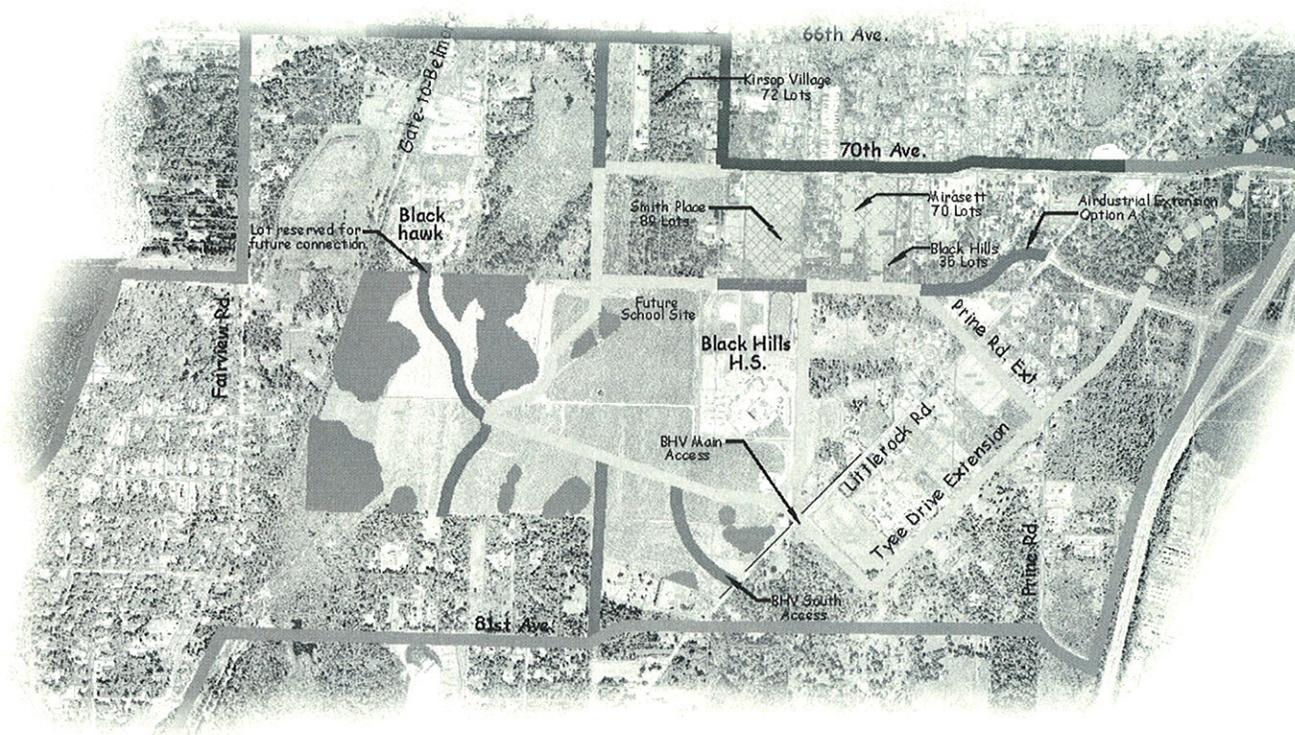


# BLACK HILLS SUBAREA TRANSPORTATION PLAN

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CITY OF TUMWATER  
THURSTON COUNTY  
TUMWATER SCHOOL DISTRICT  
DOELMAN FAMILY



JANUARY, 2003

**BLACK HILLS SUBAREA TRANSPORTATION STUDY**

**January, 2003**

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## **ACKNOWLEDGEMENTS**

This analysis was completed with technical guidance and valuable input from the Black Hills SubArea Plan Transportation Advisory Committee. This dedicated group met regularly during 2002 while data was being collected and refined, analyzing scenarios and making recommendations. Without this team of professionals, the analysis could not have been completed.

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## I. INTRODUCTION

### ***Background***

Prior to adoption of the Tumwater/Thurston County Joint Plan (Joint Plan) in 1995, land use within the Black Hills SubArea was agriculture and a mix of single family and multi-family residences. Much of the land area was vacant. The Joint Plan recommended a mix of land use designations for this area, including General Commercial, Multi-Family Residential High and Medium Density, and Utilities Institutional (for a future high school site). A large portion of the area was under a single ownership and part of the Doelman dairy farming operation. The Joint Plan assigned land use designations to the Doelman property with the intent of creating a framework for the development of a mixed use "village" which would provide a variety of housing types and employment close to needed services, such as commercial establishments, schools, and transit.

The City of Tumwater/Thurston County Joint Plan has identified the area of the Tumwater UGA south of 70<sup>th</sup> Avenue and west of Littlerock Road as an area with high growth potential. Development pressures have increased significantly over the past ten years, and it was realized that the transportation system was not adequate to serve the anticipated growth. Within the last ten years, the residential subdivisions of Black Hawk, Israel Place, and Foster Place have been constructed. Approximately five years ago, the Black Hills High School campus opened. More recently, over 200 new lots have been approved for residential development. The residential and commercial development that has been proposed has caused a need to evaluate transportation improvements and circulation in this area.

The intent of this plan is to provide a blueprint for the transportation system serving the area, so that no potential new corridors or other options are precluded as development occurs. Development will occur regardless if this plan is in place or not. However, with this plan, the roadway network can be designed to best accommodate future development.

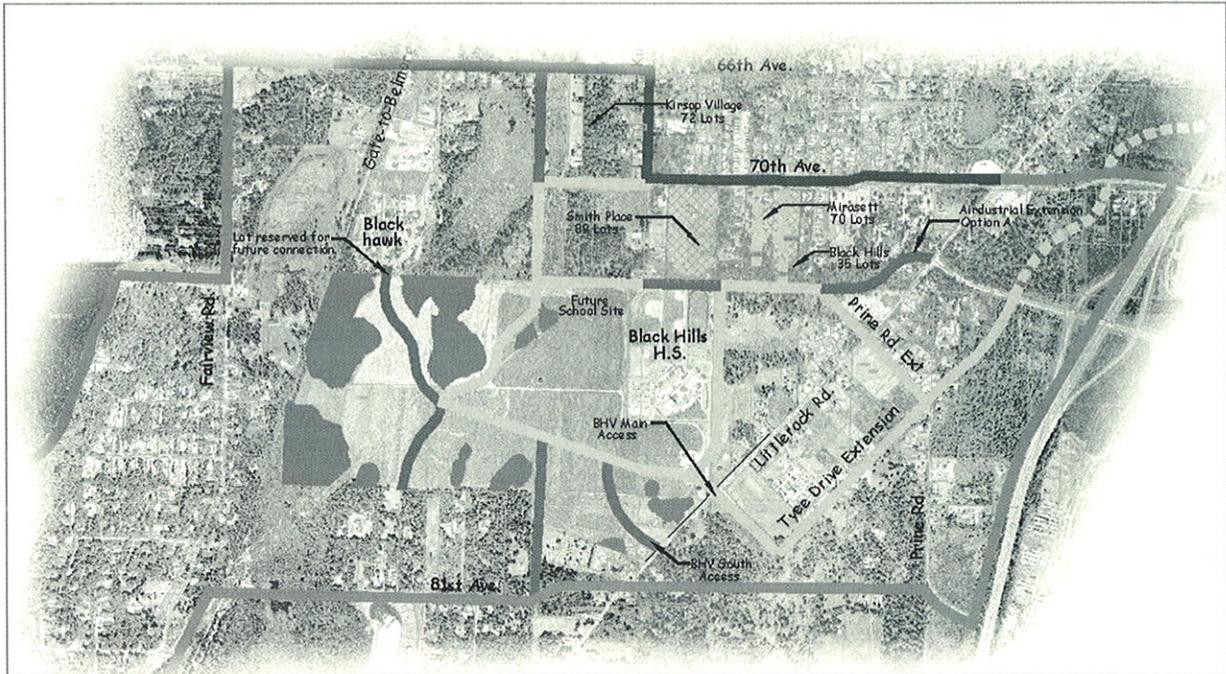
### ***Scope of Study***

The City of Tumwater has taken the lead position on preparing the SubArea Study of the transportation network serving this area. The key elements of this study address:

- Access to existing and proposed land uses
- Circulation enhancements for all transportation modes
- Roadway and intersection safety and capacity improvements
- Street connectivity
- Location of new roadway connectors
- Implementation of Traffic Management Zones
- Non-motorized connectivity and circulation

## Study Area

The study area covers the land area between 66<sup>th</sup>/70<sup>th</sup> Avenue to the north and 81<sup>st</sup> Avenue to the south. Interstate 5 provides the east boundary, and Black Lake is the primary border to the west.



Black Hills SubArea Study Boundary

## Coordination

A Transportation Advisory Committee (TAC) was established to guide the study team. The TAC was comprised of local representatives (project partners), representing the following interests:

- City of Tumwater
- Thurston County
- Tumwater School District
- Representative of the Doelman family
- Members of the local community

The first meeting of the TAC took place in January, 2002, when an overview of the study was presented and goals and objectives of the study were refined. The traffic data collection program and comparisons between summer and winter counts were also presented to the group.

The second meeting was held in March 2002, at which time the TAC discussed current traffic volumes on the road network, on both the existing roadways and the existing network with programmed improvements. Four scenarios for possible future roadway connections were presented, and the group recommended that the “full connection” scenario be brought forward at the next meeting for further review and discussion.

On June 6, 2002, the TAC met for the third time. Benefits and impacts to the SubArea road network “with” and “without” the connections were analyzed. The TAC reached consensus that connections would be phased in order to cause the least disruption to existing neighborhoods, and also to include only one connection from 81<sup>st</sup> Avenue to the planned urban village (Black Hills Village).

In late October, meetings were held with neighborhood groups and associations to present the anticipated transportation system short-comings and a variety of potential solutions:

- Black Hawk neighborhood – October 24, 2002
- 81<sup>st</sup> Avenue neighborhoods – October 29, 2002

An open house was held on December 12, 2002.

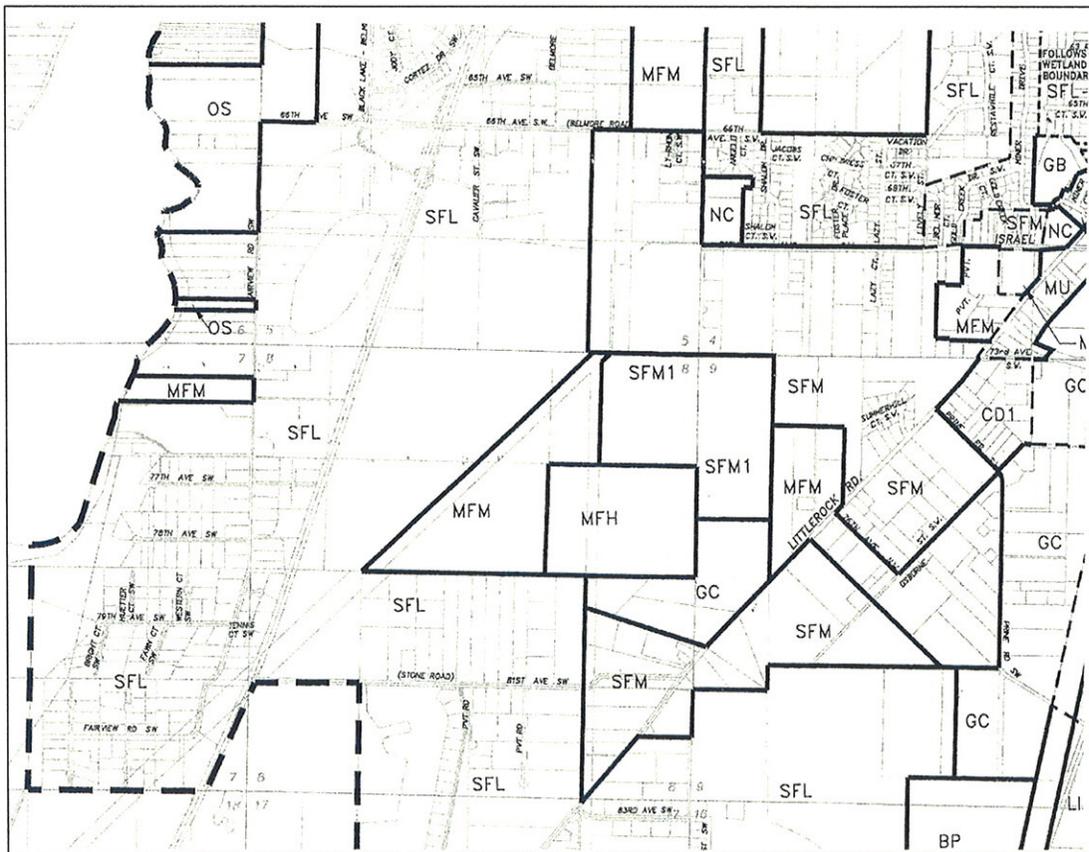
Sign-in sheets and comment forms from these meetings are included in Appendix 1 – Public Outreach.

## II. EXISTING CONDITIONS

### Land Use

The study area is located in the City of Tumwater's growth area, but within unincorporated Thurston County. Current zoning in the study area is primarily single family, with some multi-family designations. A small neighborhood commercial zone is located at the corner of 70<sup>th</sup> Avenue and Kirsop Road, and property south of Black Hills High School on Littlerock Road is zoned general commercial.

The Doelman property, which is currently being master planned for a mixed use village, consists of approximately 288 acres located between Littlerock Road and the Burlington Northern Railroad Line, just south of 70<sup>th</sup> Avenue SW. The site is undeveloped and is currently being used to grow feed for livestock. The Bonneville Power easement also crosses the property. Several single family subdivisions, including Black Hawk, Israel Place, Foster Place, Lazy Acres and Gold Creek, are located north of 70<sup>th</sup> Avenue. There are scattered multi-family uses, and Black Hills High School is situated at the northwest corner of the Doelman property, just west of Littlerock Road.

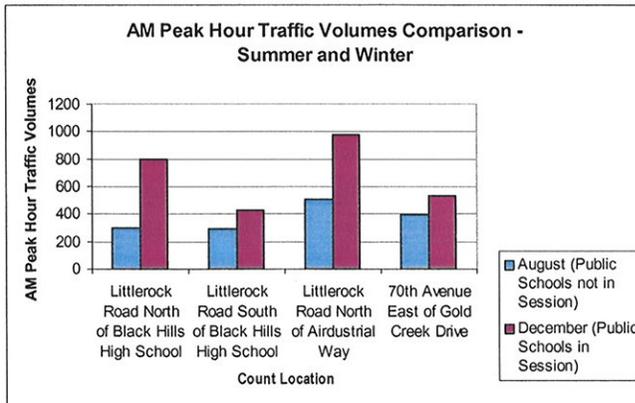


Current zoning in the Study Area

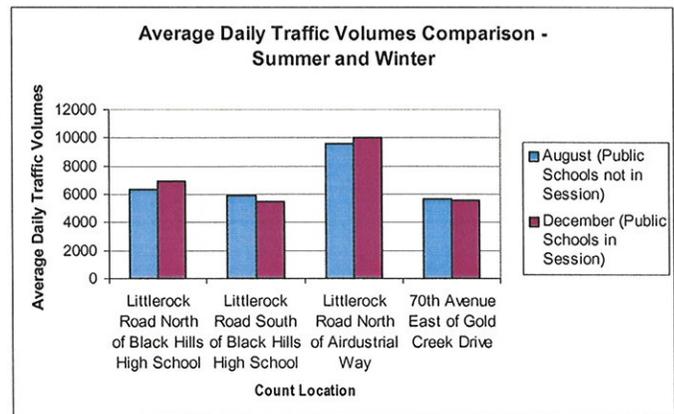
SFL – Single Family Low Density Residential (4-7du/acre)  
 SFM - Single Family Medium Density Residential (6-9 du/acre)  
 MFM – Multi-family Medium Density Residential (9-15 du/acre)  
 MFH – Multi-family High Density Residential (14-29 du/acre)  
 GC –General Commercial      NC – Neighborhood Commercial

### Traffic Volumes

A comprehensive traffic count program was conducted to establish base year traffic conditions. Counts were conducted for AM and PM peak hours, both in the winter and in the summer, in order to identify the traffic pattern differences with and without school in session. It was found that the morning peak hour between 7:00 and 8:00 AM is the highest traffic hour, likely due to the schools located within the SubArea. In fact, the morning counts at some locations are nearly twice as high when school is in session.



The total number of vehicles traveling on the roadways daily are more balanced, regardless of whether or not the schools are closed.

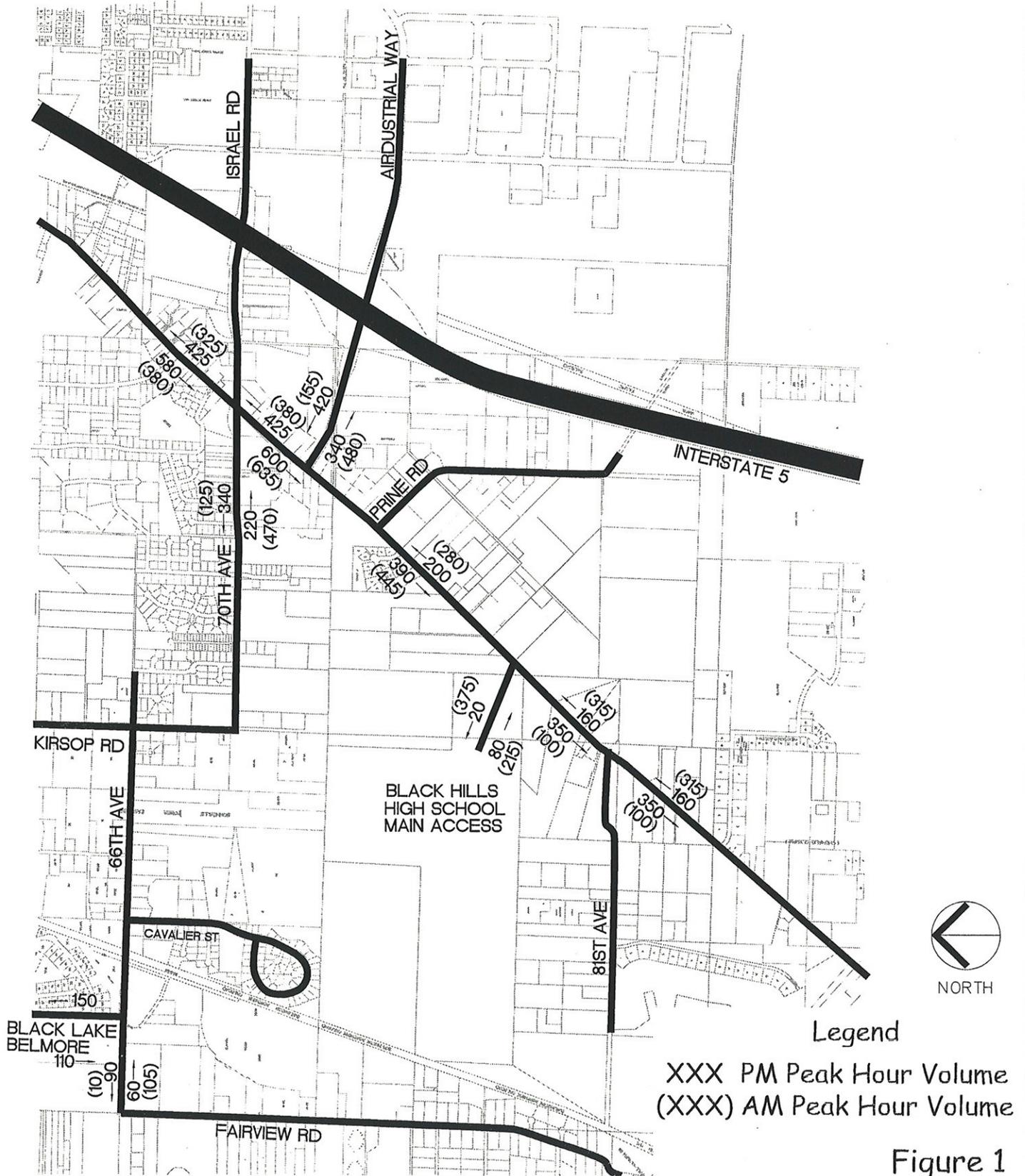


Roadway link volumes for existing conditions are shown on Figure 1. Count data, turning movement counts, and additional traffic analysis data is included in Appendix 2 of this Study.

### Operations

All roadways and intersections within the study area currently operate within the city's adopted level of service standards.

# Black Hills SubArea Existing PM Peak Hour Link Volumes Existing Roadway Network



## II. FUTURE CONDITIONS (2020)

### **Land Use**

Long-range goals in the Littlerock SubArea Plan, which was completed in 1997, include a mixed-use area with a “village” atmosphere that will be transit-oriented, pedestrian-friendly, safe, provide affordable housing, and result in a well-designed community character. The Tumwater/Thurston County Joint Plan specifically notes that within the Doelman ownership *“land use designations have been assigned to this property with the purpose of creating a framework for the development of a mixed use village which would provide a variety of housing types close to needed services, such as commercial establishments, a high school, and a transit route along Littlerock Road.”*

The Doelman family plans to develop their property as *Black Hills Village*, a unique neighborhood comprised of a variety of housing types, integrated open spaces, and a small commercial area adjacent to Littlerock Road. The Tumwater School District has also requested that an elementary school site be located within the village, adjacent to Black Hills High School.

The SubArea has high commercial and residential growth potential by 2020. A number of single family subdivisions are currently in the development and planning stages, both north and south of 70<sup>th</sup> Avenue. Property south of 70<sup>th</sup> Avenue and east of Littlerock Road is zoned Multi-Family Medium Density, and is anticipated to develop at 9-15 dwelling units per acre.

It is expected that the large unoccupied lands between Littlerock Road and Interstate 5 will transition to commercial and mixed use development.

### ***Traffic Model Development and Forecasts***

Traffic volume forecasts for the year 2020 were developed in cooperation with the City of Tumwater and the Thurston Regional Planning Council (TRPC). TRPC created a computer model of the entire roadway network of Thurston County. This regional model, developed using the Tmodel2 software package, was calibrated by TRPC to accurately reflect the traffic conditions currently experienced by Thurston County's drivers (a detailed description of the process for developing the regional model is given in the technical document "Thurston Regional Travel Demand Model" by TRPC). Land-use, population, and employment projections used in developing the model were derived cooperatively between TRPC, Thurston County and the City of Tumwater.

### **Transportation Demand Management Goals**

The regional transportation model incorporated aggressive Travel Demand Management (TDM) strategies and transit ridership forecasts. For the future year traffic forecasts, it is assumed that significant auto vehicle reductions will be achieved during the 20-year planning period. The aggressive TDM goals for the region were established by TRPC through the Regional Transportation Plan process and are incorporated into the 2020 land-use forecasts. Traffic projections for the year 2020 reflect these factors.

### **2020 Travel Forecasts**

Traffic projections for this study were made based on the regional transportation model. Area traffic growth rates were predicted by comparing base year traffic model volumes to the 2020 model volume projections. The City of Tumwater was given a 20-year population and employment forecast by the state Office of Financial Management to plan for and accommodate within its boundaries. The City determined where this growth will occur and assumed a high level of commercial and residential development in the Black Hills SubArea. The calculated growth increment between the base year model scenario and 2020 model scenarios was applied to the actual roadway link volumes collected during 2001 to create the 2020 link volumes use in the analysis.

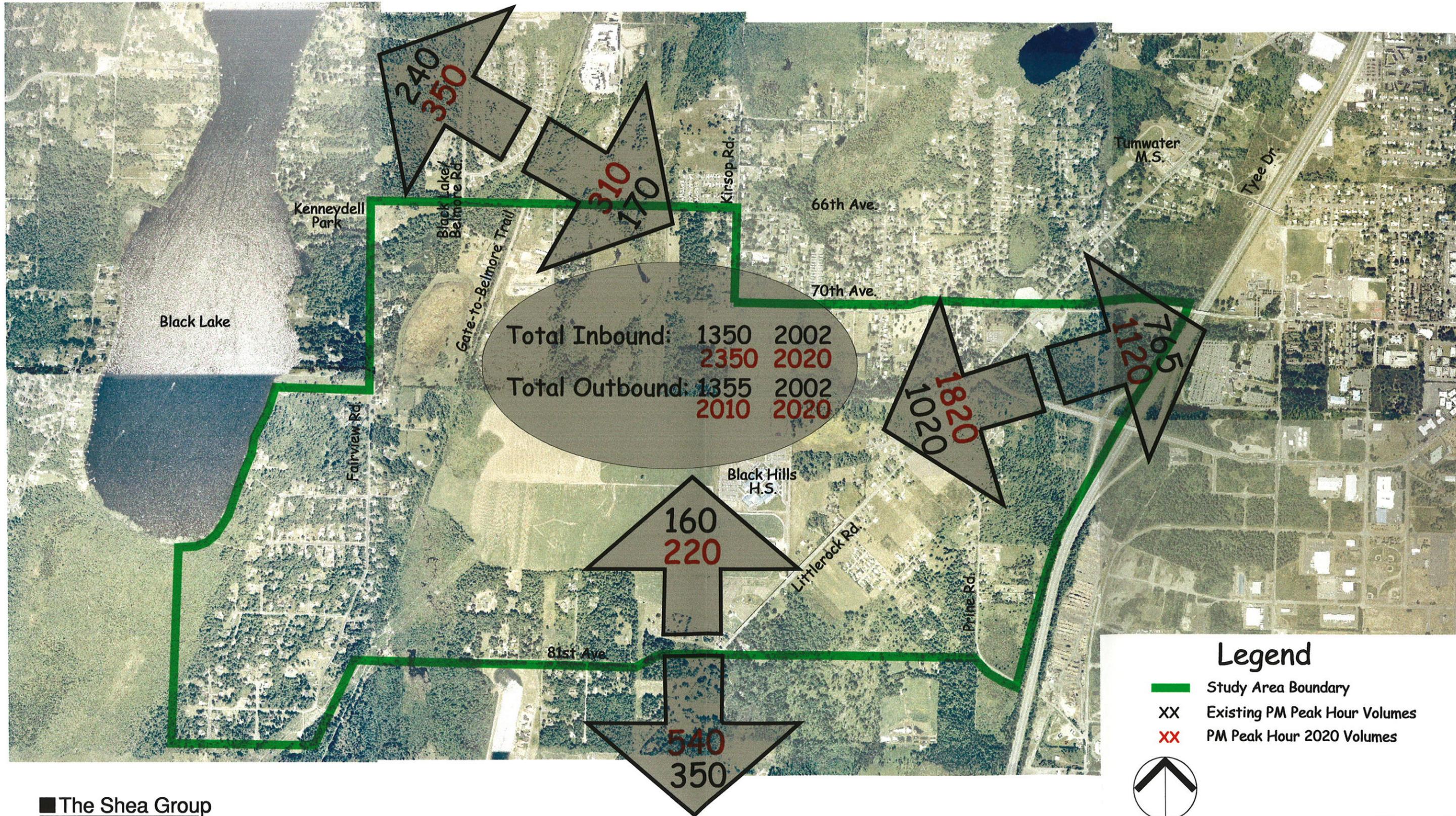
### **Acceptance of Model Process and Forecast Results**

The 2020 traffic volume network maps were reviewed by City of Tumwater and Thurston County staff. The traffic forecasts and model refinements were approved and accepted by each agency. These traffic volumes were then used as the basis for completing the traffic operations sections of this study.

### **Current Conditions**

At present, the AM peak hour has a higher volume of traffic than the PM peak hour because of the schools located in the SubArea. However, as the area develops, the PM hour will become more prevalent due to a higher number of evening commute trips. For this reason, the AM peak was not evaluated for future conditions.

# Black Hills SubArea Existing & 2020 Traffic Volumes



**Legend**

- █ Study Area Boundary
- XX Existing PM Peak Hour Volumes
- XX PM Peak Hour 2020 Volumes



NORTH

Figure 2

## **Connection Scenarios**

As a part of the alternative analysis of this study, four connection scenarios were identified and presented to the Advisory Committee. For each of the four scenarios, which look at the 2020 horizon, a set of baseline conditions were assumed, including:

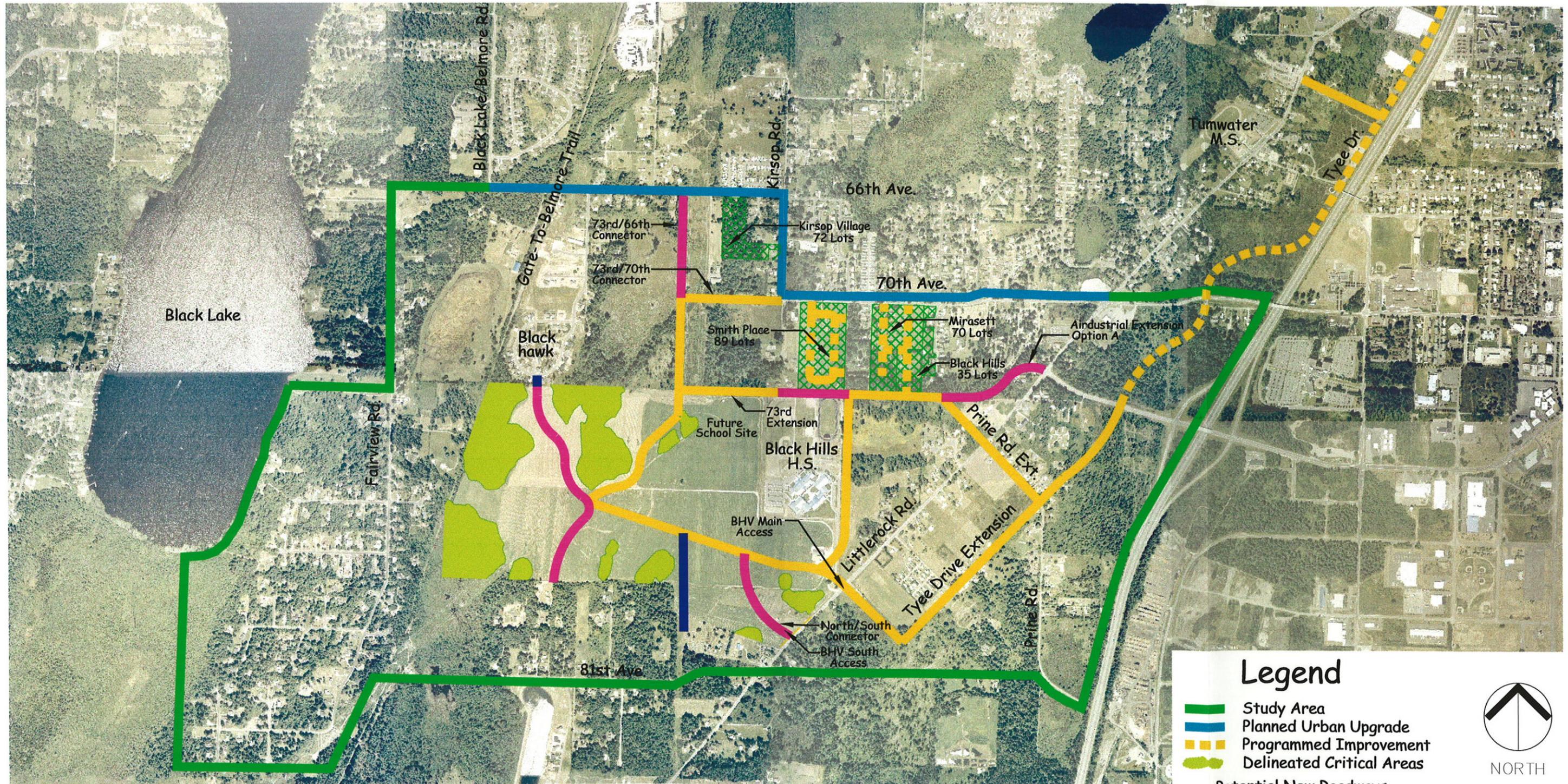
- The extension of Tyee Drive from Airdustrial to Prine Road
- Airdustrial would be widened to 4-lanes as planned
- An interconnecting roadway network within Black Hills Village will exist

After reviewing the alternatives, the Advisory Committee selected Connection Scenario 4 (CS-4), the “full connection” scenario, as the preferred alternative (see Appendix 2 for figures depicting all four scenarios). This option provided the most connectivity within the sub area, and had the added benefit of allowing Littlerock Road to remain at a “neighborhood” scale (two to three lanes, versus the four to five lanes needed without the grid system proposed in CS-4). In general, more connections means:

- Shorter travel distances (reduced vehicle miles traveled, reduced travel time)
- Better emergency access
- More non-motorized use (new connections can be designed to include sidewalks and bicycle lanes)
- Enhanced circulation (route choices are available)

The full connection scenario includes a “hierarchy” of roadway improvements that include capacity improvements at intersections, new roadway links (both primary and circulation enhancements), and a “traffic management zone.” These are discussed in detail in the following chapter. Figure 3 shows the Full Connection Scenario network. Figure 4 shows the PM peak hour volumes at key intersections and roadway links with the full connection scenario (CS-4) in place. Detailed traffic analysis is included in Appendix 2.

# Black Hills SubArea Full Connection Scenario



**Legend**

- █ Study Area
- █ Planned Urban Upgrade
- - - Programmed Improvement
- █ Delineated Critical Areas

Potential New Roadways

- █ Motorized Circulation Enhancement
- █ Non-Motorized Circulation Enhancement
- █ Primary Connection

  
 NORTH

# Black Hills SubArea 2020 PM Peak Hour Link Volumes Full Connection Scenario

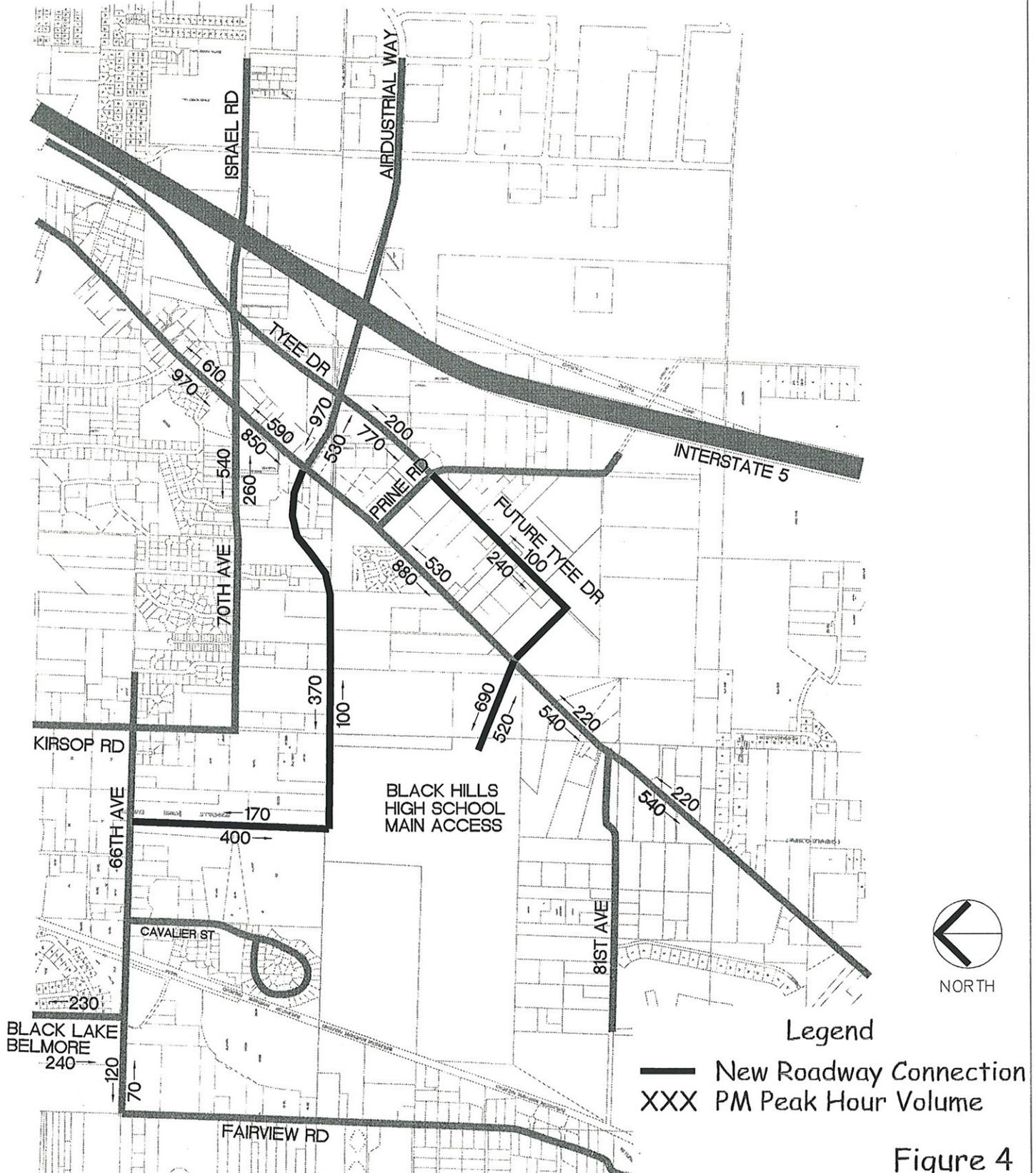


Figure 4

## IV. IMPROVEMENT CATEGORIES

In order to provide a transportation network that provides connectivity, enhances circulation, promotes non-motorized modes, and preserves the local neighborhood aesthetic, a comprehensive approach is necessary. The resulting 2020 transportation blueprint, therefore, must include a “hierarchy” of improvements. For the Black Hills SubArea, this includes the following:

### New Connections

- Primary connectors
- Circulation enhancements
  - Planned urban upgrades
  - Traffic Calming upgrades



*The extension of Tye Drive is considered a “primary connector,” which would look much like this developed section of Tye north of the SubArea, behind Fred Meyer*

### Operations/Capacity

- Intersections
- Roadways

### Traffic Management Zone

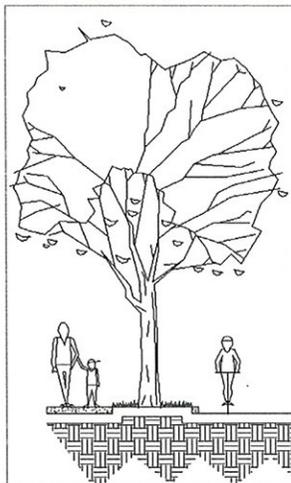
- Livability/neighborhood preservation
- Safety
- Aesthetics
- Connectivity

### Non-Motorized Elements

- Pedestrian
- Bicycle
- Trails
- Safe access to schools



*Safe access to the Black Hills High School and proposed new elementary school are important elements of the overall plan*

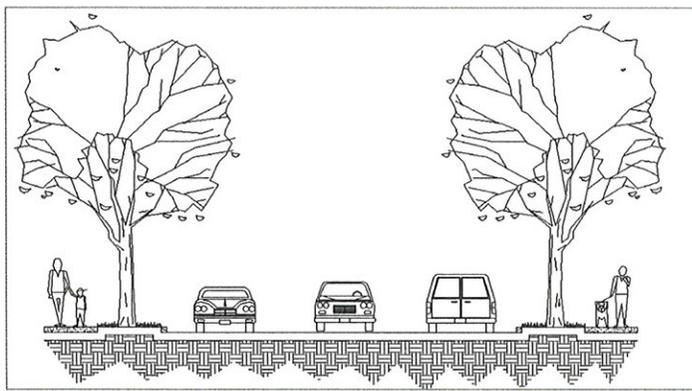


*Providing adequate pedestrian and bicycle facilities within the SubArea is important for a balanced solution to circulation and connectivity*

Each improvement component is described in detail in this chapter.

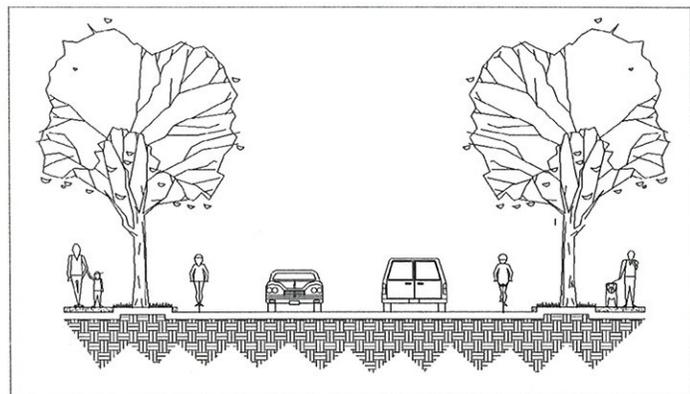
## New Connections

As illustrated in Figure 3, several new connections are needed to enhance circulation and mobility and provide access within the SubArea. Some of the needed connections are considered *primary*, while others are meant as *enhancements*. Primary connections are determined to be necessary linkages, designed to carry higher volumes of traffic and to connect major land uses. Enhancements are intended to improve circulation and access, but are not intended to carry high volumes of traffic. Some enhancements may be only non-motorized, and not provide any additional vehicular connections. Other enhancement connections may be “traffic calmed” with additional landscaping or concrete treatments to keep volumes and speeds low, maintain neighborhood livability, and improve aesthetics.



**“Primary Connectors”** are necessary improvements to the transportation grid. They are designed to carry higher volumes, and to connect major land use destinations, such as commercial and high-density residential

**“Enhancement Connectors”** are designed to improve connectivity and provide non-motorized mobility, and are narrower in width and more circuitous in nature. Traffic calming features would likely be incorporated into these neighborhood roadways.



All connections will include provisions for bicycles and pedestrians to improve non-motorized travel for existing and future development. The connections are intended to be built as development occurs, since the impact of development on the existing roadways will not be realized until that development occurs. In this sense, the connections are phased, and are not necessarily planned for construction prior to development.

In all cases, new connections as shown on Figure 3 are not intended to indicate *specific* alignments, but only to show that a connection *should exist in the vicinity*.

## Primary Connections

### *Tyee Drive Extension (Airdustrial Way – Black Hills Village Entrance)*

The Littlerock Road Corridor Development Plan includes the extension of Tyee Drive from Trosper to Airdustrial as an integral component of the roadway network. Tyee Drive is intended to provide enhanced commercial access to the area between I-5 and Littlerock Road as well as reduce the traffic-bearing load on Littlerock. By providing another north/south route, commercial traffic does not have to remain on Littlerock between Airdustrial and Trosper, and traffic in general is better balanced. This allows Littlerock to be developed as a 2/3 lane boulevard between Trosper and Airdustrial. Tyee Drive is currently built between Trosper Road and Costco. It will be extended to the south as development occurs.

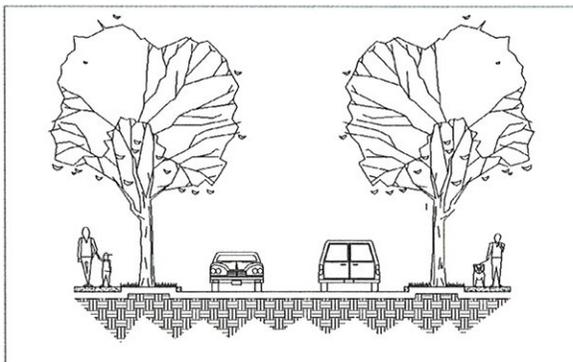


*The first portion of Tyee Drive was built with the construction of Fred Meyer.*

Likewise, the extension of Tyee Drive from Airdustrial south has the same positive impact on Littlerock Road in the Black Hills SubArea. The land uses between Airdustrial and the UGA limits are commercial and multi-family, so extending Tyee Drive through this area as development occurs provides enhanced access to those uses. Tyee Drive would be built incrementally as development occurs and creates the need for the connection. In addition to the extension to the south, east/west connections would be made from Tyee Drive to Littlerock Road at acceptable intervals, creating a grid network. It is likely that one or more of these Tyee Drive-Littlerock Road east/west connectors would intersect with Littlerock Road at the entrance(s) to Black Hills Village. Tyee Drive would include two travel lanes, left turn pockets, sidewalks, bike lanes, and planter strips.

### *73<sup>rd</sup> Avenue Extension*

The 73<sup>rd</sup> Avenue Extension provides access from Littlerock Road to Black Hills High School, the proposed elementary school, and Black Hills Village. It also enhances connections (both vehicular and non-motorized) from the 70<sup>th</sup> Avenue, Black Hawk and



other northwest neighborhoods to the schools and future commercial areas of Black Hills Village. Construction of the 73<sup>rd</sup> Extension would occur as development of the Village or the school takes place. The 73<sup>rd</sup> Extension would intersect with Littlerock at Prine Road, creating a new intersection that could be either signalized or a roundabout.

Impacts to critical areas, Black Hills High School, private properties, and approved developments could make portions of this route difficult or impractical to construct. However, this is an important connection and right-of-way for the connection should be set aside as new development occurs. It is possible that non-motorized enhancements, such as bicycle or pedestrian paths, could be accommodated within right-of-way and environmental constraints.

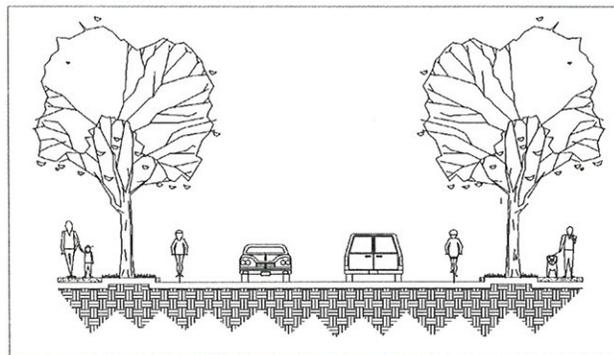
### *73<sup>rd</sup> – 70<sup>th</sup> North/South Connector*

A north/south connector from the 73<sup>rd</sup> Extension to the 70<sup>th</sup> extension provides better access for NW neighborhoods to/from Black Hills High School, the proposed elementary school, and commercial development. It provides a major circulation route for that traffic movement, and allows other area roadways such as Cavalier to remain local access. Without the connector, the likelihood of increased traffic heading to/from the NW to/from schools and commercial areas on local roads (such as Cavalier) would be more significant.

This connection provides enhanced emergency vehicle access, reduces travel time to/from school properties, and alleviates traffic volumes on Littlerock Road and 70<sup>th</sup> Avenue. The new connector would include bike lanes and sidewalks, improving non-motorized mobility and safety.

This is especially important in the vicinity of neighborhoods and schools.

A portion of this connection is illustrated within the right-of-way of the Bonneville Power Administration (BPA) power lines. Feasibility of this alignment is still under discussion with BPA. If use of BPA right-of-way were not possible, purchase of private properties to accommodate the roadway would be required.



Environmental constraints in the area will need to be evaluated in order to determine feasibility and alignment options.

## Enhancement Connections

### 73<sup>rd</sup> – 66<sup>th</sup> North/South Connector

This connection is considered a “circulation enhancement” and is not a primary connector, since the 73<sup>rd</sup>-70<sup>th</sup> connector provides much of the benefit. However, extending the connector north all the way to 66<sup>th</sup> provides a major circulation route for traffic movement between the NW neighborhoods, schools, and commercial properties, and allows other area roadways such as Cavalier to remain local access. Without this additional connector, increased traffic on local roads (such as Cavalier) is more likely. This connection is considered a circulation enhancement and *is not intended to carry high volumes of traffic*.

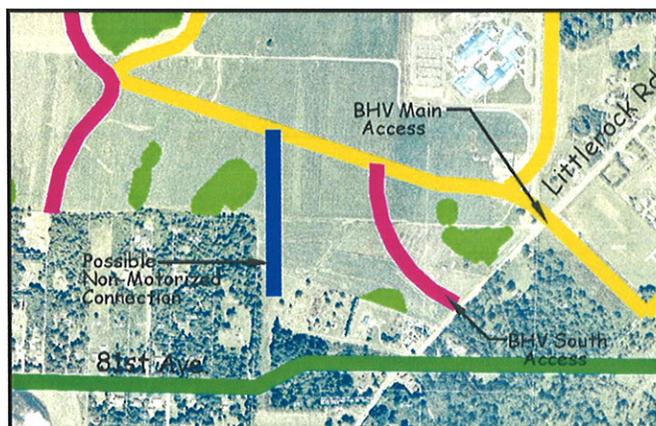


This connection provides enhanced emergency vehicle access, reduces travel time to/from school properties, and alleviates traffic volumes on Littlelock Road and 70<sup>th</sup> Avenue. The new connector would include bike lanes and sidewalks, improving non-motorized mobility and safety for both existing and future development. This is especially important in the vicinity of neighborhoods and schools.

The connection is illustrated within the right-of-way of the Bonneville Power Administration (BPA) power lines. Feasibility of this alignment is still under discussion with BPA. If use of BPA right-of-way were not possible, purchase of private properties to accommodate the roadway would be required.

### 81<sup>st</sup> – Black Hills Village North/South Connector(s)

One or more connections between 81<sup>st</sup> and Black Hills Village improve efficiency, circulation, and access between the commercial and residential properties and Littlelock Road and I-5. These connections are considered circulation enhancements and *are not*

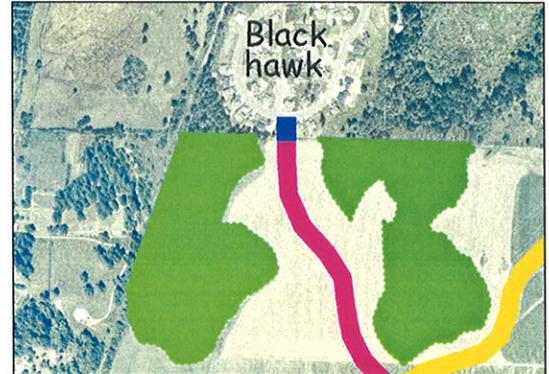


*intended to carry high volumes of traffic*. Such connections would include bike lanes and sidewalks, improving non-motorized mobility and safety for existing and proposed development. It is likely that these connectors would include traffic calming features that would slow traffic, limit volumes, and provide aesthetic improvements.

Originally, two vehicular connections from 81<sup>st</sup> Avenue to the Black Hills Village area were considered. However, based on significant public input, only a non-motorized connection to/from the proposed school and commercial development within the Village is still under consideration. This connection would be constructed by abutting landowners as the need arises and would primarily benefit neighborhoods wanting to access the Black Hills Village commercial area and schools.

#### *Black Hawk Connector*

This connection is considered a “circulation enhancement” and is not a primary connector, since the 73<sup>rd</sup>-70<sup>th</sup> connector provides much of the benefit. Without this additional connector, increased traffic on local roads (such as Cavalier) is more likely. Originally a vehicular connection was considered, however, based on public input, only a non-motorized connection is currently under consideration. The primary benefit would be for Black Hawk residents wanting to access schools and the commercial area in Black Hills Village.



#### ***Options Considered and Rejected***

The following connections were considered but rejected due to public input:

- *Western connection – 81<sup>st</sup> Avenue- Black Hills Village*  
No connection is proposed at this time.
- *Eastern connection – 81<sup>st</sup> Avenue-Black Hills Village*  
Consider non-motorized connection.
- *Black Hawk Connector*  
Consider non-motorized only.

Although these connections were eliminated from the final plan, the need for the connections should be revisited as development occurs.

## ***Operations/Capacity***

### **Measuring Level of Service for Roadway Links and Intersections**

#### *Level of Service*

The acknowledged source for determining overall capacity for arterial segments and independent intersections is the current edition of the *Highway Capacity Manual*. Capacity analyses results are described in terms of Level of Service (LOS). LOS is a qualitative term describing operating conditions a driver will experience while traveling on a particular street or highway during a specific time interval. It ranges from A (very little delay) to F (long delays and congestion). The City of Tumwater has adopted an LOS D for urban roadways. Thurston County has set a standard of LOS D for urban and LOS C for rural roads.

#### *Roadway Links*

The operation of roadways is assessed using a "link capacity" analysis. Each roadway has a theoretical maximum vehicle carrying capacity for a given time frame. The functional classification, number of lanes, presence of traffic signals or turn-lanes are examples of features that affect the volume of traffic a particular roadway segment can handle. The Florida Department of Transportation has prepared a set of generalized level of service tables for roadway segments (see Appendix 2). The tables are based on information contained in the 1997 *Highway Capacity Manual* and provide general LOS ratings based on the volume of traffic on the roadway. These tables offer conservative guidelines for analyzing roadway capacity. There are other factors that can improve the capacity of a link, such as access control and medians.

#### *Intersections*

Level of service calculations for intersections determine the amount of 'control delay' (in seconds) that drivers will experience while proceeding through an intersection. Control delay includes all deceleration delay, stopped delay, and acceleration delay caused by the traffic control device. The level of service is directly related to the amount of delay experienced. For signalized intersections the overall LOS grade represents the weighted average of all movements at the intersection. For intersections under minor street stop-sign control, the LOS of the most difficult movement (typically the minor street left-turn) represents the intersection level of service. The LOS criteria for stop-sign controlled intersections are different than for signalized intersections because driver expectation is that a signalized intersection is designed to carry higher traffic volumes and experience greater delay. The following tables show the level of service criteria for signalized and stop-sign controlled intersections.

<b>Table 1</b> Level of Service Criteria for Signalized Intersections	
Level of Service	Average Control Delay (seconds/vehicle)
A	≤ 10
B	> 10 – 20
C	>20 – 35
D	>35 – 55
E	> 55 - 80
F	> 80

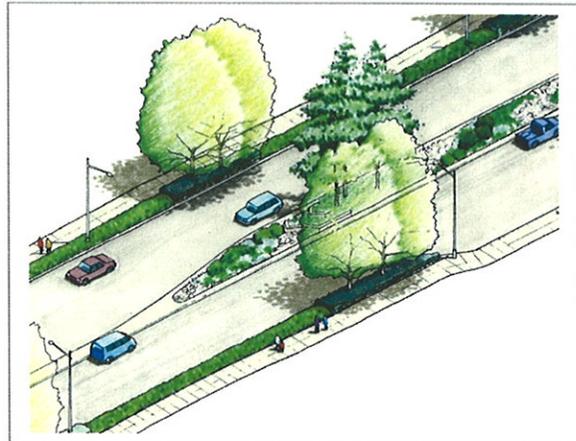
<b>Table 2</b> Level of Service Criteria for Stop-Sign Controlled Intersections	
Level of Service	Average Control Delay (seconds/vehicle)
A	≤ 10
B	> 10 – 15
C	> 15 – 25
D	> 25 – 35
E	> 35 – 50
F	> 50

Another measure of the function of a signalized intersection is the 'degree of saturation' which is typically presented as the 'volume to capacity' (v/c) ratio. Many factors affect the volume of traffic an intersection can accommodate during a specific time interval. These factors include the number of lanes, lane widths, the type of signal phasing, the number of parking maneuvers on the adjacent street, etc. Based on these factors, the intersection is determined to have a total vehicle carrying capacity 'c' for the analysis period. The analysis period volume 'v' is compared to the calculated carrying capacity and presented as a ratio. If the v/c ratio is below 1.0, the demand volume is less than the maximum capacity. If the v/c ratio is over 1.0, the demand volume is exceeding the available capacity.

### **Littlerock Road**

Based on an evaluation of link volumes on Littlerock Road with and without the full connection scenario in place, it appears that by 2020 Littlerock Road *would not* need to be widened to five lanes from Airdustrial Way to the Urban Growth Boundary south of 81<sup>st</sup> Avenue. Instead, Littlerock Road in the study area could be maintained as a two to three lane roadway.

Two to three lane roads are at a neighborhood scale and “calm traffic” by slowing speeds. The median controls access and left-turn movements, which increases capacity and safety of the corridor. Additionally, the median provides additional area for landscaping and aesthetic improvements. The narrower road section also would impact private property owners less because not as much land would be required.

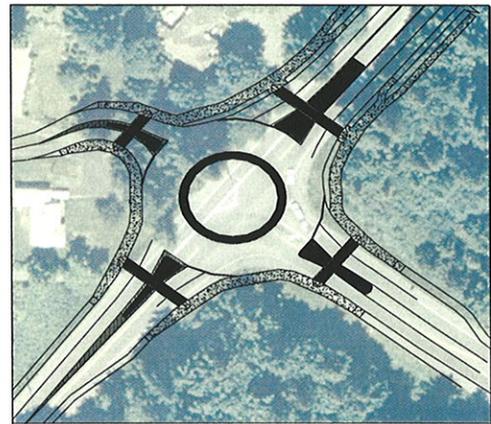


*A streetscape vision of how the Littlerock Road Corridor could develop.*

### **Intersections**

#### ***Littlerock Road/Airdustrial Way***

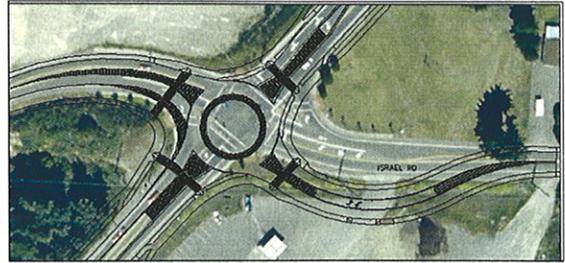
With or without connection improvements, this intersection remains as proposed in the Littlerock Road Corridor Development Plan, which calls for upgrading from a stop-controlled intersection to a multi-lane roundabout.



*Proposed roundabout configuration at the intersection of Littlerock Road and Airdustrial Way.*

***Littlerock Road/Israel Road***

With or without connection improvements, the Littlerock Road/Israel Road intersection remains as proposed in the Littlerock Road Corridor Development Plan. The intersection will be upgraded from a signalized intersection to a single-lane roundabout.



***Roundabout proposed for intersection of Israel Road/Littlerock Road.***

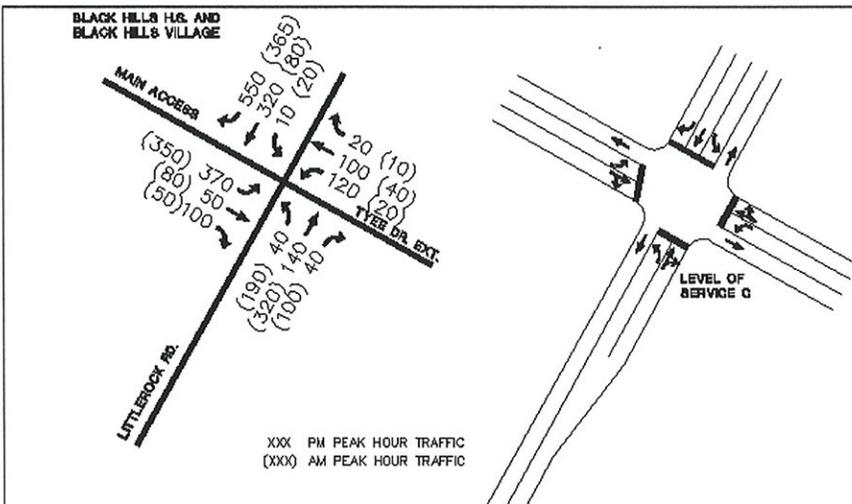


***Littlerock Road/Prine Road***

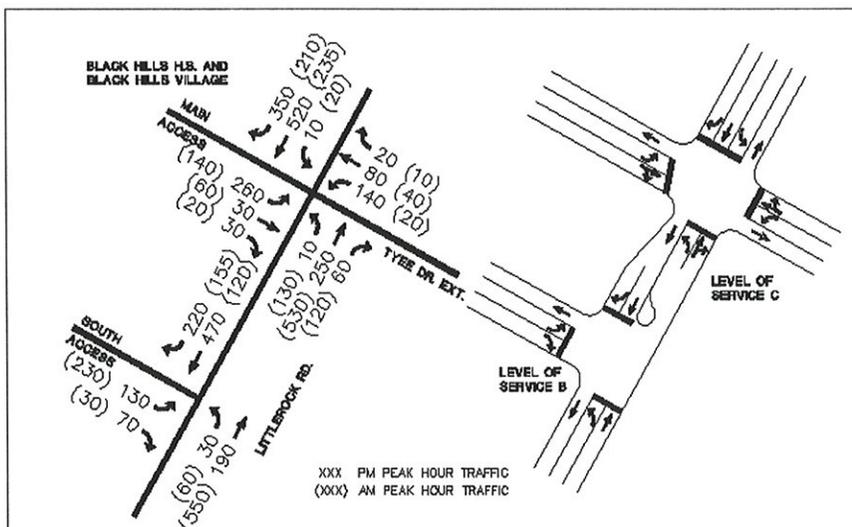
If 73<sup>rd</sup> Avenue is extended, it would intersect Littlerock Road at Prine Road, creating a new intersection, which could be controlled by a roundabout or a signal.

### Littlerock Road/Black Hills Village

The number of intersections from Littlerock Road into the proposed Black Hills Village development has significant impact, regardless of where intersections are located along Littlerock Road. For this analysis, a "main" intersection at the existing signal on Littlerock and a "south" access to the proposed commercial area (which may also be signalized), were evaluated. In addition to the intersection geometrics and operations (see Appendix 2 for detailed analysis), it is also functionally important that intersections be appropriately spaced. Signalized intersections located too closely along a corridor will degrade operations of the corridor, and could impact other intersections up and downstream.



With the other SubArea connections in place, a single access point into the Village would not require multiple turn lanes, however, it provides only limited access into the site, which is likely not desirable since all commercial and residential traffic would be forced to circulate from one intersection into the village.



Two entrances from Littlerock into the Village would enhance access and circulation, but would not provide significant additional capacity.

### ***Intersection Spacing and Access Management***

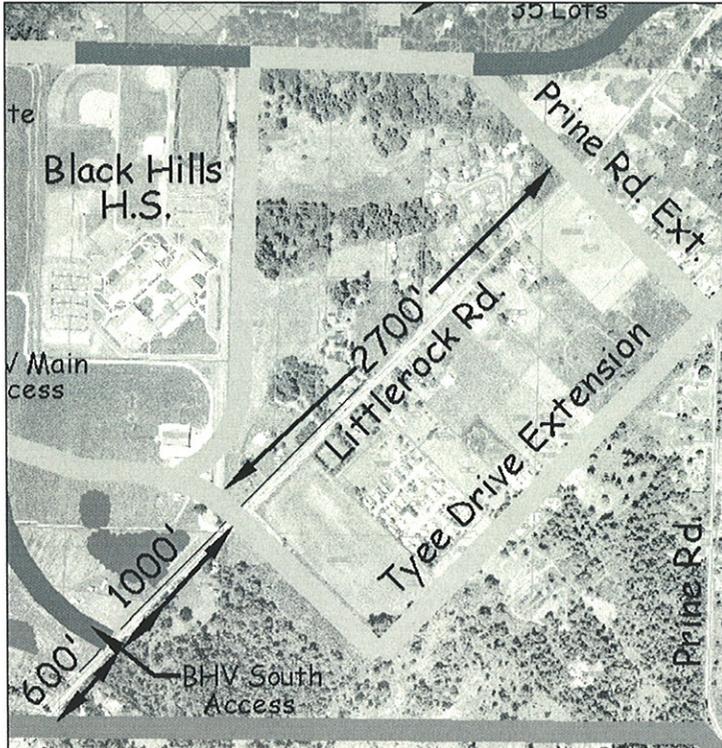
The development of the SubArea along Littlerock Road brings the challenge of providing a reliable, safe, free-flowing transportation network to serve the residential and commercial uses. Access Management is one of the major tools needed to address this challenge. The intent of Access Management is to provide access for land development while preserving the safety, capacity, and speed of travel on a corridor. Studies have shown that the uncontrolled proliferation of driveways and intersections along a given section of roadway reduces the average speed of travel, increases the number and severity of accidents, and inhibits bicycle and pedestrian usage.

There are several ways to manage access along a corridor, including medians, roundabouts, and controlled intersection and driveway spacing. North of this SubArea, from Airdustrial to Trosper, Littlerock Road is proposed as an access-controlled facility. In that area, Littlerock will be a median-divided boulevard that will control the location of left-turn opportunities. Several roundabouts are also proposed along that segment of the corridor, to control intersections and accommodate u-turn movements to allow access to all properties. In order to maintain Littlerock Road as a two to three lane section in the Black Hills SubArea, it is possible that the boulevard-style with planted medians may be needed. However, even without medians, intersection spacing should be controlled. According to general roadway classification, Littlerock Road would be a "Class C," and should have the spacing indicated in the table below.

<b>Class Description &amp; Function</b>	<b>Design Speeds</b>	<b>Minimum Signal &amp; Intersection Spacing</b>	<b>Median</b>	<b>Private Direct Access</b>
Class B  Moderate speed, moderate volume, intracity roadways.	30 to 40 MPH	½ mile	Restrictive median required on multilane roadways.  Two-way left turn lane allowed if ADT less than 25,000.	Allowed with restrictions: <ul style="list-style-type: none"> <li>• 300 feet minimum spacing.</li> <li>• One access per parcel or contiguous parcels, exceptions allowed with justification.</li> <li>• No additional access for subdivided parcels.</li> <li>• All access must meet minimum standards, corner clearance allowances not permitted.</li> </ul>
Class C  Moderate speed, moderate volume, short distance roadways.	30 to 35 MPH	¼ mile	Restrictive median may be used if operational or safety conditions warrant.	Allowed with restrictions: <ul style="list-style-type: none"> <li>• 150-foot minimum spacing.</li> <li>• One access per parcel or contiguous parcels, exceptions allowed with justification.</li> <li>• No additional access for subdivided parcels.</li> <li>• Corner clearance restrictions apply.</li> </ul>
Class D  Low speed, moderate volume, short distance roads.	25 to 35 MPH	¼ mile  Less than ¼ mile permitted with justification.	Restrictive median may be used if operational or safety conditions warrant.	Allowed with restrictions: <ul style="list-style-type: none"> <li>• 125-foot minimum spacing.</li> <li>• One access per parcel or contiguous parcels, exceptions allowed with justification.</li> <li>• Additional access for subdivided parcels may be allowed with justification.</li> <li>• Corner clearance restrictions apply.</li> </ul>

### SubArea Intersection Spacing

Along Littlerock Road through the Black Hills SubArea, there are several existing and proposed intersections. Approximate spacing of those intersections is indicated on the graphic below.



#### Main Access

The “main access” into Black Hills village is shown at the current signalized intersection location. Currently, there are no plans to relocate this intersection, although when the Village Master Plan is prepared, the exact intersection location may be reevaluated.

#### South Access

There is adequate spacing between the main and south accesses (1000 feet) to allow for signalized intersections at both locations. At this time, the access is intended to serve the Village commercial area.

#### 81<sup>st</sup> Avenue

The intersection of Littlerock and 81<sup>st</sup> Avenue is not anticipated to need a traffic signal, as the roadway is intended to remain rural residential in nature. Primary school, residential, and commercial accesses from Littlerock into the Black Hills Village is expected to occur at the main and south accesses. This will help the neighborhoods of the southern part of the SubArea to retain their existing rural character.

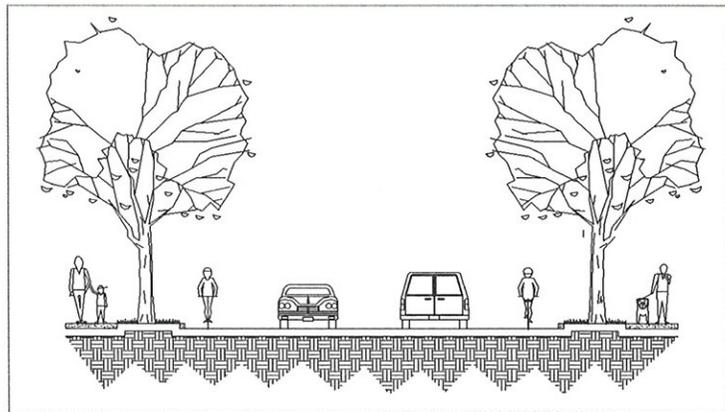
### **Traffic Management Zone**

The purpose of a Traffic Management Zone is to limit potential impacts to existing neighborhoods. This can be accomplished through the use of traffic calming measures. Roadways within the Traffic Management Zone (see Figure 5) of the SubArea fall into two categories: those with planned improvements with or without any new SubArea connections and those that are recommended for traffic calming improvements *because* of other connections.

### **Planned Urban Upgrades**

#### *70<sup>th</sup> Avenue/Kirsop Road/66<sup>th</sup> Avenue*

Full urban improvements (including bike lanes and sidewalks) would be constructed, and are required, as a condition of development projects along 70<sup>th</sup>. Until such time, the County plans to at least improve the shoulders along 70<sup>th</sup> as a first step. No additional capacity lanes are planned or needed, however,

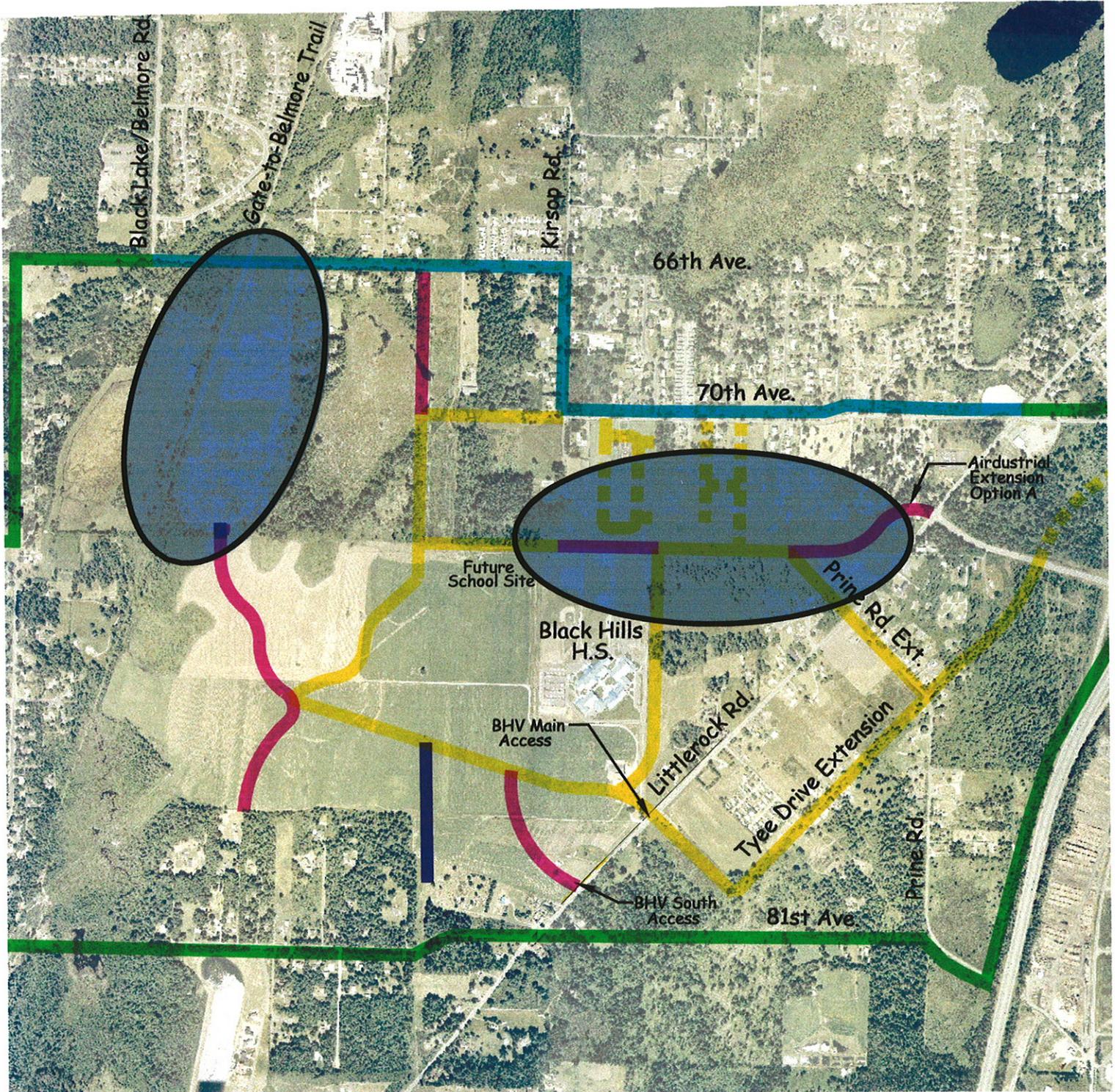


residents are concerned with existing traffic volumes and speeds on these roadways. The County may consider additional urban amenities to help reduce speed and/or volumes, including traffic circles, raised speed tables, or landscaping. Traffic calming devices are known to influence driver behavior, and can effectively reduce speeds. Many traffic calming devices have the added benefit of improving aesthetics (such as through landscaping) and creating “gateways” into residential areas.

### **Traffic Calming Upgrades**

No major improvements – capacity, non-motorized, or safety – are planned for any of these roadways regardless of whether or not the SubArea connection scenario is in place. However, with the full connection scenario in place, and development occurring as planned, it is likely that traffic calming measures may be appropriate for several local access roads within the SubArea. The County may consider additional urban amenities to help reduce speed and/or volumes. Traffic calming devices such as traffic circles, raised speed tables or landscaping are known to influence driver behavior, and can effectively reduce speeds. Many traffic calming devices have the added benefit of improving aesthetics (such as through landscaping) and creating “gateways” into residential areas.

# Black Hills SubArea Traffic Management Zones



## Legend

**The Shea Group**  
a Parametrix company

Engineering • Planning • Environmental • Surveying

- |   |                         |   |                                       |
|---|-------------------------|---|---------------------------------------|
|  | Study Area              |  | Potential New Roadways                |
|  | Planned Urban Upgrade   |  | Motorized Circulation Enhancement     |
|  | Programmed Improvement  |  | Non-Motorized Circulation Enhancement |
|  | Traffic Management Zone |  | Primary Connection                    |



Figure 5

## **Traffic Calming Measures**

**Traffic Calming** is the combination of measures that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized street users.

Traffic calming goals include:

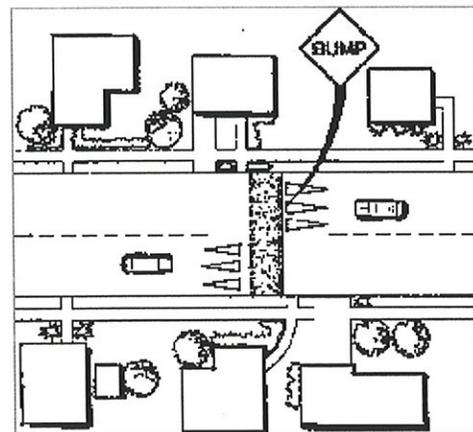
- increasing the quality of life;
- incorporating the preferences and requirements of the people using the area (e.g., working, playing, residing) along the street(s), or at intersection(s);
- creating safe and attractive streets;
- helping to reduce the negative effects of motor vehicles on the environment (e.g., pollution, sprawl); and
- promoting pedestrian, cycle and transit use

There are four general types of traffic calming measures. *Vertical deflections*, *horizontal shifts*, and *roadway narrowings* are intended to reduce speed and enhance the street environment for non-motorists. *Closures* (diagonal diverters, half closures, full closures, and median barriers) are intended to reduce cut-through traffic by obstructing traffic movements in one or more directions.

### **Vertical Deflections**

These are designed to change the vertical elevation of a roadway, and are usually either speed humps, or tables, as the wider humps are often called. When properly spaced (300-600 feet apart), they can effectively slow travel speed. The best applications for speed tables are residential streets with grades below 8 percent. They are not typically used on major roads, bus routes, or primary emergency response routes.

In terms of effectiveness, studies have shown that speeds between humps have been observed to be reduced between 20 and 25 percent on average, that traffic volumes have been reduced on average by 18 percent depending on alternative routes available, that collisions have been reduced on average by 13 percent on treated streets. Some communities have also observed an increase in traffic noise from braking and acceleration of vehicles, particularly buses and trucks.

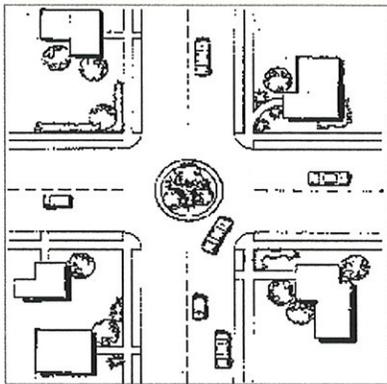


Emergency response vehicles experience an approximate delay of between 3 and 5 seconds per hump for fire trucks and up to 10 seconds for an ambulance with a patient.

Speed tables can also be used as raised mid-block pedestrian crossings. When combined with a decorative concrete treatment, they can serve as safe and aesthetically pleasing pedestrian enhancements as well as means to slow vehicles.

## Horizontal Shifts

These measures cause drivers to shift horizontally, either through traffic circles or “chicanes”, which are a series of narrowings or curb extensions that alternate from one side of the street to the other forming S-shaped curves. A common tool is the “traffic circle” which is a raised island, placed in an intersection, around which traffic circulates

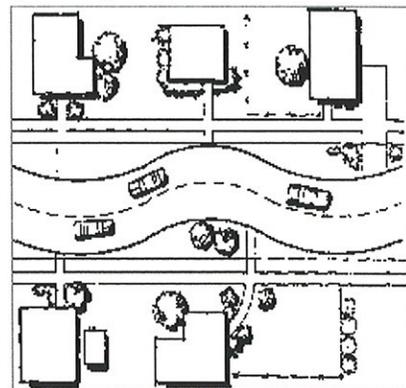


Traffic circles require drivers to slow to a speed that allows them to comfortably maneuver around them. They are not meant to control intersection operations, and are much different from roundabouts. Circles are typically located at the intersections of local or collector streets and are not used at intersections with high volumes of large trucks and buses.

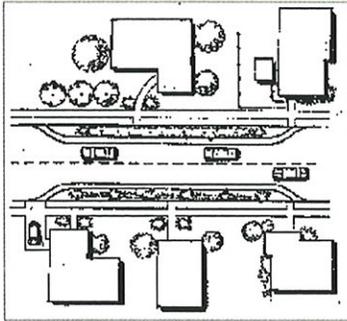
Studies indicate that the presence of traffic circles has no effect on access and only a minimal diversion of traffic. Midblock speeds can be slowed about 10 percent; and intersection collisions have been reduced on average by 70 percent and overall collisions by 28 percent.

Traffic circles can be landscaped and incorporated into “gateways” or other entrance features into neighborhoods or residential areas.

Chicanes can transform straight, speed-prone routes into slower, curved roadways more conducive to a neighborhood feel. There is limited available data on speed and volume reductions on roadways with this treatment, and they can impact parking and driveways. However, removal of previously paved areas to create the curves can eliminate impervious area and increase landscaping opportunities.



## Roadway Narrowings

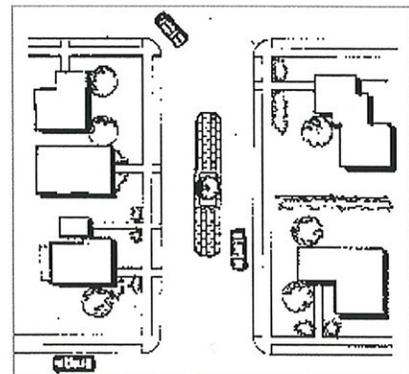


Narrowing the roadway with through “chokers” and medians can effectively cause drivers to slow down through traffic calmed zones. Chokers are mid-block curb extensions that narrow a street by extending the sidewalk or widening the planting strip. These can also serve as safe pedestrian crosswalks if so marked. Chokers are best used on local and collector streets and main roads through small communities. They work well combined with other measures, such as speed tables, raised intersections,

textured crosswalks and raised median islands.

Studies indicate that speeds have typically been reduced on average by 14 percent, and that there is a 20 percent reduction in volume. Chokers are preferred by many fire department/emergency response agencies to other traffic calming measures.

Medians are also used to narrow a roadway. When located along a centerline, medians effectively narrow travel lanes. The narrower lane widths cause drivers to slow. Medians can serve as mid-point refuges for pedestrians, and work well when combined with crosswalks. Medians also provide landscaping opportunities and serve as a visual amenity, enhancing neighborhood identity.



## Closures

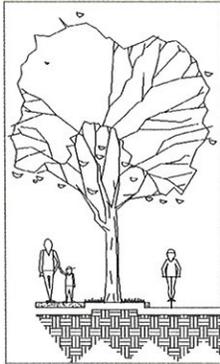
Closures are the most drastic form of traffic calming, and are typically only used when other traffic calming measures have failed to produce the desired results. There are several forms of closures, from partial to complete access closures.

- *Diagonal diverters* are barriers placed diagonally across an intersection, blocking through movement; they are sometimes called full diverters or diagonal road closures.
- *Half closures* are barriers that block travel in one direction for a short distance on otherwise two-way streets; they are sometimes called partial closures, entrance barriers, or one-way closures (when two half-closures are placed across from one another at an intersection, the result is a semi-diverter).
- *Full-street closures* are barriers placed across a street to completely close the street to through-traffic, usually leaving only sidewalks open; they are sometimes called cul-de-sacs or dead-ends.

## Recommendations for SubArea

The Traffic Management Zones identified in this Study could incorporate many of these traffic calming measures. Much of the public input has been a hesitation to build new connections that could bring higher volumes of traffic through neighborhoods that already experience traffic volumes and speeds beyond their “rural” aesthetic. No specific features have been identified for placing at any of the SubArea roadways.

### Non-Motorized Elements



A key component to managing growth is the ability to maintain the “livability” of the area in which the growth occurs. Planning street systems that move vehicles, pedestrians and bicyclists are critical in maintaining a sense of community livability. In an area that combines residential, commercial, and schools, non-motorized access, circulation and safety is particularly critical. The Conceptual Non-Motorized Plan for the Black Hills SubArea is illustrated in Figure 6. This plan indicates the *directional flow* of non-motorized modes (pedestrians and bicycles) between major destinations, such as residential areas, schools, Kenneydell Park, Black Lake, trail systems, and commercial land uses. The plan does not inventory existing facilities, although in many cases, sidewalks, widened shoulders and trail segments do exist.

Pedestrian connections are particularly important in areas where vehicular access cannot be created, due to limited property availability or sensitive areas such as wetlands. In these cases, such as the areas between 81<sup>st</sup> and the Black Hills Village site or 70<sup>th</sup> and the existing and proposed schools, these non-motorized connections may be all that is needed. These circulation enhancements could be combined bike/pedestrian paths that provide safe access from area neighborhoods to the Village commercial areas, schools, and the future “Gate to Belmore” Trail.

### Sidewalks and Walkways

The City and County plan to include pedestrian amenities for all new connections and future urban upgrades within the SubArea. Where sidewalks are not feasible due to right-of-way limitations or critical area impacts, at a minimum, widened shoulders should be provided. Through neighborhoods, and on traffic-calmed streets with lower posted speeds, sidewalks may not be buffered from travel lanes by means of a landscaped planter strip. On collectors with high volumes and speeds, additional safety is gained by the addition of a planter strip buffer. Littlerock Road north of the SubArea is designed to include planter strips and/or tree wells to increase pedestrian safety.



## Bicycle Facilities



There are several classifications of bicycle facilities, including designated lanes, shared lanes, paved shoulders, and multi-modal paths. Designated lanes are striped and marked specifically for bicycle use, and are planned on Littlerock Road north of the SubArea. Where physical space is limited, shared vehicle/bike lanes are utilized. In this case, wider outside lanes can reduce the potential safety and mobility impacts of shared lane usage. Experienced riders wishing to operate at maximum speed with minimum delay operate well in shared lanes; children and recreational riders tend to prefer the safety and separation of the bicycle and vehicular traffic. This can be achieved through multi-modal paths that are separated completely from the roadway. There are several opportunities within the SubArea for a variety of shared lane and path connections, particularly to and through the Black Hills Village, near and between schools, and between existing and proposed residential development. These allow connections to be made while limiting the type of “traffic” (cars, bikes, pedestrians) that uses the connections.

## Trails

The “Gate-to-Belmore” Trail creates the western edge of the SubArea, and provides opportunities for future recreational use. The Gate-to-Belmore railroad line was acquired in 1996 by the County from Burlington Northern Railroad. This corridor links the urban trail system from Tumwater at Kenneydell County Park with the south county communities of Gate and Rochester. The future trail will offer access to the Black River and runs adjacent to the Black River-Mima Prairie Glacial Heritage Preserve and Black River Natural Area just south of Littlerock.



*The Gate-to-Belmore Trail could look similar to The Chelanis Western Trail, above*

## Safe Access to Schools

The schools, City, County, and residents have a vested interest in providing safe access to Black Hills High School and the proposed elementary school. This includes safe, convenient pick up and drop off locations along designated bus routes, as well as providing alternative means for students traveling to and from school. Sidewalks and widened shoulders will improve student pedestrian safety. Multi-purpose trails will allow safer cycling and walking opportunities.

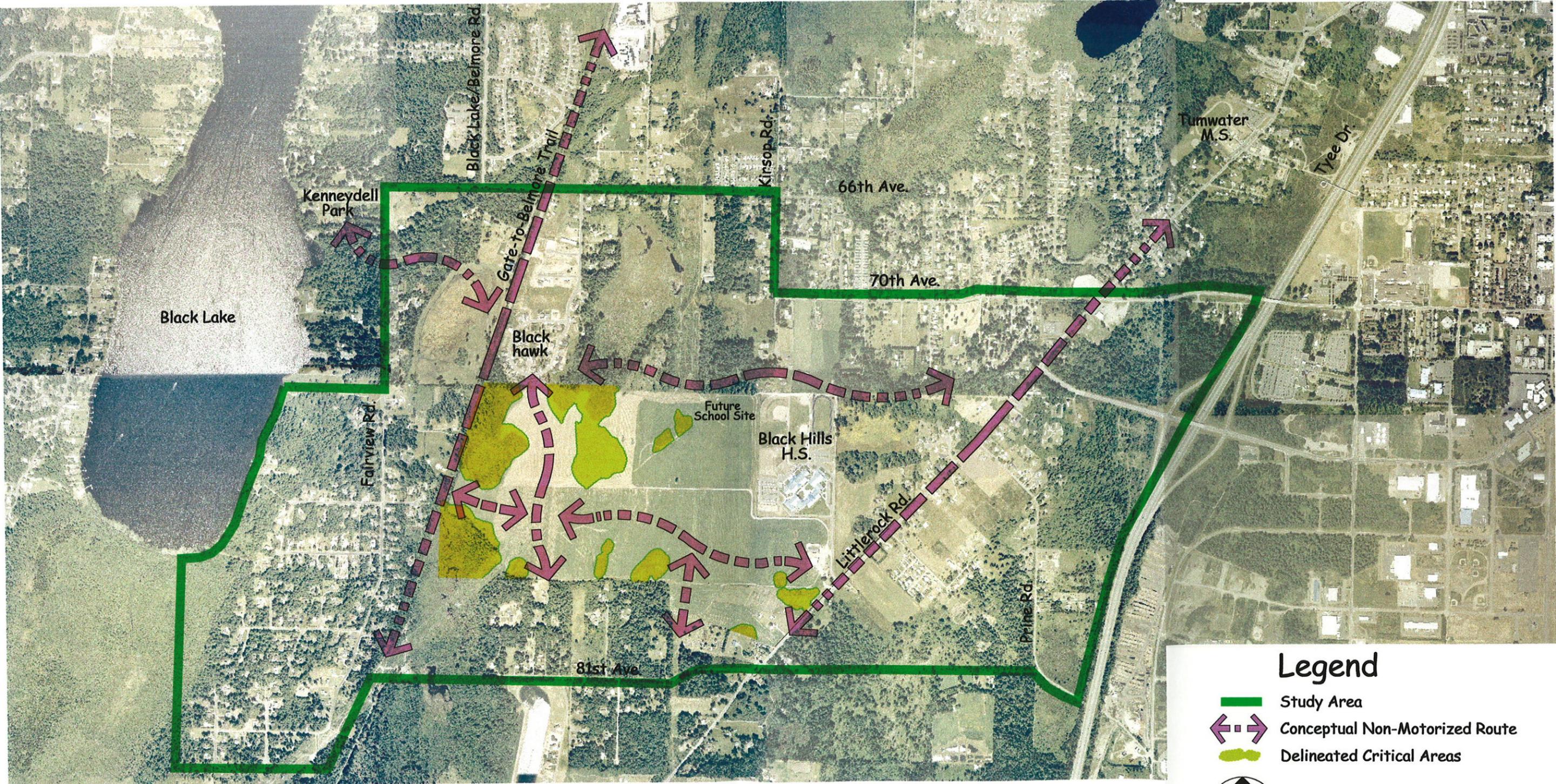


*Black Hills High School*

In addition, the Tumwater School District would like to work with the City, County, and development community to incorporate internal bus stops in new

residential areas. This will limit the number of bus stops on major roadways, reducing traffic delays created by loading and unloading of students during morning and afternoon hours.

# Black Hills SubArea Non-Motorized Conceptual Plan



**Legend**

- █ Study Area
- ↔ Conceptual Non-Motorized Route
- █ Delineated Critical Areas

  
NORTH

Figure 6

## **V. SUMMARY AND RECOMMENDATIONS**

### ***Integration into City and County Plans***

A key component of this study is its integration into City and County Comprehensive Plans. By adopting this study as a component of those plans, new connection routes are preserved, and development within the SubArea will need to comply with the improvements as described. As part of the formal adoption process, the plan will go through SEPA review, which includes a public comment period. Prior to adoption of Comprehensive Plan amendments, there will be opportunities for additional public comment at Planning Commission and City Council public hearing(s).

### ***Phasing of Improvements***

Most of the proposed improvements in this plan are intended to be built as development occurs. A summary of improvements and the anticipated time frame is included by improvement category:

#### **New Connections**

Proposed new primary connections and extensions such as Tyee Drive, 73<sup>rd</sup> Avenue, and the 70<sup>th</sup>-73<sup>rd</sup> Avenue north/south connector are of higher importance for vehicular access and circulation, and would likely be constructed sooner than other described improvements. However, these will depend on the timing of development of the commercial areas within the SubArea. Enhancement connections like the one between 66<sup>th</sup> Avenue and 73<sup>rd</sup> Avenue are secondary, and would likely be built only as they are needed.

#### **Operations/Capacity**

There are no existing operational or capacity deficiencies on the roads or at the intersections within the SubArea. Improvements to Littlerock Road between Israel Road and Trosper Road are currently under design. Construction is anticipated for 2004. Primary connections should be in place before proposed non-motorized enhancements for Black Hawk and 81<sup>st</sup> Avenue are constructed. Improvements to other intersections along Littlerock Road are not needed until development occurs.

#### **Traffic Management Zone**

The County plans to upgrade 70<sup>th</sup> Avenue to include widened shoulders, and is currently requiring all new development fronting 70<sup>th</sup> to improve the road to its full urban standard, which includes sidewalks and other non-motorized amenities. Traffic calming projects are not currently proposed nor funded for any residential streets within the identified Traffic Management Zone. Within the Black Hills Village itself, there are preliminary plans to design streets with the "livable community" features (curved, narrow roads, landscaping, traffic circles) described in this study.

**Non-Motorized Elements**

As new connections are made, enhancements constructed, schools built, and as the Black Hills Village is developed, many new pedestrian and bicycle facilities will be realized. These include bike lanes, multi-use pathways, and widened shoulders. The goal is to provide better and safer connections between residential areas and parks, trails, schools, and other major destinations.