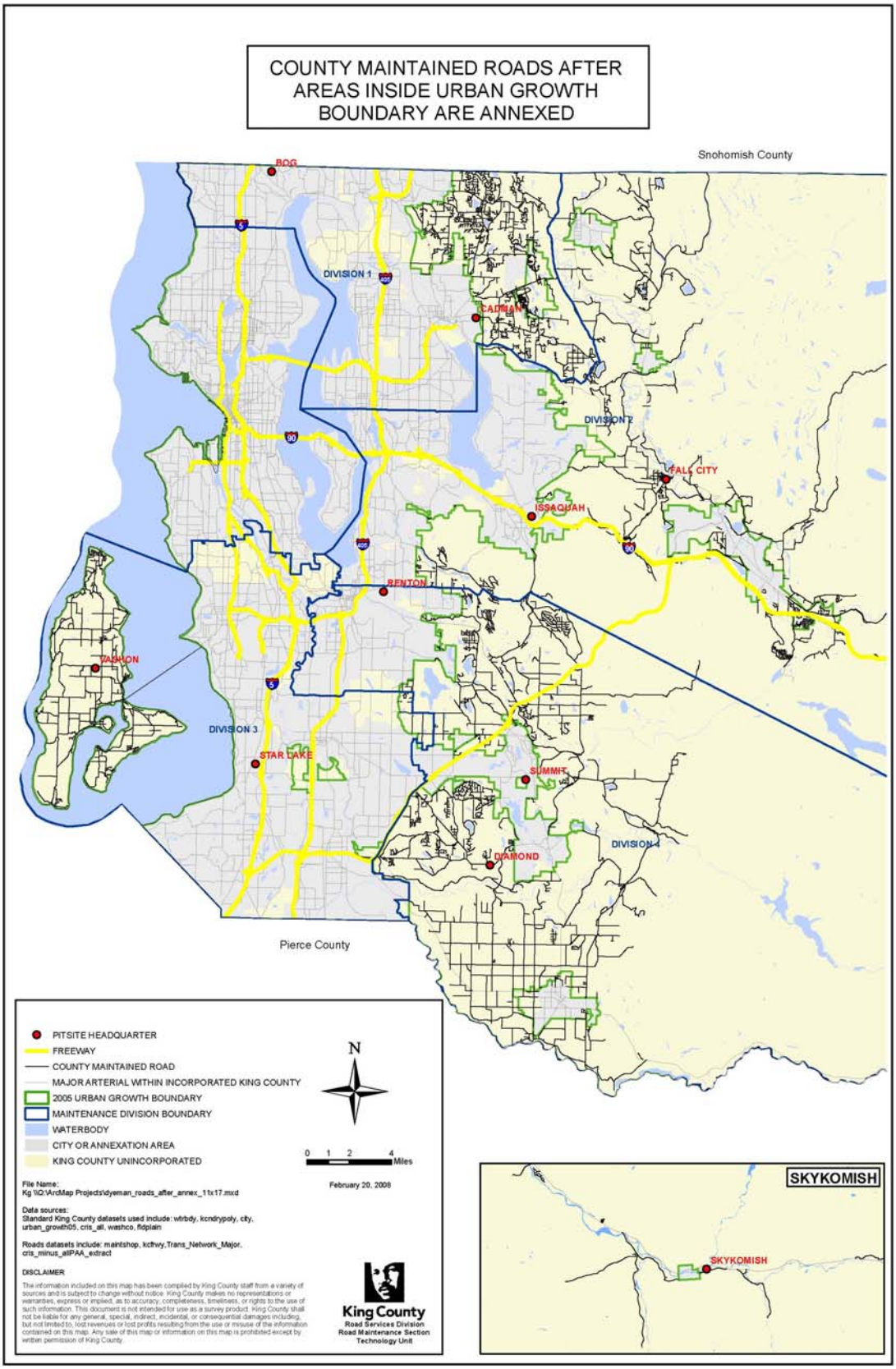


**Exhibit IV-2: Current Location of Crew Facilities**[13]

| Current Site | Current Staffing Assignment |
|---|---|
| Bog (Shoreline) | 8.0 |
| Cadman | 12.5 |
| Issaquah | 9.5 |
| Fall City | 14.5 |
| Renton | 204.5 |
| Summit | 15.5 |
| Diamond | 16.0 |
| Star Lake (West Kent) | 25.0 |
| Vashon | 7.0 |
| Skykomish (Stevens Pass) | 4.0 |
| Total | 316.5 |

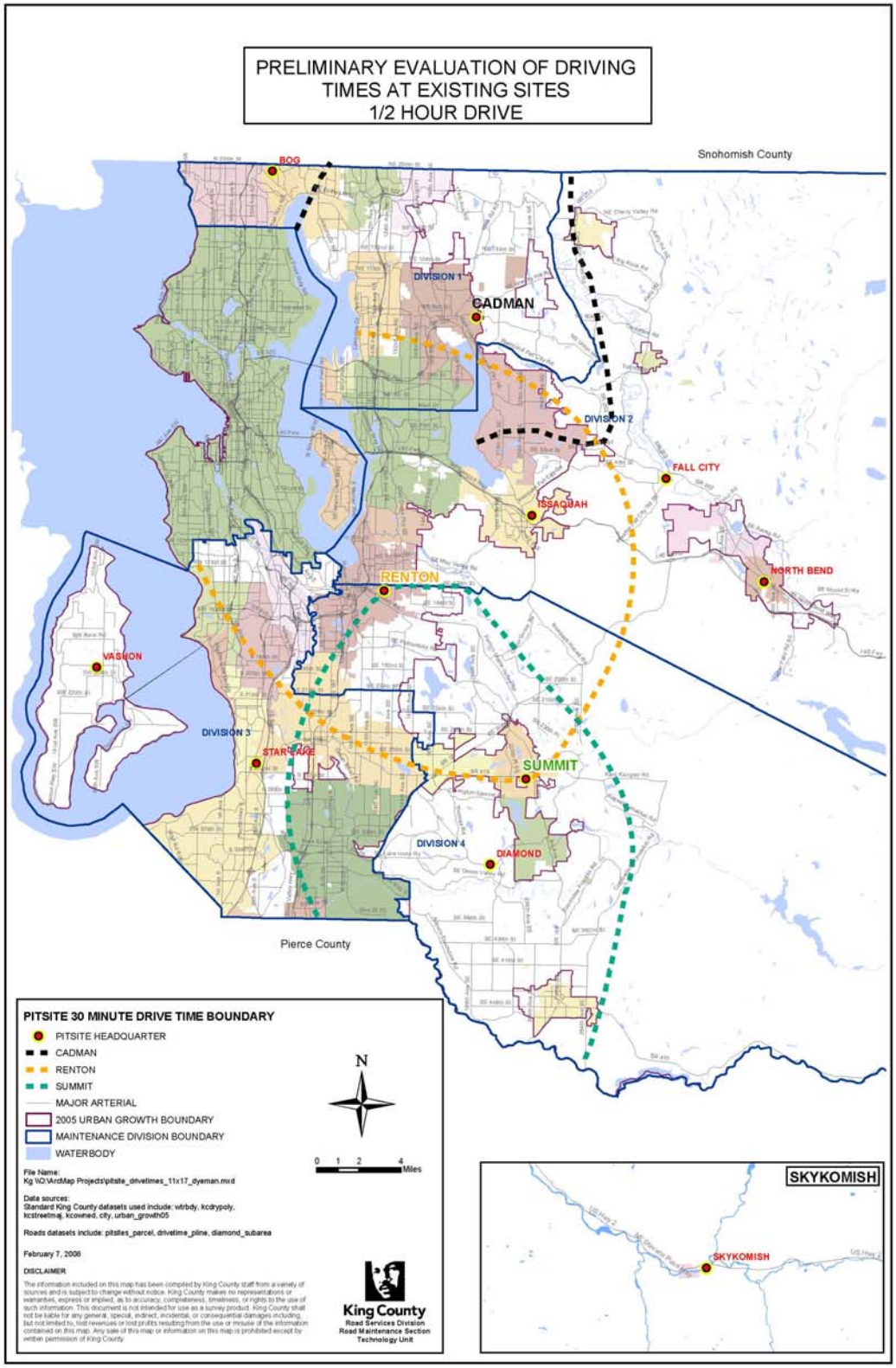
## 2. Drive Times

Balancing the economies of scale from consolidation with timely access to county roads is a driver for determining how to consolidate the current facilities. Given that there will be a need for fewer crew facilities, service areas were identified such that all county roads could be serviced within a 30-minute drive time. Exhibit IV-3 shows county roads, after annexation, which could be serviced within a 30 minute driving radius from the potential crew sites of Renton, Cadman, and Summit. This shows that many locations in the eastern part of the county could not be readily accessed. To meet this criterion, a smaller facility which can accommodate between 8 and 15 employees, would be needed in the eastern part of the county.

The data presented in Exhibit IV-3 likely understate travel times and accessibility during peak periods and weather events. These events tend to disproportionately increase east-west drive times while north-south drives are relatively less impacted.

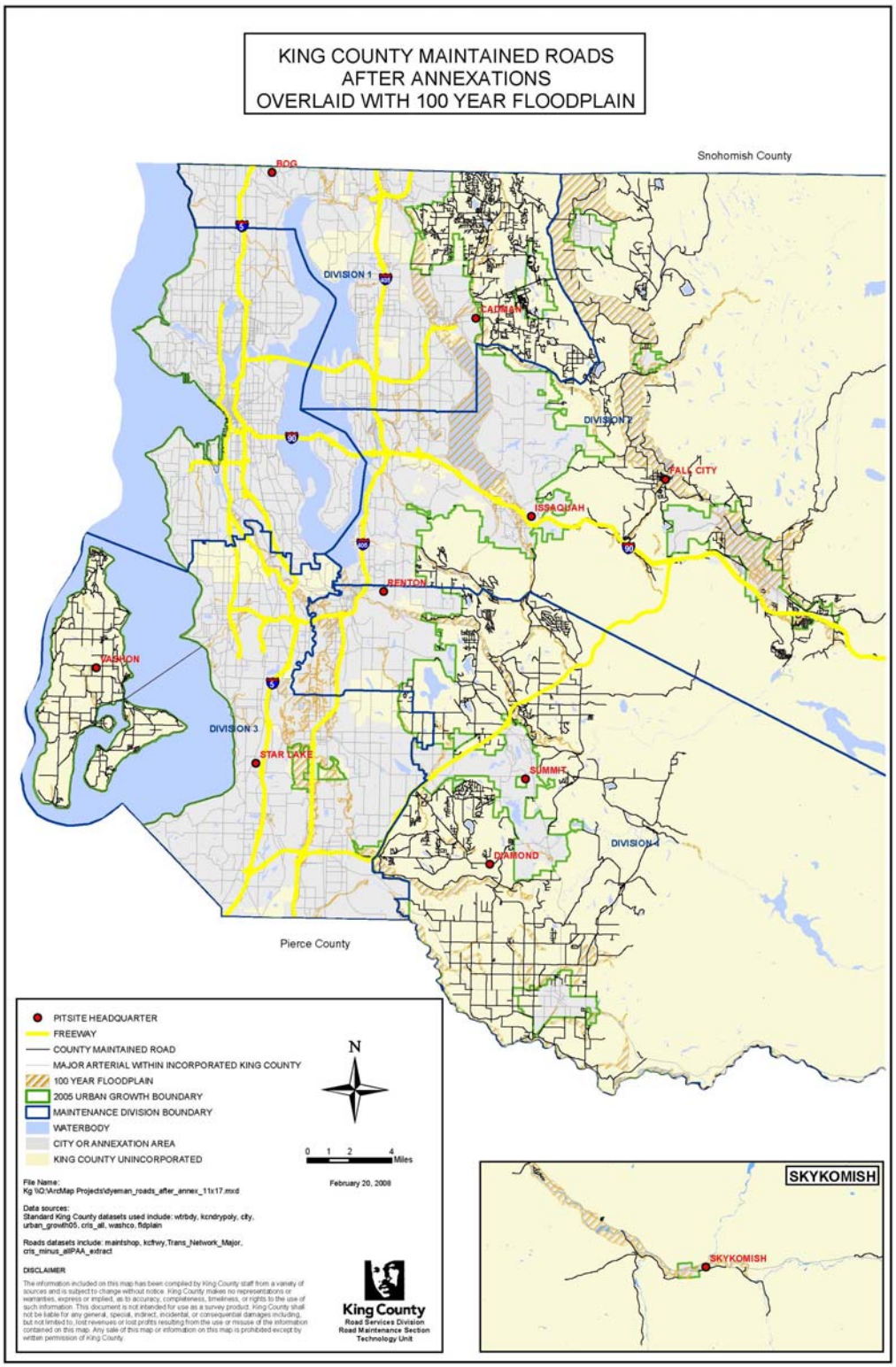
[13] Excludes seasonal hire extra help positions.The positions at Renton include Roads Maintenance Administrative, Engineering, Environmental, and Utility Inspection positions.The Renton numbers exclude positions from other sections in the Roads Division (Traffic, Soils Lab, Survey) and other agencies (Fleet, Parks).

## Exhibit IV-3: Estimated Driving Times



The eastern crew site would need to address accessibility to the Snoqualmie Valley during flooding and emergency events. Exhibit IV-4 on the following page shows the roads maintained after annexations overlaid with the 100 year flood plain. Many of Roads main arterials are directly located in the floodplain and during a flood, would be inaccessible. This underscores the importance of an eastern crew facility that would enable access to the eastern part of the county if an east/west route were closed due to flooding. In addition, location decisions will also need to consider issues related to snow and ice control services in the higher elevations of the county in areas like Wilderness Rim.

**Exhibit IV-4: King County Maintained Roads after Annexations Overlaid with 100-Year Floodplain**



Renton is centrally located within King County. Maintaining Renton as the headquarters for Special Operations, which must service the entire county, is most efficient for drive times.

## 3. Crew Supervision and Equipment Productivity

The consolidation of crew facilities will enable more efficient crew supervision and work force management. This provides greater flexibility when employees are unexpectedly absent. In addition, consolidation will allow for more efficient use of equipment. Equipment can be shared and deployed more effectively.

### a. Workload

A 38% decrease in the unincorporated area road network leaves Roads Maintenance with a high concentration of roads in the eastern part of the county. This part of the county is more susceptible to winter storm events and flooding concentrating workload in support of emergency and storm response. Increased support to WLRD and Roads CIP will concentrate workload in Special Operations. Roads CIP and WLRD work is best served through a central location. The benefits of retaining Renton as a headquarter are twofold; Renton is ideally located in a central location and is already established as the current headquarters of Special Operations.

### b. Risk Management

It is Roads Maintenance's responsibility to select crew facility locations that minimize response time to assets during emergency events. If a crew facility is inaccessible during an emergency such as flooding, property is at a risk of being damaged, and lives are at a risk of being lost. As crew facilities consolidate, it may be necessary to maintain additional satellite facilities for materials storage to ensure that gravel, salt, and other emergency related equipment are accessible and in closer proximity to where they are most needed during extreme weather events.

### c. Collocation Benefits

In addition to better serving the new geographical distribution of unincorporated King County, consolidating crew facilities could also have important collocation benefits. More compact operations centralize management and create efficiencies through the operation of multiple functions at a single site. For example, collocation benefits could include reduced equipment costs by providing space for mechanics to perform repairs and service at the crew facilities.

Renton has unique collocation benefits. Besides Special Operations and Administrative headquarters for Roads Maintenance, the Renton site also headquarters Fleet, Traffic Maintenance, Survey, Materials Lab, the Solid Waste Renton Transfer Station, and King County Parks Operations.

# C. Existing Property

A fine grained facility analysis that would allow comparison between specific facilities locations in the north, south, and east, was beyond the scope of this report. Nonetheless, there are unique aspects of maintenance operations which make selecting future crew facilities from existing properties logical. The following provides summary background on existing property.

**Property Inventory**

Roads Maintenance owns 46 properties totaling 1,154.93 acres. Properties owned by the Road Services Division can be divided into six categories: sites which are staffed and serve as regional crew facilities, sites which are used exclusively for storage, sites which are designated surplus and are in the process of being sold, sites which are used for mining, sites which are inactive and potentially surplus, and sites which are being held for environmental remediation purposes. This study addresses crew facilities.

**Roads Maintenance Current Crew Facilities**

Roads Maintenance currently has ten crew facilities including: Brugger's Bog, Cadman, Diamond, Fall City, Issaquah, Renton, Skykomish, Star Lake, Summit, and Vashon. Vashon and Skykomish serve as remote satellite facilities because of the relative isolation of the maintenance areas which they serve. The term "crew facility" is used to mean any site that is staffed and can range from 4 FTEs (Skykomish) to over 204 FTEs for Roads Maintenance (Renton).

Crew facilities are currently distributed into four geographic divisions with Renton acting as headquarters for Special Operations and Administration. This alignment was ideal when Roads Maintenance operations included service to the western and more urban part of the county but will not serve Roads Maintenance after annexations are complete in 2012 (For a map of unincorporated King County roads pre-1989, please see Appendix B, Exhibits B-5 and B-6.) In addition to suboptimal locations, many of these facilities are in obsolete physical condition and in need of major renovation.

The following is the current distribution of assignments to facilities:

- Planning Unit 1) Crew Facilities at Brugger's Bog in Shoreline and Cadman
- Planning Unit 2) Crew Facilities are at Fall City and Issaquah; satellite station in Skykomish
- Planning Unit 3) Crew Facility at Star Lake and satellite station at Vashon Island
- Planning Unit 4) Crew Facilities at Summit and Diamond
- Planning Units 7-11) Renton serves as headquarters for Special Operations as well as Administration, Maintenance Engineering, Environmental, and Technology Roads Maintenance Staff

The analysis in this report addresses the volume, type, and location of work that Roads Maintenance faces in the coming decades but did not include a financial analysis that would compare the net present value of different crew facility scenarios and consolidated

configurations accounting for the quantifiable business benefits and costs of consolidation into new facilities. Such a fine grained analysis would allow comparison between specific facilities locations in the north, south, and east. The Facilities Master Plan should address the fiscal impacts of such specific real-estate decisions.

Pierce County has recently gone through a successful consolidation of their maintenance crew facilities and identified $6 million in savings over 20 years for taxpayers as well as an overall 13% improvement in productivity and efficiency of staff as a direct result of consolidation. There is strong evidence from Pierce County's experience to support the business case for consolidating Roads Maintenance crew facilities.

# D. Recommendations: Facilities Realignment

Considering the changing business drivers and the crew facility consolidation criteria identified above, Dye Management Group Inc. concludes that Roads Maintenance will be best served by three main crew facilities divided into northern, central, and southern regions, two smaller crew sites in the eastern region and Star Lake, and the two satellite operations at Vashon and Skykomish. The central headquarter site, Renton, would continue to serve as headquarters for administration, engineering, and technology as well as Special Operations and other county offices. Satellite operations at Vashon and Skykomish are well situated and should continue to operate out of their present locations.

Annexation schedules and contract renewals are beyond the control of Roads Maintenance. To accommodate tentative annexation time tables and uncertainty regarding future contracts, Roads Maintenance may find it necessary to proceed with consolidation in stages. This will enable them to remain flexible and respond appropriately even as service areas are in a state of flux.

**North Regional Road Maintenance Crew Facility**

In the North, Cadman appears to be the site best suited for a regional road maintenance crew facility. The Cadman site is relatively large, centrally positioned to service northern unincorporated King County, and is permitted and equipped with offices, garages, equipment and material storage, scales, as well as a decant facility. Significant improvements would be necessary as buildings are old and in disrepair. There is not sufficient covered storage for equipment and the decant station is not open to the public.

**East Regional Sub-Crew Facility**

In the East, the existing facilities of Fall City and Issaquah do not appear to be adequate to serve Roads Maintenance future needs. Fall City is located on a small lot near the Raging River and much of the area served by Issaquah is in the Eastgate and Klahanie PAA. The business analysis of this report suggests a much more detailed location study that evaluates the specific needs of winter maintenance, flooding trends of the Snoqualmie Valley, and other requirements for locating an eastern sub-crew facility or satellite site.

**South Regional Road Maintenance Crew Facility**

In the South, Diamond and Summit should be consolidated and an appropriate alternate site selected as a regional road maintenance crew facility.

**Central Headquarter**

Renton would continue to serve as headquarters for Administration, Engineering, and Environmental as well as Special Operations Work Units.

**Star Lake- Crew Facility**

Since the future relationship of Burien, North Highline, and Roads Maintenance is unknown, it is important that Roads Maintenance remains flexible and adaptable to various annexation scenarios. Currently, the Star Lake facility services the majority of Burien's needs. This facility should likely remain operational as long as the city contract remains at the 2008 service level.

# E. Recommendations: Business Practices

The following recommendations address business practices that drive facility needs:

## 1. Budget for Maintenance Emergency Activities

The current practice is to use the maintenance budget and seek supplemental funding. Maintenance has sometimes received additional deferred maintenance funding; however, the supplement has not covered the entire amount of work deferred. The net effect of emergency response work without deferred maintenance appears to be a reduction in maintenance level of service and a growing backlog. This actually increases the costs of maintenance and can reduce the life of the county's road assets. Increasing backlogs of deferred maintenance work indicate that Roads Maintenance is diverting employees to storm and emergency response. Storms have become frequent events and stormless winters atypical; Roads Maintenance should budget to reflect shifting climate patterns by creating an emergency event storm response contingency reserve in fund balance and specifically accounting for all the costs associated with major storm events.

## 2. Roads Maintenance Should Aggressively Pursue More Contracts through Active Marketing

King County Roads Maintenance is both Roads CIP and WLRD's preferred contractor, particularly for small projects. It is important that Roads Maintenance seek to maintain flexible schedules for contract projects to distribute the workload evenly. Budgeting for these projects will enable Road Maintenance to maintain a high caliber of road maintenance operations in the unincorporated area. In the face of declining responsibilities due to annexation activity, increasing loan out labor associated with

support to Roads CIP and WLRD enables Roads Maintenance to shift these additional employees to provide emergency response when necessary, enables a large pool of staff expertise and equipment, and enables recovery of a portion of the Section's overhead costs. Contracts with other organizations including King County Solid Waste, Parks and Recreation Division, and Seattle City Light should also be considered.

## 3. Update Maintenance Management System Production Standards to Better Link Maintenance Budgeting and Maintenance Level of Service

With new best management practices, specifications and other factors that effect production factors for maintenance activities updated standards are required. These will enable better budgeting and analysis of the link between the FTEs, equipment, and materials required to meet maintenance level of service standards. Such information can also be used to perform an analysis of the labor required to meet King County's maintenance level of service standards. This can provide highly accurate data to plan for and budget future Roads Maintenance FTE levels.

# Appendix A

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## A. Trends Affecting Future Roads Maintenance Workload

This section describes the projected trends in the county that will affect the volume, type, and geographical distribution of work performed by Roads Maintenance. The trends addressed include: annexations, changes in business practices, changes in the physical environment, as well as changes in environmental regulation.

## B. Summary

Changes within King County beyond the control of Roads Maintenance will affect the responsibilities of the Road Services Division in the coming decades. Population growth dynamics, changing economic patterns, as well as major annexations and incorporations within the Urban Growth Area (UGA) will concentrate workloads to the east and rural side of the county. Changing environmental regulations and climate patterns will influence the specific functional needs of Roads Maintenance operations. The impacts of these trends are explained in more detail in this section.

## C. Annexation

By 2012, the county assumes that cities will annex all land within the Urban Growth Area. Roads Maintenance will be responsible for 1,090 road miles, a reduction of 38% from 1,768 unincorporated area road miles in 2008.[14]

**Uncertainty**: Exact time-line of annexations

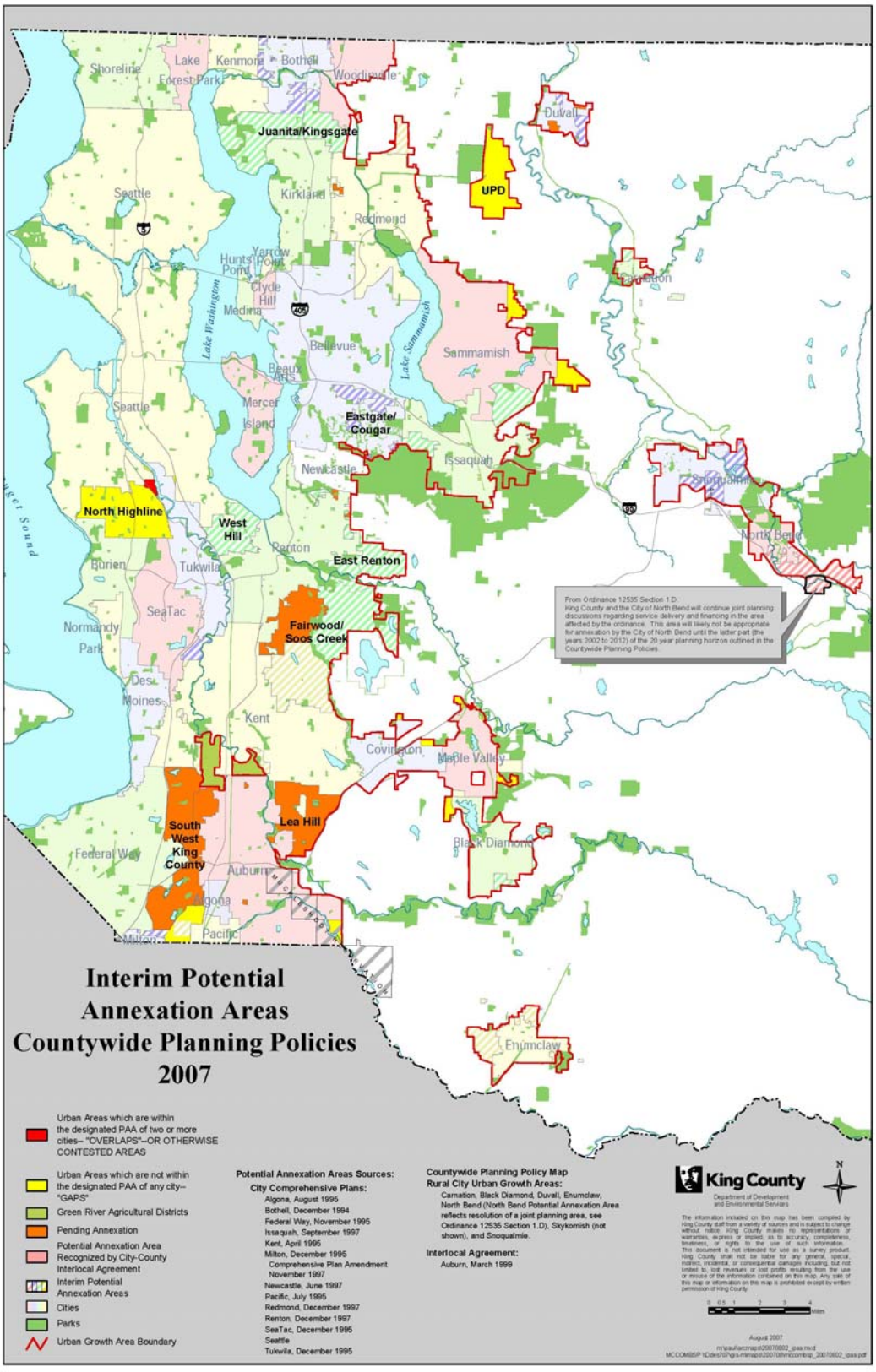
Annexations and incorporations are beyond the control of the county yet are critical to understanding and evaluating future responsibilities of Roads Maintenance. Voter approval is necessary for an unincorporated area to become annexed by a city and political support and exact timelines can be difficult to assess with any certainty. Nonetheless, the Countywide Planning Policies (CPP) developed jointly by the cities and King County in the early 1990s as required by the state Growth Management Act (GMA) state the goal that all unincorporated areas of King County within the urban-designated areas be annexed by neighboring cities by 2012. Consequently, the number of road miles in unincorporated King County for which Roads Maintenance is directly responsible will decrease by 38%, from 1768.3 miles in 2008 to 1090.4 road miles in 2028.

[14] This number does not include new road miles within unincorporated King County, only miles directly lost to annexation. Roads Maintenance expects 114 miles of new construction in unincorporated King County over the next twenty years for a total of 1204 miles.

Roads Maintenance currently provides support to partner cities on a contract to contract basis. (See Exhibit II-3, page 8) Cities choose areas within the UGA to annex. If assets within a particular region are in disrepair, or if a particular region has low property values, the city may delay annexation. This concentrates assets in poor condition, which require significant work and investment, within the county's jurisdiction. Roads Maintenance believes that the unincorporated areas left, and in particular the older, urban areas, are costing more to maintain and therefore are not achieving designated levels of service. Examples include West Hill and North Highline, which are some of the last to be annexed.

Geographically, annexations will progressively shift the unincorporated base to the eastern and rural part of the county. Areas in eastern King County include numerous stream crossings which require more environmental considerations as well as flooding and snow and ice emergencies. Although there are fewer roads in the unincorporated King County base, Roads Maintenance experiences a disproportionate volume of work in these areas. The unincorporated King County base will still include the Snoqualmie Valley and the Wilderness Rim, a one thousand home subdivision in the rural area, and other high elevation locations. The Snoqualmie Valley is particularly prone to seasonal flooding events and the Wilderness Rim is located at a high elevation necessitating steady snow and ice removal. Exhibit A-1 on the following page shows the potential annexation areas within King County. For an illustration of King County maintained roads after annexation, please refer to Exhibit IV-1.

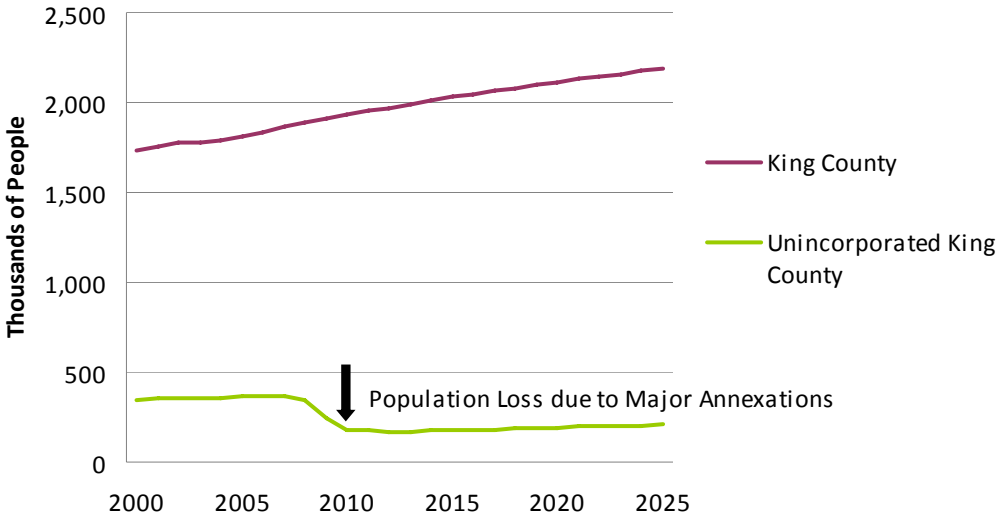
## Exhibit A-1: Interim Potential Annexation Areas



# D. Population Growth and New Road-Miles

Population growth within unincorporated King County is projected to be roughly 3000 persons per year after the completion of the annexation initiative as shown in Exhibit A-2. This population growth increases the workload volume by 6% through 2028. This will contribute to continued growth in the unincorporated county road system, with 114 new lane-miles added to the system over the next 20 years.

**Exhibit A-2: Forecast Population in Incorporated (Red) and Unincorporated King County (Green)**[15]




Note: Exhibit III-3 is based on projected annexation/incorporations guides and should be used only as a very rough indication of potential population trends. King County Population Assumptions:[16] Forecast of King County total population based on WA State OFM "intermediate" projection released December 2007. Assumes annexation initiative proceeds as scheduled, with all but two PAAs annexed by 2011. Assumes last two PAAs, Eastgate and Klahanie, annex by 2012. After 2012, assumes annual growth of 3,000 persons per year in unincorporated King County, primarily rural.

# E. Economic Growth and Vehicle Miles Traveled (VMT)

VMT, which is projected to increase at roughly 1.3-1.5% per year through 2028, is directly linked to population growth, economic growth, and employment.[17] This translates to significant VMT growth of about 30% by 2028.

**Uncertainty**: Impacts of urban/rural interface on traffic and safety patterns

[15] Felt, Chandler Demographer; This figure was compiled with the assistance of Chandler Felt, King County Demographer, Office of Management and Budget

[16] Felt, Chandler, Demographer; WA State Office of Financial Management, cities of King County, King County Budget Office, 2004; updated January 2008 (very rough)

[17] Puget Sound Regional Council. "Puget Sound Trends: Vehicle Miles Traveled" August, 2007

While the King County Comprehensive Plan expects population and employment growth to be contained within the UGA, there will also be some growth in the smaller incorporated areas in eastern King County and some in unincorporated King County. The classification of some of unincorporated King County as "rural" is largely a misnomer, as growth distribution more closely resembles "exurbia." Exurbia is typically characterized as not fully suburban and not fully rural; low density communities located on the suburban fringe with high population growth from a low base and a high percentage of commuters who make journey-to-work trips to the suburbs or other urban districts.

This is supported by data from the Puget Sound Regional Council which found that between 1999 and 2006, the average commute in King County increased by 5%.[18] Increased commutes disproportionately affect residents of unincorporated King County, particularly residents of eastern King County. These residents have some of the longest driving distances to work within the Puget Sound region, a mean distance of 24.9 miles in 2006 for a 13% increase from 1999-2006.[19] Employment and population trends directly affect VMT within King County. Historically in the Puget Sound region, population has been growing at about 1.4% per year, employment at about 1.5%, and VMT at 1.3%.

Although VMT is expected to increase 30% in the next 20 years, Roads Maintenance estimates a growth in the road system of only 114 miles, or about 10%, based on historical changes over the past ten years.[20] This low ratio of increasing VMT to increasing new roads implies an increase in congestion on existing roads. Increased VMT could further stress a road system ill-equipped for changing traffic patterns and volume. There will be resulting improvements to address safety and related needs that will add to maintenance inventory.

Increases in the urban-rural interface will have significant impacts on Roads Maintenance operations. Although it is difficult to quantify to what extent shifting demographics within unincorporated King County will impact roads maintenance in terms of increased volume of maintenance work, certain safety issues, such as increased flagging for work zone safety, should be anticipated.

## F. Environmental Regulation

The principal environmental regulations and policies affecting Roads Maintenance workload are:

- Clean Water Act (CWA): Increased National Pollutant Discharge Elimination System (NPDES) permitting requirements for the Stormwater Management Program (SWMP)
- King County Critical Areas Ordinance

[18] Puget Sound Regional Council. "Puget Sound Trends: Vehicle Miles Traveled" August, 2007
[19] Ibid.
[20] From 1998-2007, there were 57 new miles of road in the unincorporated King County base (not including areas within the Urban Growth Boundary). Assuming a continued rate of road growth, there will be 114 new miles of road in 2027.

- Endangered Species Act (ESA): Direct regulatory requirements on maintenance activities as well as retrofit initiatives to bring existing infrastructure into compliance, such as culvert replacement
- Regulations relating to the handling of road/construction waste materials
- Compliance with the Clean Air Act
- King County Climate Change Action Plan (GHG Regulation)

**Uncertainty**: Quantification of the increased work required to follow best management practices in maintenance activities in compliance with these policies and regulations, as well as the political climate surrounding climate change.

## 1. Clean Water Act: National Pollutant Discharge Elimination System Permits (NPDES)

Under the Clean Water Act (CWA), the Environmental Protection Agency (EPA) requires all point sources (localized sources) discharging pollutants into US waterways to obtain permits. Authority for enforcement of the CWA in Washington State has been delegated to the Washington State Department of Ecology (hereafter referred to as "Ecology"). Ecology has implemented NPDES permitting in a phased approach. Section 5 (S5) of the Phase I Municipal Stormwater NPDES Permit requires government agencies to create a Stormwater Management Program (SWMP).[21] This program documents compliance with Section 5 and details implications for the general operation and maintenance of programs within the King County Roads Maintenance Section. Roads Maintenance anticipates changes in the following areas:

- Increased cleaning, repair, maintenance, and installation of stormwater facilities
- Increased street sweeping
- Increase in maintenance of road rights-of-way and associated structures
- New inspection programs
- Increased catch basin cleaning
- Implementation of Illicit Discharge Detection and Elimination (IDDE) Training
- Increased permit requirements for controlling runoff from new developments, redevelopment, and construction sites
- Implementation of environmental best management practices , particularly in the area of erosion and sediment control
- Increased sampling (parameters, frequency, locations), reporting, and monitoring

[21] King County Roads Maintenance. "The Stormwater Management Program (SWMP)—Section 5(S5) of the Phase I Municipal Stormwater NPDES Permit" SWMP Presentation. January 31st, 2008.

Changes to this program are of particular importance to the amount of vactoring (decanting) done by King County and the cities. More precipitation falling as rain rather than snow directly leads to an increase in stormwater runoff. Stormwater, especially stormwater that runs over pavement, has a relatively high concentration of pollutants that collect in catch basins and require increased vactoring to comply with NPDES permits.[22] In light of these new environmental regulations, it is likely that the quantity and frequency of vactored catchbasins and street sweeping will place new demands on Division maintenance operations as well as on the Street Waste Alternative Program (SWAP). The Roads Maintenance budget forecasts additional revenue from a growth in vactoring and estimates large increases in the decant program.[23]

King County Road Maintenance Service anticipates that NPDES requirements will increase the amount of monitoring and reporting needed on a project, facility, and regional basis. The Department of Ecology is currently establishing pollutant thresholds, or Total Maximum Daily Loads (TMDL), to limit the amount of pollutants discharged into water quality impaired receiving waters. Ecology has increased its inspection staff for NPDES-permitted sites, with an increase in the frequency of impromptu compliance inspections. At present, no TMDLs have been established in unincorporated King County. However, the establishment of TMDLs is inevitable since King County's storm water system within the road right-of-way is so large. Furthermore, King County Road Maintenance may be required to retrofit drainage systems within unincorporated King County to comply with the TMDLs.

Current permit requirements have been appealed by environmental groups claiming that the requirements are too lenient. It is not clear what the outcome of these appeals will be and if environmental groups are dissatisfied with the results of these appeals, they may seek relief through the judicial system. Nonetheless, it is likely that the current permit, in effect for the next five years, will be re-issued with more stringent requirements upon expiration.

Stormwater and water quality best management practices will be required more in rural areas because fish and wildlife habitat in those areas are the most extensive. State, federal, and local permit agencies have historically focused on protecting these areas. More stringent requirements are anticipated for mitigation, stormwater controls, best management practice usage, and potential retrofits in rural areas. Rural habitat protection is the main focus in many of the Water Resource Inventory Area (WRIA) plans, Puget Sound Partnership, and salmon recovery plans, and will continue to increase regulation and cost of maintaining roadways in those areas.

The new NPDES Construction Permit has reduced the threshold for permit requirements from 1 acre to 5,000 square feet of land clearing. This will require more review, cost, monitoring, and mitigation for many construction projects. Based on concerns regarding increased pollution and runoff from construction sites, it is likely

[22] Washington State Department of Ecology.
[23] Department of Transportation Roads Maintenance Division 2008 Budget (unadopted).

that the 5,000 square feet threshold will be reduced further. As a consequence, King County Roads Maintenance will be applying for and securing more permits for its projects. Increased compliance monitoring will be required in order to meet environmental conditions associated with those permits.

## 2. Other Environmental Permitting

Projects that at one time were routine now require more environmental review work, documenting the need for the project, evaluating impacts, designing mitigation, meeting with federal representatives, preparing permit application documents and biological evaluations, and performing post-construction monitoring. As additional species, both plant and animal are recognized as threatened or endangered, and as other activities are seen as contributing to their decline, the regulatory framework in which maintenance must be undertaken will continue to become more complex, time consuming, and expensive.

Road Maintenance construction projects must obtain various permits from county, state, and federal agencies. These permits include Washington State Department of Fish and Wildlife Hydraulic Project Approval (HPA), Army Corps of Engineers (ACOE) nationwide permits, King County Department of Development and Environmental Services (KCDDES) clearing and grading, and Shoreline Management Area (SMA) approvals.

The Army Corps of Engineers (ACOE) is concerned about the increased amount of pollutants entering water bodies in storm water and it is anticipated that increased regulation will be utilized as a means to address this concern. The ACOE is expanding its jurisdiction to include smaller streams, wetlands and ditches in county owned rights-of-way which will increase: permitting time, monitoring requirements before, during and after construction, mitigation requirements; and ultimately costs for both Division and Special Operations projects are expected to increase.

Regulations governing construction activities conducted within sensitive or threatened species habitat areas are subject to frequent changes. These changes can be driven by legislative actions at the federal, state, or local level, or adjudicated in response to citizen lawsuits. These regulatory changes generally increase the number of projects that are subject to regulation while, at the same time, making the design, study, construction, and monitoring requirements more complex, rigorous, and costly. For example, the recent Supreme Court decision regarding Rapanos has ruled that small streams and ditches that were once unregulated at the federal level are now jurisdictional waters of the ACOE, which has a major impact on KCDOT's permitting, design, maintenance, and construction workload.[24] As a result of the Rapanos decision, these areas that were formerly free of federal oversight are now regulated.

[24] Rapanos et.ux., et al. v. U.S.

## 3. Green House Gas (GHG) Regulation

King County, along with California and Massachusetts, is taking a proactive stance and implementing relatively aggressive adaptation strategies to tackle climate change. Currently these are the only state and local governments to legislate climate-change analysis in the state environmental review process for land development. King County requires climate change mitigation and adaptation factors to be included in cost-benefit evaluations for projects within the county.[25] King County Executive Ron Sims has targeted the transportation sector as the biggest challenge to climate change mitigation within King County.[26] Although most GHG reduction responsibilities belong to Fleet and Transit divisions within the King County Department of Transportation, this policy initiative will bring Roads Maintenance operations under greater scrutiny.[27] For King County to achieve its climate change goals, the entire DOT, including Roads Maintenance, will have to make significant changes in facilities, equipment, and operations.

In 2006, King County became the first county to join the Chicago Climate Exchange (CCX), a voluntary, legally binding, carbon emissions trading and offset market. The effectiveness of a carbon trading program depends on the thorough, up-to-date, and transparent disclosure of all emissions contributing to climate change. Accurate representation of emissions establishes baselines from which progress can be benchmarked and measured. Recording and tracking emissions will require additional administrative and support work on the part of Roads Maintenance. Furthermore, financial penalties result if the goals of CCX are not met.

By 2050, King County is to reduce greenhouse gas (GHG) emissions by 80% below 2007 levels. The most effective way to reduce GHG emissions is to not produce them in the first place. The greatest potential for reducing GHG emissions within the Roads Maintenance sector is to minimize employee drive time by strategically locating crew facilities. Proximity to worksites will be a major consideration when determining where new Roads Maintenance crew facilities should be located.

Another opportunity for Roads Maintenance to minimize GHG impacts is to replace energy intensive facilities. King County's Green Building Ordinance requires all new construction and renovations of government facilities with budgets of over $250,000 to attain the highest achievable level of LEED™ certification (Leadership in Energy and Environmental Design). Since many Roads Maintenance buildings are in disrepair and are currently on-track for major renovations, Roads Maintenance will have the dual opportunity to improve facilities while simultaneously decreasing their carbon footprint by eliminating energy inefficient buildings.

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[25] Executive Orders on Global Warming Preparedness (PUT 7-5, 7-7, and 7-8)

[26] Ron Sims "Town Meeting with Politicians on Solutions to Climate Change" University of Washington January 31, 2008.

[27] As of 2008, the use of state vehicles (Fleet) and employee vehicles (Non Fleet) comprise the second largest source of GHG emissions within the County, or 38% of total emissions (13.8 million $MTCO_2^e$ annually)

## 4. Continued Compliance with the Endangered Species Act

Roads Maintenance may have increased responsibilities in relation to ESA compliance. Recently adopted best management practices and any new best management practices required for ESA compliance increase the amount of work required to perform maintenance activities per mile of roadway or per maintenance feature. This is a major contributing factor to increased Road Maintenance workload.

**Uncertainties**: New best management practices regarding ditch maintenance, roadside vegetation control, chip sealing, and sea wall restoration in compliance with ESA are unknown. New-listings, or de-listings, of additional species as endangered or threatened are uncertain.

The purpose of the ESA of 1973 is to protect animal and plant species as well as the "the ecosystems upon which they depend." King County is subject to the enforcement authority of three federal agencies under the ESA.

In response to the ESA listings of Chinook salmon and bull trout in 1999 and 2001 respectively, the Regional Road Maintenance ESA Program (RRMP) was developed and approved by National Marine Fisheries Service (NMFS) to provide legal protection under Section 4(d) of the ESA for species under their jurisdiction. The National Oceanic and Atmospheric Administration (NOAA) Fisheries approved the program and issued a Biological Opinion to thirty agencies in August 2003. The Biological Opinion gives Roads Maintenance an affirmative defense by NOAA Fisheries against a potential third-party lawsuit. The Biological Opinion applies through the end of the calendar year 2008. Roads Maintenance is currently working with NOAA to get the program re-approved for an additional 5 years.

In 2008, negotiations will occur with the Army Corps of Engineers (ACOE) and the United States Fish and Wildlife Service (USFWS) to approve the program under Section 7 of the ESA, and will include all 185 of the endangered, threatened, and candidate aquatic and terrestrial species in Washington State. [28]

Anticipated future federal listing of clams, mussels, other fish, and amphibian species found in King County will impact road maintenance work. Orca and steelhead were recently listed as threatened in Puget Sound and listing of other species is anticipated. The Wild Fish Conservancy, Sierra Club, and other resource protection groups are researching the need for other listings under the ESA. Lake Washington kokanee, sea run cutthroat trout, several freshwater clam species, and Coho salmon are potential listings. The status of Pacific smelt and five species of rockfish in Puget Sound is being reviewed by NOAA for ESA listing.

The consequences of such listings will require negotiated addenda to the existing Regional Roads Maintenance ESA Management Program (RRMP), and additional restrictions or requirements. Examples of these additional restrictions and

[28] USFWS does not have a comparable 4 (d) program.

requirements are: more sampling, monitoring, mitigation and reporting to government agencies, changes in conservation areas (buffers), and/or new operational requirements such as Best Management Practices (BMPs). In addition, new listings will require King County Roads Maintenance Environmental Unit to prepare more Biological Assessments (BA) for future maintenance projects, with increased consultation with federal agencies.

Additional changes in ESA requirements may result from third-party lawsuits against the county if salmon or other listed species are thought to be impacted by Road Maintenance actions.

Washington State law (RCW 77.57.030) requires that all road and bridges be installed and maintained to provide unrestricted fish passage.

In August 2007, the Washington State Department of Transportation (WSDOT) lost a law suit brought by the Treaty Tribes of Washington regarding fish barriers in state owned rights-of-way. The US District Court sustained the Tribes' allegation that failure to provide fish passage at road crossings, and a failure to restore passage in a timely manner, breached the Tribes' Treaty rights with respect to fisheries. The Court has not yet determined restitution but it can be anticipated that the Court will require a substantially increased commitment by WSDOT to restoring fish passage. As the jurisdiction with the second largest number of culverts, King County Road Maintenance Services recognizes that the county has exposure to law suits by the Treaty Tribes. If the Tribes decide to sue King County, it is likely that the county will be required to complete an inventory of culvert fish barriers, and increase the number of barriers removed per year. Both of these tasks will increase the workload for Roads Maintenance staff.

## G. Climate Change

Increased storm frequency and/or intensity will contribute to a significant increase in storm and emergency response. Climate models predict a broad range of impacts on emergency operations, anywhere from an increase of 50% to 100% in the next 20 years.[29] Furthermore, portions of unincorporated King County are susceptible to flooding and snowstorms. For this reason, despite a loss of jurisdiction due to annexation, work associated with emergency events in unincorporated King County could remain relatively stable in the coming decades and depending on the effects of climate change, emergency events in this region could increase substantially. Climate change could increase health concerns associated with West Nile Virus which would require larvacide or mechanical means of removing standing water (vactoring) in catch basins, ditches, and ponds in the event of a breakout.

[29] This figure is calculated based on an accumulation of knowledge about climate projections from the University of Washington Climate Impacts Group as well as review of recent weather patterns in the Puget Sound region

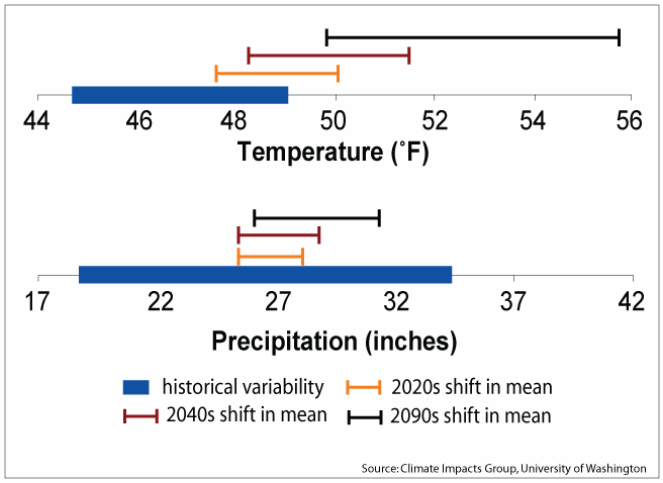
**Uncertainty:** Since it is nearly impossible to quantify increased frequency and intensity of storms with any certainty, the full potential for impacts on Roads Maintenance can not be defined. For example, changes in peak flow of rivers and changing salmon spawning patterns could alter the "fish window" and limit the amount of work Roads Maintenance is able to perform due to the impact on labor distribution. There would also be impacts associated with demands for higher levels of emergency response, increased liability for damages, and deterioration to the roadway infrastructure.

While the exact impacts of climate change are ambiguous at the local level, it is possible to predict regional trends. Temperatures in the Pacific Northwest have increased 1-3° F and annual precipitation has increased 10% since the beginning of the 20th century. Climate models produced by the University of Washington Climate Impacts Group project that by 2030, temperatures will increase another 3° Fahrenheit and by 2050, temperatures will have increased 5° Fahrenheit.[30] Climate is acutely sensitive to ostensibly small changes in temperature. For every degree of warming, the snow level rises 300 feet. Increased precipitation as rain coupled with a rising snow level translates to increased winter flooding events and increased risk for landslides throughout the Pacific Northwest.

Precipitation patterns are of particular importance to Roads Maintenance. Although total precipitation is not projected to intensify significantly, precipitation will become more concentrated and unevenly spread during an annual climate cycle. Precipitation projections by the University of Washington Climate Impacts Group indicate that historically extreme precipitation events will intensify; heavy rain days will become heavier, while dry days will be even drier. Winter flood conditions will be followed by reduced summertime stream flow conditions, in other words, the Pacific Northwest will experience wetter winters and drier summers and more intense storms in general.[31] The results of this research are summarized in Exhibit A-3.

[30] Climate Change Impacts on the United States *The Potential Consequences of Climate Variability and Change: Pacific Northwest Region;* National Assessment Synthesis Team, US Global Change Research Program; 2000.
[31] 2007 King County Climate Plan

**Exhibit A-3: Climate Change Impacts on Temperature and Precipitation in the Pacific Northwest through 2090** [32]




The effects of climate change are becoming apparent throughout Washington State. Windstorms, heat waves, droughts, dust storms and extreme rain and snow are now typical of any given season. In the 1970s, large forest fires (>500 acres) occurred at the rate of six per year, while today, the figure is closer to 21 major forest fires per year.[33] Loss of snow pack in the Cascade Mountains translates to historic 50 year droughts occurring every ten years, and historic ten year droughts occurring every two years.[34]

Roads Maintenance operations may already be experiencing the effects of climate change. Roads Maintenance reports several major abnormal flooding events in the past 5 years with five back-to-back storm events in King County between November 2006 and February 2007. The 2005-2006 storm season was also abnormally active with 58 winter storm projects, thirty of which exceeded $30,000 in repairs.[35] While it is impossible to link these events in isolation to global climate change, it is reasonable and realistic to expect an increase in storm frequency and intensity in the coming decades. What Roads Maintenance refers to as the "Season of Storms" may become a more typical Pacific Northwest winter.

The 2007 King County Climate Plan identified vulnerable infrastructure particularly prone to the impacts of increased flooding and climate change in general. Many of these vulnerable areas are located within unincorporated King County and would affect Roads Maintenance operations. Particularly flood prone regions include unincorporated parts of King County within the Snoqualmie Valley and the Lower Green River. These regions provide corridors to properties valued at over $1.5 billion dollars.[36] Furthermore, the King County

[32] Climate Change Impacts Group. University of Washington, Compilation of Various Climate Scenarios
[33] "Impacts of Climate Change on Washington State's Economy: A Preliminary Assessment of Risks and Opportunities." Department of Ecology. Department of Community, Trade and Economic Development. November 2006. http://www.ecy.wa.gov/pubs/0701010.pdf
[34] "Impacts of Climate Change on Washington State's Economy: A Preliminary Assessment of Risks and Opportunities." Department of Ecology. Department of Community, Trade and Economic Development. November 2006. http://www.ecy.wa.gov/pubs/0701010.pdf
[35] King County DOT Roads Services Division "2006 Winter Storm Report" August 2006.
[36] 2007 King County Climate Plan

Global Warming Team has identified 500 ageing levees and revetments over 115 miles of riverbank which are at high risk of failure during increased flooding. Failure of the county's infrastructure would lead to an estimated $4 billion in losses. In response, the county has established a Flood Control Zone District (FCZD) to manage levees and purchase vulnerable property in floodplains. The implementation of the FCZD work program will generate additional work for Roads Maintenance crews that contract with WLRD for river related work.

## 1. West Nile Virus (WNV)

Warming climate patterns will increase the frequency of WNV outbreaks within King County.

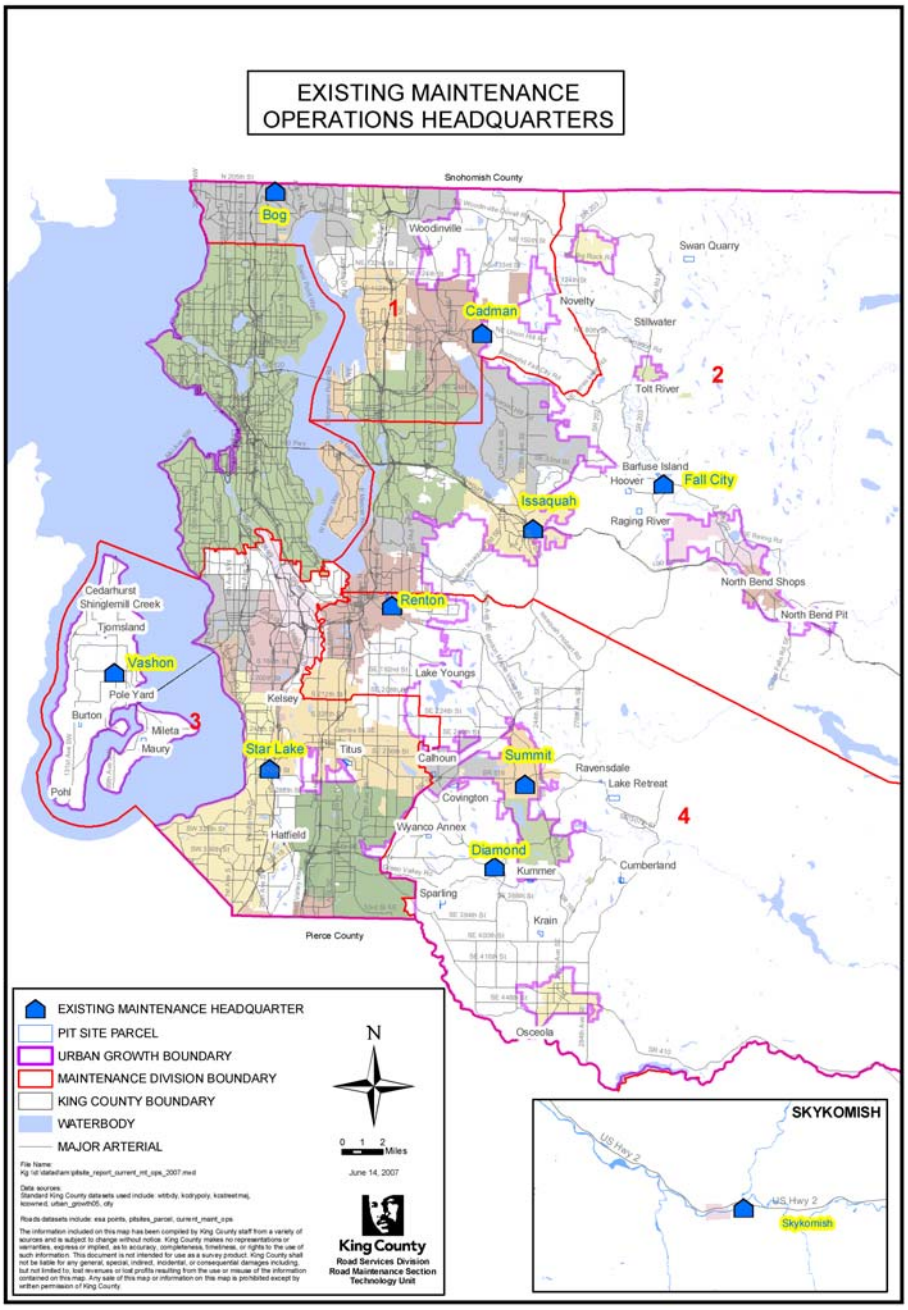
**Uncertainties**: The frequency and severity of outbreaks, the Seattle King County Department of Health response, and the impact on Roads Maintenance is uncertain.

The King County Department of Transportation (KCDOT) is responsible for controlling larva and treating stagnant water within KCDOT rights-of-way as a means to controlling mosquitoes that could potentially carry the WNV.[37] The Road Services Division has designated five WNV alert levels which correspond to increasing levels of risk, from Level 0, no risk, to Level IV, public health emergency declaration. Each level is associated with particular tasks for Roads Maintenance.[38] Tasks include monitoring mosquito habitat on county properties, reducing mosquito habitat on county property where feasible, conducting mosquito surveillance by larval dipping, conducting larval and/or adult mosquito control efforts on county property and at county facilities and responding to citizen complaints regarding ditches and catchbasins.[39] This is the lowest level of response. Depending on the situation, conditions might require larvacide or mechanical means of removing standing water (vactoring) in catch basins, ditches, and ponds in the event of a breakout. (For a complete list of alert levels and associated tasks, please reference the Road Services Division West Nile Virus Response Plan.) WLRD may also have increased responsibilities for off road systems including mosquito larvaciding, pesticide application, and mosquito surveillance which could potentially be contracted to Roads Maintenance. As the threat of WNV escalates, Roads Maintenance should expect to have sporadic yet extensive work from Seattle and King County Public Health relating to WNV prevention.

[37] Washington Department of Health. "Guidance for Surveillance, Prevention, and Control of Mosquito Borne Disease." 2007.
[38] "Road Services Division West Nile Virus Response Plan." October 28th, 2005.
[39] "Road Services Division West Nile Response Plan." October 28, 2005.

# Appendix B

## Exhibit B-1: King County Roads Maintenance Current Crew Facility Distribution



## Exhibit B-2: Road Maintenance 2008 FTE Baseline

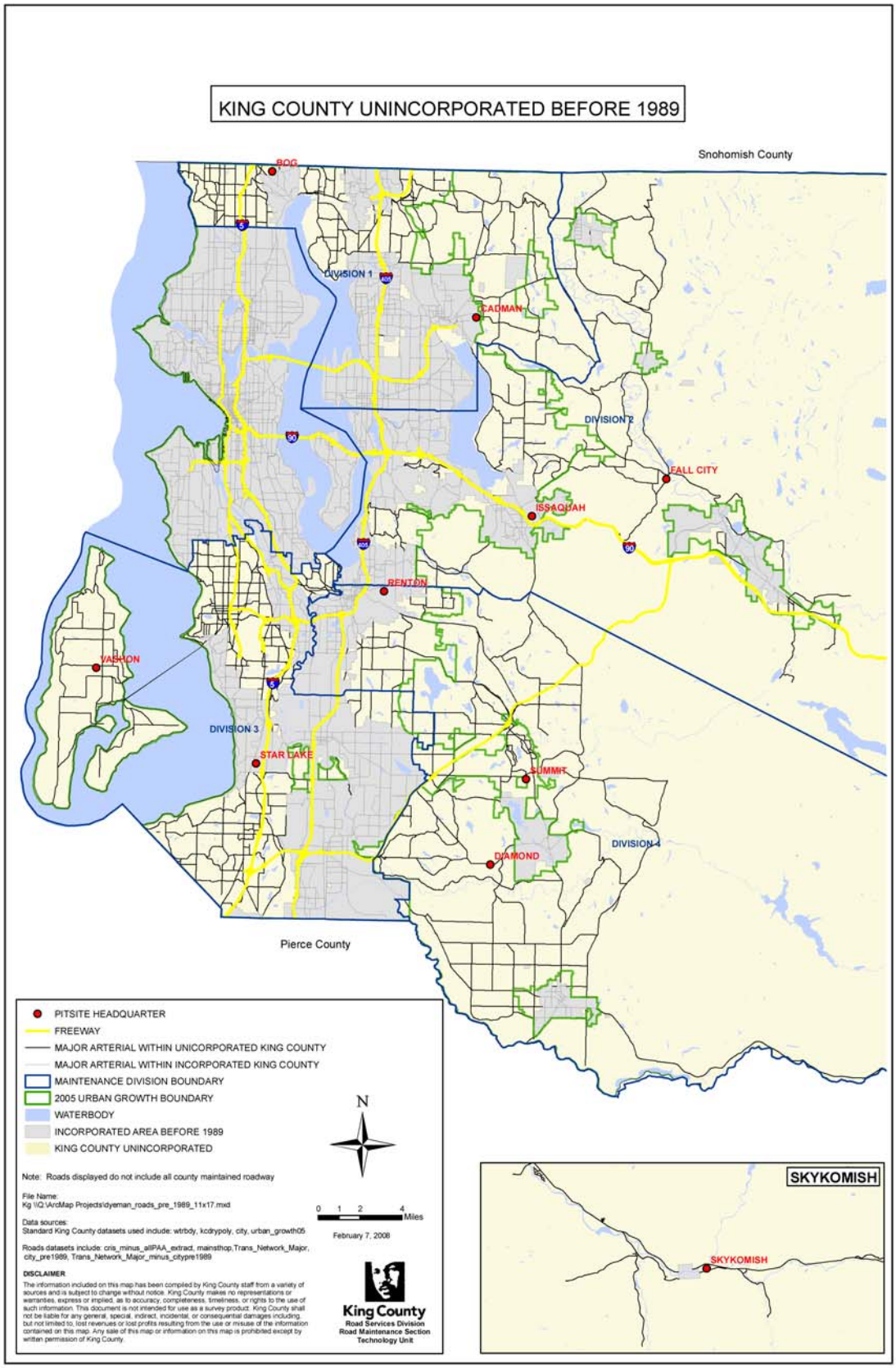
| | | 2008 | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **Miles** | **FTEs** | | | | | |
| Div | | Unincorp Road Miles | Unincorp Area FTEs | Partner City FTEs | Roads CIP FTEs | WLRD FTEs | Other Loan Out Support FTEs | Total 2008 FTEs |
| 1 | Bog | | 5.5 | 2.5 | | | | 8 |
| 1 | Cadman | | 10.8 | 1.7 | | | | 12.5 |
| | Total | 350 | 16.3 | 4.3 | | | | 20.5 |
| | | | | | | | | |
| 2 | Issaquah | | 5.5 | 4.0 | | | | 9.5 |
| 2 | Fall City | | 14.5 | | | | | 14.5 |
| | Total | 379 | 20.0 | 4.0 | | | | 24 |
| **North District** | | | | | | | | |
| **East District** | | | | | | | | |
| | | | | | | | | |
| 2 | Skykomish | 31 | 4.0 | | | | | 4 |
| | | | | | | | | |
| 3 | Star Lake | 301.1 | 18.4 | 6.6 | | | | 25 |
| 3 | Vashon | 133 | 7.0 | | | | | 7 |
| | | | | | | | | |
| 4 | Summit | | 14.4 | 1.1 | | | | 15.5 |
| 4 | Diamond | | 16.0 | | | | | 16 |
| | Total | 574.2 | 30.4 | 1.1 | | | | 31.5 |
| | | | | | | | | |
| **South District** | | | | | | | | |
| | | | | | | | | |
| **CW** | **Renton** | | **61.9** | **3.1** | **24.5** | **40.1** | **11.1** | **140.7** |
| | | | | | | | | |
| | **Total**** | **1768.3** | **158.0** | **19.0** | **24.5** | **40.1** | **11.1** | **252.7** |
| | Financial, Eng/Env | | | | | | | 52.8 |
| | Utility Inspection | | | | | | | 11.0 |
| | Total Section FTEs | | | | | | | 316.5 |
| | Unincorp Area | | | | | | | |
| | Miles/FTE | | 11.2 | | | | | |

* Based on Dye Management estimate.
** An additional 764 miles exist in partner cities.

## Exhibit B-3: Potential Annexation Area Allocations

| City | PAA | Anticipated Effective Date | Comments |
|---|---|---|---|
| Renton | Benson Hill | 3/1/2008 | |
| Auburn | Lea Hill | 1/1/2008 | |
| Auburn | Auburn West Hill | 1/1/2008 | |
| Kirkland | FinnHill/Juanita/ Kingsgate | 3/2/2010 | |
| | Fairwood Incorporation | 2010 | Should vote go forward in early '09 |
| Possibly combination of cities | North Highline | 2010 | Either to one city or split among several |
| Federal Way | East Federal Way | 2011 | |
| Renton | West Hill | 2011 | |
| Renton | Fairwood Annexation | 2011 | |
| Renton | East Renton | in small sections by 2011 | |
| Kent | Panther Lake/Kent PAA | 2010 | |
| Bellevue | Eastgate | 2010 | |
| Sammamish | Klahanie | 2010 | Assumes Issaquah agreement in summer and comp plans adjusted |

# Appendix B-4: Unincorporated King County Pre-1989



## Exhibit B-5: Unincorporated King County - Road Inventory Summary

| Unincorporated King County - 2007 | | Auburn Annexations | | Renton Annex | Unincorporated King County | |
|---|---|---|---|---|---|---|
| | | Lea Hill | West Hill | Benson Hill | (adjusted for annexation deletions) | |
| Total Road Surface Area | 24,162,225.20 | 426,924.50 | 273,406.10 | 571,476.70 | 22,890,417.90 | Square Yards |
| **Total Road Miles - All Road Types** | 1,871.20 | 32.9 | 21 | 44.1 | 1,773.20 | **Road Miles** |
| Lane Miles - All Paved Road Surface | 3,635.40 | 65.9 | 41.7 | 88.2 | 3,439.60 | Lane Miles |
| Lane Miles - Light Bituminous | 764.2 | 12.6 | 1.7 | 12.5 | 737.40 | Lane Miles |
| Lane Miles - Gravel Road | 105.1 | 0.1 | 0.3 | 0 | 104.70 | Lane Miles |
| Lane Miles - A/C and Concrete | 2,870.50 | 53.2 | 40 | 75.4 | 2,701.90 | Lane Miles |
| Lane Miles - A/C Only | 2,834.20 | 53.2 | 37.7 | 75.3 | 2,668.00 | Lane Miles |
| Road Miles - A/C Road Surface | 1,416.80 | 26.6 | 18.8 | 37.6 | 1,333.80 | Road Miles |
| Road Miles - A/C and Light Bituminous | 1,799.10 | 32.8 | 19.7 | 43.9 | 1,702.70 | Road Miles |
| Lane Miles - Light Bituminous and Gravel | 869.8 | 12.7 | 2.1 | 12.6 | 842.40 | Lane Miles |
| Square Yards - Concrete Road Surface | 234,145.60 | 0 | 14,285.30 | 965.5 | 218,894.80 | Square Yards |
| Curb and Gutter - Linear Feet | 3,673,418.00 | 121,657.00 | 72,397.00 | 164,730.00 | 3,314,634.00 | Linear Feet |
| Total Catch Basins and Manholes – Each | 33,351.00 | 910 | 516 | 1,420.00 | 30,505.00 | Each |
| Paved Ditch and Gutter - Linear Feet | 79,073.00 | 1,159.00 | 0 | 185 | 77,729.00 | Linear Feet |
| Open Ditch - Linear Feet | 6,471,524.00 | 113,207.00 | 55,475.00 | 69,380.00 | 6,233,462.00 | Linear Feet |
| Enclosed Pipe System - Linear Feet | 4,304,036.00 | 104,506.00 | 59,986.00 | 176,020.00 | 3,963,524.00 | Linear Feet |
| Total Cross Culverts and Access Tiles | 42,265.00 | 908 | 479 | 1,058.00 | 39,820.00 | Each |
| Cross Culverts Only | 17,905.00 | 448 | 216 | 569 | 16,672.00 | Each |
| Curb & Gutter and Thickened Edge - Road Miles | 942.6 | 24.9 | 16 | 49.4 | 852.30 | Road Miles |

| Unincorporated King County - 2007 | | Auburn Annexations | | Renton Annex | Unincorporated King County | |
|---|---|---|---|---|---|---|
| | | Lea Hill | West Hill | Benson Hill | (adjusted for annexation deletions) | |
| Gravel Shoulders - Road Miles | 1,935.30 | 27.7 | 17.7 | 27.9 | 1,862.00 | Road Miles |
| Gravel Shoulders - Lane Miles | 10,223,505.00 | 146,870.00 | 94,165.00 | 148,356.00 | 9,834,114.00 | Linear Feet |
| Planter Strips - Square Yards | 100,502.00 | 2,578.30 | 451.3 | 6,838.90 | 90,633.50 | Square Yards |
| Total Shoulder Miles - All Types | 2,552.50 | 38.7 | 24.4 | 33.3 | 2,456.10 | Road Miles |
| Total Shoulder Feet - Liner Feet | 13,481,240.00 | 205,553.00 | 129,334.00 | 176,848.00 | 12,969,505.00 | Linear Feet |
| Paved Shoulders - Road Miles | 593.6 | 10.7 | 6.6 | 5.1 | 571.20 | Road Miles |
| A/C Walkways - Linear Feet | 91,007.00 | 2,836.00 | 157 | 187 | 87,827.00 | Linear Feet |
| Concrete Walkways - Square Yards | 1,368,808.90 | 52,306.50 | 33,712.20 | 76,814.80 | 1,205,975.40 | Square Yards |
| A/C Walkways - Square Yards | 50,558.90 | 1,575.50 | 87.2 | 103.8 | 48,792.40 | Square Yards |
| Mowable Slopes - Square Yards | 5,225,422.40 | 49,283.90 | 39,184.50 | 9,792.60 | 5,127,161.40 | Square Yards |
| Mowable Slopes - Pass Miles | 4,452.70 | 41.9 | 33.2 | 8.2 | 4,369.40 | Pass Miles |
| Mowable Slopes - Lane Miles | 1,483.80 | 13.9 | 11 | 2.6 | 1,456.30 | Lane Miles |
| Jersey Barriers - Linear Feet | 21,533.00 | 582 | 0 | 83 | 20,868.00 | Linear Feet |
| Retaining Walls - Linear Feet | 61,163.00 | 472 | 437 | 386 | 59,868.00 | Linear Feet |
| Guardrails - Linear Feet | 339,818.00 | 2,365.00 | 3,778.00 | 174 | 333,501.00 | Linear Feet |
| Retaining Walls - Cubic Yards | 108,733.70 | 839 | 776.7 | 686.1 | 106,431.90 | Cubic Yards |
| Retaining Walls - Square Yards | 40,774.90 | 314.6 | 291.2 | 257.2 | 39,911.90 | Square Yards |
| Bridges | 182 | 1 | 0 | 0 | 181.00 | Each |
| Bridge Drains | 1,092.00 | 6 | 0 | 0 | 1,086.00 | Each |
| Bridge Surface - Linear Feet | 22,039.00 | 223 | 0 | 0 | 21,816.00 | Linear Feet |
| Fencing - Linear Feet | 19,274.00 | 615 | 0 | 160 | 18,499.00 | Linear Feet |
| Auxiliary Pipe - Linear Feet | 42,725.00 | 1,385.00 | 2,002.00 | 25 | 39,313.00 | Linear Feet |

| Unincorporated King County - 2007 | | Auburn Annexations | | Renton Annex | Unincorporated King County | |
|---|---|---|---|---|---|---|
| | | Lea Hill | West Hill | Benson Hill | (adjusted for annexation deletions) | |
| Planter Boxes | 39 | 1 | 0 | 0 | 38.00 | Each |
| Trash Racks | 104 | 0 | 0 | 0 | 104.00 | Each |
| Headwalls | 289 | 3 | 0 | 1 | 285.00 | Each |
| Brick Road Surface - Lane Miles | 2.3 | 0 | 0 | 0 | 2.30 | Lane Miles |
| Road Surface Bulb | 51 | 0 | 0 | 2 | 49.00 | Each |
| Cul-De-Sac | 417 | 18 | 5 | 5 | 389.00 | Each |
| Speed Bumps | 50 | 0 | 0 | 23 | 27.00 | Each |
| Crossing Enclosed Pipe | 8,065.00 | 423 | 0 | 94 | 7,548.00 | Linear Feet |
| Box Culverts | 36 | 0 | 0 | 0 | 36.00 | Each |
| R/D Facilities | 62 | 0 | 0 | 1 | 61.00 | Each |

## Exhibit B-6: 2007 County Maintained Roads