



# Brookman Addition Concept Plan Report

## **Appendix**

**May 9, 2008**

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Public Involvement Report

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## Appendix A – Public Involvement Report





## Brookman Road Concept Plan Public Involvement Report

Prior to beginning the Brookman Road Concept Plan project, the City developed a public involvement plan to engage and inform as many property owners and citizens as possible. The Plan included providing multiple opportunities for formal and informal comments. The plan included the formation of a steering committee consisting of property owners, residents, agencies and representatives from boards and commissions; public open house meetings, monthly updates in the gazette, and regular web updates.

The following is a detail of the multiple outreach actually provided through this process.

	date	Comment
Mailers to property owners in the Brookman Road area	March 23, 2007	
Article in Gazette regarding “kick-off” and soliciting applications for steering committee		
Council forms Steering Committee and formally authorizes contract	April 3, 2007	
Mailer to property owners in area and within 100 feet announcing project kick-off	May 23, 2007	Included scheduled steering committee and public open house dates as well as web address
Steering Committee meeting	June 2, 2007	
Steering Committee meeting	June 27, 2007	
Park Board meeting	July 9, 2007	
Steering Committee meeting	July 18, 2007	
Steering Committee meeting	August 22, 2007	
Open House #1	October 10, 2007	Notices mailed to property owners within 100 feet, within the Brookman Road area, to all Woodhaven HOA members (507 e-mail addresses), to the Arbor Lane HOA contact, to the Interested Parties list, notice posted on the website, on the Robinhood Theater Sign prior to the event, articles in the archer and included on a citywide post card about several events of citywide interest.
Steering Committee meeting	October 24, 2007	
Steering Committee meeting	December 12, 2007	
Park Board meeting	January 7, 2008	
Open House #2	January 9, 2008	Notices mailed to property owners within 100 feet, within the Brookman Road area, to all Woodhaven HOA members (507 e-mail addresses), to the Arbor Lane HOA contact, to the Interested Parties list, notice posted on the website, on the Robinhood Theater Sign prior to

		the event, and articles in the archer.
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In addition to the above date specific meetings or mailings, articles were published monthly in the Archer to inform the public that this project was taking place. The City also provided regular updates on the City web site and had copies of all materials received by the Steering Committee available on the web site.

Detailed interested parties list with updates provided when Steering Committee updates were provided.

### **Steering Committee**

The public outreach and resulting input helped shape the plan. Specifically, each Steering Committee member represents an agency or group of people and brings their own perspective to the process. Simply through the SC participation, multiple view points were considered and heard.

In addition to the Steering Committee representation, the meetings were open to the public with an opportunity to comment at the beginning of every meeting. The Steering Committee heard a presentation from one property owner with specific transportation concerns during this comment period. In addition, there were times at which the Committee would welcome input from the “audience” as they were discussing issues. The Steering Committee meetings were attended by members of the public with as few as two (2) at some and as many as eleven (11) at others.

### **Open House #1**

Approximately 70 total participants attended the Open House. Most of the survey participants live in Sherwood (67%), with a minority that live within the Brookman Addition area. Most survey participants have lived in their existing homes for more than five years (78%).

During the Open House, a presentation was given and posters were exhibited explaining differing aspects of the project, including: Project Timeline, Project Goals. Background Maps, Natural Areas and Goal 5 Resources, Slope, Buildable Lands, Ownership, Market Analysis, Infrastructure, Parks, Stormwater, Sewer and Water Service, Transportation Elements, I-5/99W Connector Study, Existing Transportation Analysis, Transportation Analysis of Three Preliminary Alternatives, and the Three Preliminary Alternatives developed by the Steering Committee and Consultant team.

An on-line survey was created (with hard copies also provided at the open house for those that did not want to complete the survey on line) to obtain feedback on the three alternatives presented and the underlying goals. Most survey participants found each Brookman Addition Goal to be very important or important; some participants felt that the goals should reflect an emphasis on green development and protect existing farmland by encouraging the I-5/99W Connector to be placed north of the study area. Survey participants liked Alternative One’s open spaces and economics, but disliked the transportation and town planning aspects. Most liked the economics and town planning of Alternative Two, but disliked the open spaces and transportation, especially the Ladd Hill realignment. Most liked the transportation elements of Alternative Three, but disliked the lack of green space and high density layout. Of the three alternatives, most survey participants preferred the

Western Town Center & Historic Railroad Village and Cedar Creek and Ladd Hill neighborhoods of Alternative One and preferred the Central Neighborhood in Alternative Two.

Survey participants also mentioned that the plan should consider the rural south side of Brookman Road. There were also concerns about the amount of traffic on residential roads north of the Brookman Addition area and concerns about traffic and infrastructure impacts outside of the Brookman Addition area. There were some that preferred a fourth “No Build, No Annexation” alternative.

Approximately 13 Open House attendees then participated in the workshop portion of the Open House where there were facilitated discussions and the opportunity for hands-on participation. Below is a summary of what came out of the workshop session:

#### Alternative 1

The groups liked the lower density, increased open space and lots of green. The street system seemed less linear, perhaps creating quieter more private neighborhoods. The groups generally disliked the limited connectivity to the north.

#### Alternative 2

Liked the realignment of Brookman Road. Disliked the amount of high density residential and the fact that it was “chopped up” and not consolidated. Townhomes are preferred over high-density attached residential. Concerned about the green spaces lost between Alternative 1 and Alternative 2, particularly in the Cedar Creek area. Also disliked the intersection in the Ladd Hill area.

#### Alternative 3

Liked the better connectivity to the north. They liked the idea of a street on the north edge, but not as a collector. Interested in the idea of “main street” commercial area. Felt this alternative eliminates too much green space and packs in too much density. Loses its character. They disliked the idea of a collector along the north edge, due to the impacts on existing homes on the boundary of the area. The groups disliked the amount of retail and commercial lands in all alternatives.

The groups were then asked to construct their own versions of the Brookman Addition Concept Plan using “puzzle pieces” from the three preliminary alternatives. Three groups completed this activity, resulting in: One concept plan identical to Alternative 1, except with a variation in the alignment of Brookman Road in the Eastern section. One concept plan with the Western and Central areas of Alternative 1 and the Eastern section of Alternative 3, with the addition of a Northern Road. One concept plan with the Western area of Alternative 2, the central area of Alternative 3, and the Eastern area of Alternative 1.

Several Steering Committee members were in attendance at the Open House and participated in the workshop. The entire Steering Committee was presented an Open House Summary report at the October 24, 2007 Steering Committee meeting and the members were asked to consider the public input and provide direction on revisions prior to additional analysis and review by the consultant team.

After considering the public input as well as agency concerns and additional consultant analysis, the Steering Committee took elements of each of the 3 original alternatives and provided specific direction to the consultant team to provide even more analysis to determine if specific transportation elements were more feasible than others.

## **Open House #2**

Prior to holding the second Open House the Consultant Team presented the revised plan based on the direction provided to the consultants and providing the additional analysis requested regarding transportation impacts and improvement costs. The Steering Committee gave the approval to forward that revised plan to the public open house for review and comment.

The purpose of Open House was to: Update the public concerning the progress and current status of the Brookman Addition Concept Plan; Provide a forum for the public to ask questions and elicit responses from the project team; Be available to answer questions and inform the public about the Brookman Addition Concept Plan process; and Receive community input both during the open house and through an optional survey available to citizens at the open house and online.

Approximately 70 total participants attended the Open House. The survey garnered 59 respondents. Most of the survey participants live in Sherwood (75%) and close to half live or own property in the Brookman Addition Area (47%). Most survey participants have lived in their existing homes for more than five years (76%).

The Open House was a question and answer event focused on posters that were exhibited explaining differing aspects of the project, including: Project Timeline, Project Goals, Existing Conditions Maps, Natural Areas and Goal 5 Resources, Buildable Lands, Property Ownership, Market Analysis, Transportation Elements, I-5/99W Connector Study, Existing Transportation Analysis, Preliminary Concept Plan - Land Use Map, Preliminary Concept Plan - Functional Transportation Classification Map, Preliminary Concept Plan - Parks, Trails & Schools Map, Transportation Analysis of the Preliminary Concept Plan.

In addition to input and comments provided at the Open House itself, residents were encouraged to fill out a Preliminary Concept Plan survey on-site or online. Project goals developed by the Steering Committee were used as criteria for respondents to evaluate the plan, its design elements and sub areas. The survey focused on four main aspects on the concept plan: transportation; open spaces, parks, and stormwater; economics; and town planning. Survey participants provided opinions on these aspects for the overall draft concept plan and in the three specific sub areas, referred to as the West Sub Area, Central Sub Area, and East Sub Area.

Regarding how well the Draft Concept Plan met a variety of specific project goals, the response was positive in terms of meeting goals for a transition of land intensity throughout the site and the preservation of land for parks and green spaces. Respondents were more neutral when evaluating the Preliminary Concept Plan in terms of creating connections to Sherwood, establishing a complete community, providing for transportation choices, encouraging long-term quality of development, a planning process rooted in consensus, involvement, and partnerships and implementation of the Concept Plan. Implementation drew the most uncertainty with 56% of participants responding “neutral/don’t know.”

Regarding the Concept Plan in general the majority of survey participants liked the approach to open spaces, parks, and stormwater areas in the draft concept plan. Survey participants disliked the approach to transportation and town planning.

Regarding specific Sub Areas in the Concept Plan participants liked the open spaces, parks, and stormwater planning in each sub area. Of the three sub areas, participants responded most favorably to the West Sub Area and least favorably to the East Sub Area.

- West Sub Area:  
Participants liked the approach to economics and town planning  
Responses regarding transportation planning were more evenly distributed between “like” (33%) and “dislike” (39%).
- Central Sub Area:  
Participants largely responded “no opinion” to transportation, economics, and town planning.
- East Sub Area:  
65% of participants disliked the approach to transportation.  
Responses were evenly distributed for town planning.  
Responses were largely “no opinion” for economics.

Survey participants also:

- Strongly opposed the connection of Redfern Drive with the Brookman Addition area;
- Requested additional connections, especially north-south, with Sherwood;
- Expressed a desire for additional parks and open space in the plan;
- Raised concerns about the enhancement of Brookman Road’s level of service in terms of potential impacts to existing property owners and traffic safety;
- Questioned infrastructure capacity and public facility impacts, especially on the schools, outside of the Brookman Addition area.

### **Final Steering Committee Recommendation**

At the February 27, 2008 Steering Committee meeting, the members were asked to provide direction on several key issues identified in the second open house. Specifically:

- Connection of Redfern into the Brookman Road area
- Alignment of Brookman Road
- Parks and Open Spaces (amount and location)
- Densities (overall and in the eastern portion)
- Constrained lands as mapped do not necessarily reflect what is “on the ground”
- How much “green” development should be encourage, required or provided

After discussion of the public input and the key issues, the Steering Committee provided the following direction to the consultant team to make modifications to the draft concept plan report:

- Connection of Redfern into the Brookman Road area – keep the connection in the plan but provide specific recommendation that the traffic volumes on Redfern may not exceed the typical volumes for a local street of this size (1000 ADT). If this is adopted

as part of the concept plan, implementation would be via amendment to the Transportation System Plan.

- Alignment of Brookman Road – The committee discussed comments supporting the realignment of Brookman to remove the “S” curve. Ultimately, it was determined that the existing alignment was preferred.
- Parks and Open Spaces (amount and location) – The Committee supported re-locating the eastern most proposed park to the Cedar Creek area near Red Fern. No specific recommendations were made to increase the total number or general amount of park space.
- Densities (overall and in the eastern portion) – The committee recommended coordinating with Metro to determine if a reduction in density in the Cedar Creek area would be accepted if it would help preserve additional openspace and natural vegetation. If Metro was not supportive of a density reduction, the Committee recommended the Planning Commission look at either further up-zoning property to the west to allow lower densities adjacent to Cedar Creek or look at other ways to help enable the retention of large standards of natural vegetation in the Cedar Creek area.
- Constrained lands as mapped do not necessarily reflect what is “on the ground” – The Committee determined not to modify maps at this time, but rather reflect in documents and maps that the information is for general planning purposes and will have to be defined in greater detail as development occurs.
- How much “green” development should be encourage, required or provided – The Committee discussed and decided to recommend that an action plan be developed to help facilitate green development throughout the Brookman Road area.

With the direction provided, the Steering Committee agreed to forward a recommended concept plan to the Planning Commission and, ultimately, City Council for review.

Attachments located in Technical Appendix:

Open House Report #1

Open House Report #2

Meeting summaries from the steering committee meetings

Copy of project kick-off flyer

Copy of open house #1 flyer

Copy of open house #2 flyer

## Appendix B – Transportation





## Memorandum

**DATE:** April 22, 2008  
**TO:** Joe Dills, Otak  
**FROM:** Chris Maciejewski, PE; Garth Appanaitis  
**SUBJECT:** **Brookman Addition Concept Plan: Committee Recommended Plan – Transportation Analysis**

P07124-000-000

The purpose of this memorandum is to review the transportation performance and other key characteristics of the project committee recommended Sherwood Brookman Road Concept Plan. The first two sections of this memorandum discuss compliance of the proposed Concept Plan with City functional classification and access spacing standards. The final five sections discuss the traffic impacts of the Concept Plan, including trip generation, study area operations analysis, neighborhood street impacts, recommended mitigation measures, and transportation cost estimates. The traffic impact analysis for the potential land use addresses long term issues utilizing a forecast year of 2030.

### Functional Classification

Highway 99W is classified as a statewide highway in the Oregon Highway Plan<sup>1</sup>. The City's Transportation System Plan (TSP)<sup>2</sup> identifies Brookman Road and Old Pacific Highway as collector roadways, Middleton Road as a neighborhood route, and Highway 99W as an arterial. Brookman Road is also identified as a collector in the Washington County TSP. The Brookman Road Concept Plan includes a roadway network that is significantly different than the existing system, and was reviewed to determine which streets should be classified as collectors or neighborhood routes. Brookman Road and Old Highway 99W were maintained as collector designations and Middleton Road was maintained a neighborhood route. The additional proposed roadways would be local streets. Figures 1 shows the recommended functional classifications.

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<sup>1</sup> 1999 *Oregon Highway Plan*, Oregon Department of Transportation, January 2006.

<sup>2</sup> *City of Sherwood Transportation System Plan*, Prepared by DKS Associates, March 2005.

**Figure 1: Brookman Concept Plan Functional Classification**



## Access Spacing Review

The proposed functional classification designations indicated in Figure 1 establishes the access spacing standards for the roadway network. Along the collector roadways, access spacing should be a minimum between off-sets of 100 feet and a maximum of 400 feet to meet City of Sherwood and Washington County standards. In general, the Concept Plan achieves these standards, with several minor exceptions. Access spacing standards in excess of 400 feet occur along green-spaces where motor vehicle access will not be provided, as well as at the grade-separated rail crossing on Brookman Road.

In addition to meeting City of Sherwood access spacing standards within the study area street network, access spacing along Highway 99W was reviewed. The Oregon Highway Plan access spacing standard for Highway 99W in Sherwood with a posted speed of 45 miles per hour (mph) is 990 feet. However, the Brookman Road Concept Plan is working in coordination with the I-5 to 99W Connector Study, which is in the process of analyzing six possible alternatives, one of which has identified a potential interchange location near the existing intersection of Highway 99W/Brookman Road. To work around the potential interchange location, the Concept Plan has closed the existing Brookman Road access to Highway 99W and proposes a new connection as far to the north as possible given the topographic features of the area (between 1,000 feet and 1,300 feet may be possible). Therefore, the Concept Plan is as consistent as feasible with the state access spacing standards while maintaining one connection to Highway 99W.

## Trip Generation

To determine the impact of rezoning the study area, the amount of motor vehicle traffic generated development of the Concept Plan was determined. Trip generation was estimated based on rates provided by the Institute of Transportation Engineers<sup>3</sup> (ITE) for similar land use types. Table 1 lists the estimated PM peak hour trips for each proposed land use of the Concept

<sup>3</sup> *Trip Generation Manual, 7<sup>th</sup> Edition*, Institute of Transportation Engineers, 2003.

Plan. Because the existing zoning of the study area is rural residential which allows little growth, the entire amount of trips listed in Table 1 was included in the impact analysis. The total PM peak hour trips generated by the concept plan is approximately 1,400 trips (which is roughly equivalent to build-out of the same number of single family homes – for comparison, there are approximately 850 existing homes in the area bounded by Brookman Road/Sunset Boulevard/Highway 99W/Ladd Hill Road).

**Table 1: Motor Vehicle Trip Generation**

			PM Peak Hour Trips		
Land Use <sup>4</sup>	ITE Code	Size	In	Out	Total
Commercial - Retail	814	29 employees	33	42	70
Employment – Office	710	349 employees	27	134	161
Employment – Industrial	110	102 employees	9	34	43
Medium Density Residential	210	943 households	600	353	953
High Density Residential	220	296 households	119	65	184
TOTAL	-	-	788	628	1,416

## Operations Analysis

The following sections describe the future forecasting and operations analysis completed for the Brookman Concept Plan. The future conditions evaluation includes future forecasting, identification of study area improvements, and motor vehicle intersection capacity analysis.

### Future Forecasting

Future travel demand forecasting for the Brookman Road study area utilized the latest 2030 model developed by Metro, Washington County, and DKS Associates for the I-5 to 99W Connector Study. As part of the model development for the I-5 to 99W Connector Study, the Sherwood TSP travel demand model zone structure and network detail was used as a guideline to refine the regional model. In addition, a detailed focus model was created for the Brookman Road Concept Plan study area, which incorporates the use of *HCM 2000 Methodology* for node delays (instead of the regional model macroscopic delay functions).

Future 2030 PM peak hour volumes at study intersections were developed for the Brookman Concept Plan land uses scenario by adjusting the travel demand model trip tables to reflect the trip rates listed in Table 1. These volumes were then used to analyze and determine future impacts from the proposed Brookman Road area on the planned roadway network. The future 2030 PM peak hour scenarios include:

- 2030 No Build (no development in the Brookman Road area)
- 2030 with Brookman Road Concept Plan

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<sup>4</sup> Park space generates a nominal amount of trips (ITE Code 411 - 1.59 trips/acre/weekday). These neighborhood parks were assumed to be limited to internal use and were not included in the external trip generation for the plan.

### **Planned Study Area Roadway Improvements**

The City of Sherwood TSP provides specific information regarding future transportation projects that were identified to meet needs created by future growth within the study area without growth along Brookman Road. For the study area intersections, the only capacity improvement project identified with committed funding is the City's capacity enhancements at the intersection of Sunset Boulevard/Sherwood Boulevard (signal or roundabout). The remaining projects in the study area that may provide additional capacity (e.g. the I-5 to 99W Connector) were not included in any of the future analysis scenarios in order to meet OAR 660-012-060 requirements.

### **Concept Plan Assumed Projects**

Several transportation improvements (in addition to the construction of the general roadway facilities shown in Figure 1) were assumed to be constructed in order to improve traffic operations in the study area and limit the impact to neighborhood streets with the proposed Concept Plan. Analysis conducted for the preliminary Concept Plan alternatives determined that the following projects would be needed with development of the concept plan:

- Traffic signal control at Hwy 99W/Brookman Road
- All-way stop control (or a roundabout) at Brookman Road/Ladd Hill Road
- Traffic calming measures on Pinehurst Drive and Inkster Drive
- Southbound right turn lane at Brookman Drive/Ladd Hill Road (not needed if roundabout)

These projects are associated with development of the Concept Plan and were not assumed in the 2030 No Build analysis. Costs estimates for these projects (and other Concept Plan transportation improvements) are included in Table 6.

Redfern Drive has been identified as an area of special concern, and an extension into the concept plan area may be considered if motor vehicle volumes do not exceed 1,000 vehicles per day. For the purposes of this analysis, no motor vehicle connection was assumed since prior analysis<sup>5</sup> indicated volume thresholds would be exceeded. However, the potential for pedestrian, bicycle, emergency vehicle or a full motor vehicle connection remains, pending refined future development layout of the site if the connection does not exceed 1,000 motor vehicles per day.

### **Capacity Analysis**

In order to provide a baseline comparison to the future Brookman Road Concept Plan, the 2030 No Build scenario evaluates future traffic volumes assuming the planned roadway geometry and no development of the Brookman Road project area beyond what currently exists today. The Concept Plan was evaluated to determine the impacts to the study area. Intersections that do not meet performance standards under the Concept Plan must be mitigated to the level of performance that would occur without development of the area per Oregon's Transportation Planning Rule (TPR).

The performance standard for intersections controlled by City of Sherwood is Level of Service (LOS) D. For intersections along Highway 99W, performance standards are based on the

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<sup>5</sup> *Brookman Addition Concept Plan – Transportation Analysis*, prepared by DKS Associates, March 19, 2008.

volume-to-capacity (v/c) ratio of the intersection. The v/c standard for Highway 99W/Brookman Road and Highway 99W/Sunset Boulevard is 0.99. As listed in Table 2, the intersections of Hwy 99W/Sunset Boulevard, Highway 99W/Brookman Road, and Sunset Boulevard/Woodhaven fail to meet ODOT/City standards in the No-Build scenario. Under the Brookman Road Concept Plan development (and construction of assumed projects) the intersection of Highway 99W/Brookman Road would meet performance standards as a signalized intersection. However, the intersections of Highway 99W/Sunset Boulevard and Sunset Boulevard/Woodhaven Drive would continue to not meet performance standards. In addition, Sunset Boulevard/Timbrel Lane would not meet performance standards. While the intersection of Sunset Boulevard/Woodhaven Drive would not meet performance standards, the performance would improve due to traffic shifts associated with the adjacent improvements at Sunset Blvd/Timbrel Ln. Therefore, mitigation would not be required at this location. Two intersections have impacts that will require mitigation (indicated in bold type).

**Table 2: 2030 PM Peak Hour Intersection Performance**

		Intersection Performance (Delay LOS V/C)	
Intersection	Agency	No Build	Concept Plan
<b>Signalized Intersections</b>			
Hwy 99W / Sunset Blvd	ODOT	94.3 F 1.24	<b>111.0 F 1.28</b>
Sunset Blvd / Sherwood Blvd	City	15.5 B 0.46	22.6 C 0.62
<b>All-Way Stop Intersections</b>			
Brookman Rd / Old Hwy 99 <sup>6</sup>	City	7.0 A 0.43	0.4 A 0.20
Sunset Blvd / Pinehurst Dr	City	23.0 C 0.81	28.0 D 0.87
<b>Unsignalized Intersections</b>			
Hwy 99W / Brookman Rd <sup>7</sup>	ODOT	1126 A/F 3.20	29.7 C 0.93
Sunset Blvd / Woodhaven Dr	City	86.2 A/F 0.91	88.9 A/F 0.89
Sunset Blvd / Timbrel Ln	City	24.3 A/C 0.34	<b>134.4 B/F 1.02</b>
Sunset Blvd / Redfern Dr	City	26.2 A/D 0.14	32.1 A/D 0.17
Brookman Rd / Ladd Hill Rd <sup>8</sup>	County	16.3 A/C 0.35	13.7 B 0.68
Brookman Rd / Middleton Rd <sup>9</sup>	County	10.8 A/B 0.23	9.2 A 0.33

**2-Way Stop Intersection LOS:**

A/A = Major Street turn LOS/ Minor Street turn LOS

**All-Way Stop/Signalized Intersection LOS:**

LOS = Level of Service

Delay = Average delay per vehicle (seconds)

V/C = Volume to Capacity Ratio

<sup>6</sup> Analyzed as single-lane roundabout for Concept Plan

<sup>7</sup> Analyzed as signalized intersection for Concept Plan. ODOT's desired signal spacing standard is one half mile, MUTCD signal warrants must be met based on ODOT methodology and OAR 734-020-460 (1) A traffic signal shall not be installed unless one or more of the warrants identified in the MUTCD are met or will be met consistent with the requirements of OAR734-020-0490. The satisfaction of a warrant or warrants, however, is not in itself justification for a traffic signal. Installation of a signal must be approved by the State Traffic Engineer.

<sup>8</sup> Analyzed as all-way-stop control for Concept Plan

<sup>9</sup> Analyzed as all-way stop control for Concept Plan

## Mitigation Measures

To offset the negative impacts of the Brookman Road area development on the surrounding transportation system, mitigation measures are required. In addition, more extensive mitigation measures would be needed to bring each study intersection into conformance with ODOT/City operational standards. Table 3 lists a series of mitigation measures (including those previously assumed to be constructed with development) that would be required for the Concept Plan.

**Table 3: Intersection Mitigations**

Location	Project	Scenario	
		No Build	Concept Plan
Hwy 99W/Sunset Blvd	Add eastbound right turn overlap		X
	Add westbound right turn lane		X
	Add westbound right turn overlap		X
	Hwy 99W 7-lane section	+	+
Hwy 99W/Brookman Rd	Add a traffic signal*	+	X
Sunset Blvd/Woodhaven Drive	Prohibit left turns; or Construct a roundabout	+	+
Sunset Blvd/Timbrell Ln	Construct a roundabout		X
Brookman Rd/Ladd Hill Rd	All-way stop control <sup>10*</sup>		X
	Add a southbound right turn lane*		X
	-or- Construct a roundabout		X

X – Required to meet OAR 660-012-060 Transportation Planning Rule (TPR) requirements for rezone approval

+ - Needed to meet State/City operations standards

\* - Project was assumed in Capacity Plan analysis

Based on the mitigation measures listed for in Table 3 for TPR compliance (projects indicated with an “X”), operations analysis was performed for the Concept Plan. The results are listed in Table 4. As listed, each intersection would be mitigated to either meet operations standards, or to a level not worse than 2030 No-Build conditions. Two locations (Hwy 99W/Sunset Boulevard and Sunset Boulevard/Woodhaven Drive) would not meet performance standards for either the No Build or Concept Plan scenarios. Improvements are triggered due to background traffic and these locations would not require additional mitigation to that identified in Table 3 to meet TPR requirements for this plan. These system capacity deficiencies will need to be addressed by City of Sherwood, Washington County or ODOT for meeting long-term needs.

<sup>10</sup> Assumed improvement for capacity analysis.

**Table 4: 2030 PM Peak Hour Intersection Performance – Mitigated for TPR Compliance**

		Intersection Performance (Delay LOS V/C)	
Intersection	Agency	No Build	Concept Plan
<b>Signalized Intersections</b>			
Hwy 99W / Sunset Blvd	ODOT	92.7 F 1.23	66.5 E 1.14
Sunset Blvd / Sherwood Blvd	City	15.5 B 0.46	22.5 C 0.63
Hwy 99W / Brookman Rd <sup>11</sup>	ODOT	1126 A/F 3.20	30.3 C 0.93
<b>All-Way Stop Intersections</b>			
Sunset Blvd / Pinehurst Dr	City	23.0 C 0.81	30.9 D 0.91
Brookman Rd / Ladd Hill Rd <sup>12</sup>	County	16.3 A/C 0.35	13.2 B 0.66
Brookman Rd / Middleton Rd <sup>13</sup>	County	10.8 A/B 0.23	9.0 A 0.31
<b>Roundabout Intersections</b>			
Brookman Rd / Old Hwy 99 <sup>14</sup>	City	7.0 A 0.43	0.5 A 0.21
Sunset Blvd / Timbrel Ln <sup>15</sup>	City	24.3 A/C 0.34	3.6 A 0.49
<b>Unsignalized Intersections</b>			
Sunset Blvd / Redfern Dr	City	26.2 A/D 0.14	33.2 A/D 0.19
Sunset Blvd / Woodhaven Dr	City	86.2 A/F 0.91	68.7 A/F 0.79

**2-Way Stop Intersection LOS:**

A/A = Major Street turn LOS/ Minor Street turn LOS

**All-Way Stop/Signalized Intersection LOS:**

LOS = Level of Service

Delay = Average delay per vehicle (seconds)

V/C = Volume to Capacity Ratio

## Residential Street Impacts

A significant challenge to development of the Brookman Road area is providing connections to the surrounding street network without degrading livability on residential streets. North of the site, there are several local or neighborhood route street connections that will be provided, which will increase traffic volumes on those roadways. To monitor the impacts of the Concept Plan, a screenline analysis was conducted to determine traffic volumes at key points on the system.

Table 5 lists the existing, future no-build, and Concept Plan weekday traffic volumes at four locations north of the site. Generally, daily traffic volumes below 2,000 to 3,000 vehicles are considered livable for residential streets. However, narrow residential streets (28 feet wide) have

<sup>11</sup> Intersection is unsignalized in No Build scenario

<sup>12</sup> Intersection is unsignalized in No Build scenario

<sup>13</sup> Intersection is unsignalized in No Build scenario

<sup>14</sup> Intersection is all-way stop controlled in No Build scenario

<sup>15</sup> Intersection is unsignalized in No Build scenario

a lower traffic volume threshold of 1,000 vehicles per day, as adopted in the City of Sherwood TSP. Locations with traffic volumes exceeding these levels should be considered for a traffic management program (which could include the installation of traffic calming devices to manage vehicle speeds).

Volumes listed in Table 5 for the Concept Plan assume that traffic calming projects and other network mitigation would be implemented as previously stated with development of the Concept Plan. With the inclusion of traffic calming measures, traffic volumes will be within facility standards for most neighborhood streets.

**Table 5 – Residential Street Weekday Two-Way Volumes**

	<i>Facility Threshold</i>	<i>2007 Existing</i>	<i>2030</i>	
			<i>No-Build</i>	<i>Concept Plan</i>
SW Woodhaven Dr. south of Sunset Blvd	3,000	1,200	1,200	1,900
SW Timbrel Ln. south of Sunset Blvd	*	2,300	2,400	6,600
SW Pinehurst Dr. south of Sunset Blvd.	3,000	1,500	1,700	2,100
SW Middleton Road south of Inkster Dr.	3,000	300	400	500

\* SW Timbrel lane is designated as a collector roadway in the City of Sherwood TSP. Therefore, residential street thresholds were not applied

## Cost Estimates

Planning level cost estimates for transportation facility construction, traffic calming measures, and intersection improvements that were developed for the Concept Plan are listed in Table 6. The total cost of the transportation network in the Concept Plan area is approximately \$105 million.



**Table 6: Transportation Planning Cost Estimates**

<b>Location</b>	<b>Project</b>	<b>Planning Cost (\$1,000s)</b>
<b><i>Concept Plan Infrastructure Projects</i></b>		
Concept Area	Construct new 2-lane local roadways	\$80,400
Old Highway 99	Upgrade to collector standards	\$1,235
Brookman Road east of Middleton Road	Urbanize and rebuild existing roadway	\$10,855
Brookman Road west of Middleton Road	Construct new collector with grade-separated rail crossing	\$6,770
Brookman Road/Old Hwy 99	Construct a roundabout	\$800
<b><i>Traffic Calming / Neighborhood Cut-through Reduction Projects</i></b>		
Redfern Drive/Pinehurst Drive/Inkster Drive	Install speed cushions	\$50
<b><i>Intersection Mitigation Projects*</i></b>		
Hwy 99W/Sunset Blvd	Add eastbound right turn overlap phase	\$10
	Add westbound right turn lane	\$250
	Add westbound right turn overlap phase	\$10
Hwy 99W/Brookman Rd	Add a traffic signal	\$250
Sunset Blvd/Timbrell Ln	Construct a roundabout	\$800
Brookman Rd/Ladd Hill Rd	All-way stop control	\$10
	Add a southbound right turn lane	\$250
	-or- Construct a roundabout	\$800
<b><i>Concept Plan Infrastructure Projects Subtotal</i></b>		\$100,060
<b><i>Traffic-Calming Subtotal</i></b>		\$50
<b><i>Intersection Mitigation Subtotal</i></b>		\$1,580-\$2,120
<b><i>TRANSPORTATION TOTAL</i></b>		<b>\$101,690-\$102,230</b>

\* – Required to meet OAR 660-012-060 Transportation Planning Rule (TPR) requirements for rezoning approval



## Appendix C – Stormwater



# Technical Memorandum



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**To:** Julia Hajduk - City of Sherwood  
**From:** Ashley Cantlon, EI, Kevin Timmins, PE  
**Copies:** Joe Dills  
**Date:** April 9, 2008  
**Subject:** Brookman Addition Stormwater Infrastructure Plan  
**Project No.:** 14156

## Introduction

This memorandum presents a Stormwater Infrastructure Plan (SWIP) for the Brookman Addition Concept Plan. The purpose of the infrastructure plan is to:

- Describe the recommended stormwater management strategy for the Brookman Addition Concept Plan Area.
- Show how the strategy would be applied to the concept plan.
- Provide a cost estimate for the stormwater management infrastructure.
- Document supporting calculations.

An existing conditions analysis was performed by Otak, Inc. in June of 2007, and a technical memorandum was created to document findings. The original analysis provided a basis for developing the draft Brookman Addition SWIP (December, 2007.) Subsequent to the draft SWIP, the concept plan was revised and the draft SWIP was updated to produce this final SWIP. An updated version of the Concept Plan can be seen in attachment A.

## Stormwater Strategy

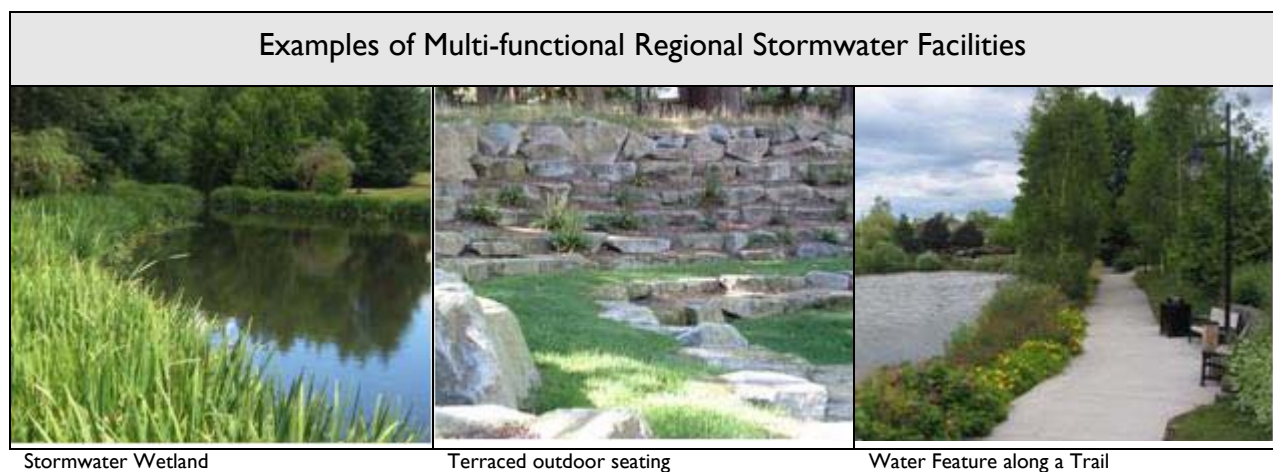
The Stormwater Management Strategy describes the recommended stormwater management tools to be applied within the Brookman Addition Concept Plan Area to help achieve the City of Sherwood's goals during its expansion. The following goals were incorporated into the stormwater management strategy for this project with respect to parks and green spaces:

- Protection of natural resource areas consistent with the City of Sherwood's Goal 5 program and other priority resource areas identified by the Steering Committee.
- Sustainable, system-based solutions such as regional stormwater management and other low-impact development practices.

- Stormwater follows the City of Sherwood recommendations in the Stormwater Master Plan.

The recommended Stormwater Management Strategy for Brookman Addition is to collect and convey all runoff from the site primarily within the road right-of-way (R.O.W.), and then route stormwater to regional detention and water quality facilities. After all runoff has been treated and detained, it will be discharged into natural drainage ways adjacent to each facility.

Design of the regional stormwater facilities should be integrated with the urban and natural areas to provide additional habitat value or public open space for recreation. Photograph examples of integrated facilities are shown below.



While not accounted for in the recommended stormwater infrastructure for this SWIP, Low Impact Development Applications (LIDA) should be encouraged for new development. The integration of LIDA to new development will reduce impervious areas and may also reduce effective runoff that is generated from a particular site. Consequently, regional facility sizes may be reduced per design standards in place at the time the proposed regional facilities are implemented.

Increased interest of LIDA over the past few years has resulted in more literature and design guidance. Clean Water Services is currently developing a LIDA Guidance Manual, which is the suggested reference for design guidance. Pending the release of this document, the following documents are recommended reference materials that include more information about use of LIDA in the Pacific Northwest.

- City of Portland. (September 2004). Stormwater Management Manual. Revision 3. Portland, OR: Bureau of Environmental Services.
- Puget Sound Action Team and Washington State University Extension Pierce County. (January 2005). Low Impact Development Technical Guidance Manual for Puget Sound. (PSAT 05-03). Olympia, WA.

- City of Gresham. (July 2007). Green Development Practices for Sustainable Stormwater Management. Gresham, OR: Department of Environmental Services, Community and Economic Development Department.

## **Stormwater Concept Plan**

The Stormwater Concept Plan Diagram provides a schematic representation of the recommended stormwater system in Brookman Addition. This plan illustrates the application of the recommended stormwater management strategy to the current version of the Brookman Addition Concept Plan, and is used to document assumptions made about the Stormwater Infrastructure Costs. Additional assumptions and calculations performed to determine facility sizes are presented later in the Stormwater Calculations section of this memorandum.

Conveyance of stormwater through the Brookman Addition Concept Plan Area is illustrated in the Stormwater Concept Plan Diagram. Much of the site runoff will need to be conveyed through pipes. All stormwater runoff is conveyed to one of six regional facility sites.

## **Regional Detention Facilities**

Regional detention facilities were sized per *CleanWater Services Design and Construction Standards*. Currently, the standards require that the 2-, 10-, and 25-year post-development runoff rates will not exceed the respective 2-, 10-, and 25-year pre-development runoff rates. Six regional facility sites were identified based upon existing site topography and location of natural systems. Six drainage basins were delineated based on existing drainage patterns as contributing runoff to each regional facility. Locations of recommended regional stormwater facilities and the associated tributary drainage areas are illustrated in the Stormwater Concept Plan Diagram.

## **Regional Water Quality Facilities**

Water quality facilities were also sized per *CleanWater Services Design and Construction Standards (June 2007)* using a water quality flow produced by a design storm of 0.36 inches over four hours applied to 100 percent of new impervious area.

This Storm Water Infrastructure Plan (SWIP) recommends all site runoff to be treated by regional water quality facilities. Vegetated swales are recommended for treating new impervious area within each of the six basins, and were designed to be integrated with the regional stormwater detention facilities. Impervious areas were calculated based on land use assumptions within each basin, as presented in the stormwater calculations section of this memorandum. Proposed locations of facilities are shown in the Stormwater Concept Plan Diagram. Each is next to a detention facility, with the exception of one located in the undetained portion of Basin 1.

## **Estimated Cost**

The Stormwater Infrastructure Cost Estimate includes stormwater infrastructure costs for the following elements:

- Required public conveyance elements that do not follow a road shown in the concept plan.
- Regional facilities.

It is assumed that stormwater conveyance infrastructure shown in within the right of way is part of road cost, and is included in the transportation cost estimate.

The total estimated cost to construct Stormwater Infrastructure for the Brookman Addition Concept Plan Area is \$2.6 million. Soft costs for implementation are estimated to cost an additional \$1.3 million. Land acquisitions costs for regional facilities are estimated to be \$3.2 million.

A detailed breakdown of the Stormwater Infrastructure Cost Estimate is provided in Attachment B.

Costs for Regional Stormwater Facilities were determined according to estimates for facility size (footprint and volume). Assumptions and calculations used to estimate facility sizes are presented later in the Stormwater Calculations section of this memorandum. The following standard assumptions were made about the geometry of the regional stormwater management facilities.

- Facility side slopes were assumed to be 3H:1V.
- Each regional facility site was assumed to require a flow splitter manhole incorporated into the design to route water quality flows to the water quality facility and bypass higher flows directly to the regional detention facility.
- Regional stormwater facilities for detention were assumed to require an excavation volume based upon five to six feet of storage depth, plus an additional one foot for freeboard. Facility footprints were assumed based on depth, bottom area, and side slope.
- Costs for inlet/outlet pipes, manholes, inlets, flow splitters, and flow control devices were based on recent bid tabulations for projects in the area.

## **Stormwater Calculations**

There is a strong correlation between new impervious area and increased stormwater runoff. The first step toward sizing water quality facilities and estimating site runoff is to estimate the amount of impervious area associated with the various types of development planned for the Brookman Addition Concept Plan. Actual imperviousness will vary throughout Brookman Addition and will need to be recalculated as development occurs. Assumptions about impervious area used for the SWIP are documented in this section of the memorandum.

Several calculations were then made as part of developing the SWIP and cost estimate as documented in this section of the memorandum. The calculations include:

- Sizing of regional stormwater facility for water quality.
- Sizing of regional stormwater facility for stormwater detention.



## **Impervious Area**

At the concept planning stage, seven types of residential land uses were mapped for the Brookman Addition community: medium density residential - low, medium density residential - high, high-density residential, employment, mixed use, parks, and streets. Estimated dwelling units per acre for residential lots were estimated to be 8 for Medium Density Residential – Low, 11 for Medium Density Residential – High, and 24 for High Density Residential. Non-residential land uses identified include parks, civic uses, and other open space areas.

Average values for percent impervious area were assumed for each development zone. Table 1 shows the assumed percentages for impervious area associated with each land use that were used in the design of stormwater facilities for the site. These values are based upon a comparison of typical values published in regional stormwater design manuals and local studies of development practices similar to those anticipated to occur in Brookman Addition.

<b>Table 1 – Summary of Impervious Area Reference Calculations</b>		
<b>Description</b>	<b>Density (units/acre)</b>	<b>Impervious Area (%)</b>
Employment	N/A	85
High Density Residential	24	65
Medium Density Residential – High	11	60
Medium Density Residential – Low	8	55
Mixed Use	N/A	85
Parks	N/A	10
Streets	N/A	80

## **Downstream Analysis**

City of Sherwood's Stormwater Management Plan requires detention to be provided for all new development within the city, therefore a downstream analysis was not conducted as part of this concept plan.

## **Regional Stormwater Facility for Stormwater Detention**

Regional stormwater pond sizes were estimated for each of the six basins. As part of the draft SWIP analysis, Hydraflow Hydrographs 2004 software was used to estimate peak flows and required pond volumes in accordance with Santa Barbara Urban Hydrograph (SBUH) methodology. Hydrologic curve numbers (CN) of pervious areas with C type soils were assumed to be 86 except for one forested area, where a CN of 79 was assumed. Pervious areas with B type soils were assumed to have a CN value of 80. For proposed conditions, pervious areas were given the same corresponding CN values, as the land covers were similar. Impervious areas were assigned a CN of 98. Table 2 summarizes area, time of concentration (TOC), and 2-, 10-, and 25-year peak flows for each basin under existing conditions. Basins 4 and 6 would drain to a single regional pond. Table 3 summarizes impervious area, time of concentration, 25-year peak flow and estimated required storage volume for each drainage basin.

Table 2: Summary of Existing Condition Parameters <sup>1</sup>					
Basin	Area (ac)	TOC (min)	2-yr Peak (cfs)	10-yr Peak (cfs)	25-yr Peak (cfs)
1	25.3	23.4	4.43	9.45	12.1
2	83.6	30.8	19.49	33.29	40.2
3	12.5	25.9	2.61	4.65	5.7
4 + 6	80.2	24.0	22.79	42.12	51.9
5	22.8	22.0	1.34	3.92	5.4

Table 3: Summary of Proposed Condition Parameters <sup>1</sup>						
Basin	Impervious Area (ac)	Impervious TOC (min)	Pervious Area (ac)	Pervious TOC (min)	25-year peak flow (cfs)	Calculated Storage Volume (cf)
1	19.1	5	6.0	10	9.6	60,489
2	42.6	5	24.9	10	40.1	148,665
3	7.3	5	5.2	10	5.6	19,227
4 + 6	48.7	5	31.4	10	51.9	144,333
5	13.4	5	9.4	10	5.3	91,742

As part of the final SWIP, adjustments were made to pond sizes by calculating new impervious areas based on the latest Brookman Addition concept plan. Modifications including land use areas, and basin connectivity were made to each basin. Ratios were obtained for each basin by comparing total percent impervious areas under the draft SWIP analysis and the final SWIP. Table 4 summarizes results for adjusted detention facility sizing based on these ratios.

Table 4: Summary of Proposed Condition Factors <sup>2</sup>						
Basin	Impervious Area (ac)	Pervious Area (ac)	Final SWIP Impervious Area (%)	Draft SWIP Impervious Area (%)	Updated Pond Sizing Ratio	April 2008 Storage Volume (cf)
1	16.3	4.9	77	79	0.98	59,279
2	44.0	20.2	69	67	1.02	151,638
3	8.0	4.8	63	58	1.09	20,957
4	23.7	16.2	59	59	1.0	87,768
5	14.3	8.5	59	63	1.07	98,164
6	26.5	16.7	61	62	0.98	96,642

<sup>1</sup> Based on calculations from December 2007 analysis

<sup>2</sup> Based on calculations from April 2008 analysis

## Regional Stormwater Facility for Water Quality

Standards indicate a maximum flow depth of six inches, 4:1 side slopes or shallower, one foot of freeboard over the water quality event, minimum longitudinal slope of 0.5 percent, and a minimum length of 100 feet. Table 4 summarizes the calculated water quality flow, and design dimensions for each swale.

During implementation, it may be determined through an alternative analysis that an underground treatment device, or volume based treatment device is a more feasible design solution. Calculated water quality volumes for each basin are also shown in Table 5.

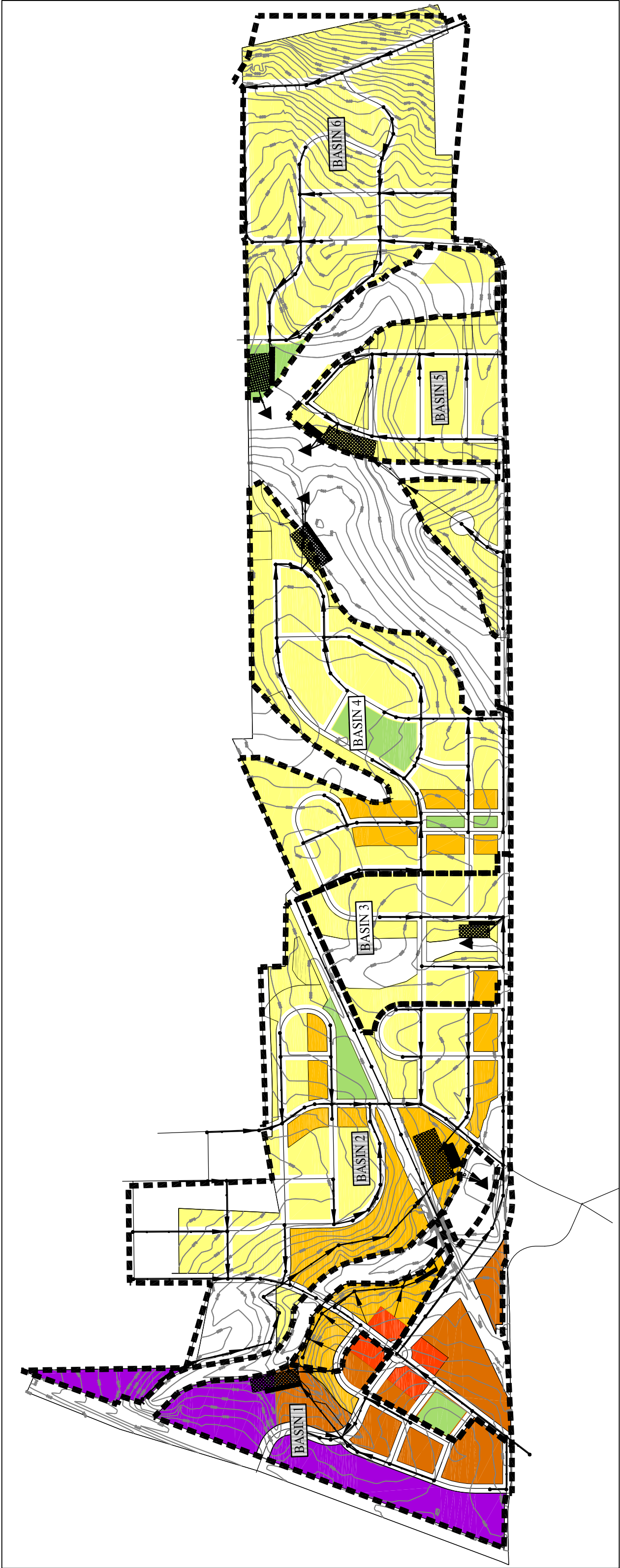
Table 5: Summary of Water Quality Facility Parameters <sup>3</sup>						
Basin	Water Quality Flow (cfs)	Water Quality Volume (cu. ft.)	Length (ft.)	Width (ft.)	Footprint Area (sq. ft.)	Longitudinal Slope (ft./ft.)
1	1.48	21,299	181	7	3667	0.01
1 (undetained)	0.29	4,205	131	4	2096	0.01
2	3.99	57,467	251	16	7028	0.015
3	0.73	10,437	122	4.5	2211	0.005
4	2.15	31,004	226	8.5	4879	0.015
5	1.3	18,662	178	6	3420	0.01
6	2.4	34,624	189	12	4824	0.01

## Alternative Analysis

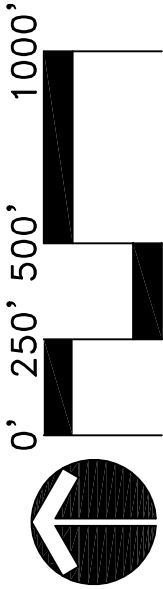
At the City's request, an alternative scenario was analyzed under the condition that Basin 5 would be 50% developed, and the other 50% would remain forested. Under this condition, total impervious area was calculated to be 8.3 ac., which would require a detention pond with a footprint of 184'X93'. A water quality flow of 0.75 cfs was calculated, which would require a regional swale facility with a 4' bottom width, and a length of 160'. These facilities would be located in the same place as proposed in the draft SWIP for Basin 5.

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<sup>3</sup> Based on calculations from April 2008 analysis



Brookman Addition Stormwater Concept Plan Diagram



- Mixed Use
- Employment
- Medium Density Residential - Low
- Medium Density Residential - High
- High Density Residential
- Park
- Proposed Drainage Pattern
- Proposed Stormwater Detention Facility
- Proposed Stormwater Treatment Facility
- Basin Boundary
- Basin Outflow/Discharge Points

CONCEPTUAL PLAN CONSTRUCTION COST ESTIMATE					
Brookman Addition Concept Plan Stormwater Infrastructure				CITY Sherwood, OR	
	TYPE OF WORK Stormwater Management Infrastructure	AREA	DATE 4/9/2008	Drainage System Designer Ashley Cantlon	
	ITEM DESCRIPTION	UNIT	AMOUNT	UNIT COST	TOTAL
	Base Construction Items (Mobilization, Traffic Control, Erosion Control, etc.)			20%	\$522,944
	Conveyance Infrastructure				
	12 INCH STORM CONDUIT, CP	LF	1,932	\$55	\$106,260
	15 INCH STORM CONDUIT, CP	LF	692	\$65	\$44,980
	18 INCH STORM CONDUIT, CP	LF	387	\$70	\$27,090
	30 INCH STORM CONDUIT, CP	LF	938	\$105	\$98,490
	36 INCH STORM CONDUIT, CP	LF	322	\$175	\$56,350
	42 INCH STORM CONDUIT, CP	LF	190	\$190	\$36,100
	CONC INLET STRUCTURE, CATCH BASIN	EA	36	\$1,500	\$53,532
	MANHOLE STRUCTURE	EA	15	\$3,000	\$44,610
	Regional Stormwater Management Facilities				
	EXCAVATION & GRADING	CY	34,989	\$12	\$419,871
	LANDSCAPING	SY	17,881	\$10	\$178,810
	PRE-TREATMENT DEVICE	EA	7	\$15,000	\$105,000
	FLOW SPREADER	EA	16	\$1,000	\$16,000
	DITCH INLET	EA	13	\$2,000	\$26,000
	FLOW SPLITTER	EA	4	\$1,500	\$6,000
	FLOW CONTROL MANHOLE	EA	6	\$10,000	\$60,000
	RIPRAP OVERFLOW WEIR	EA	6	\$2,500	\$15,000
	ADDITIONAL STORM PIPE	LF	650	\$65	\$42,250
	RIPRAP INLET/OUTLET PROTECTION	EA	27	\$310	\$8,370
SUBTOTAL, Construction					\$1,867,657
	CONSTRUCTION CONTINGENCIES			40%	\$747,063
SUBTOTAL, Total Construction Cost					\$2,614,720
	PRELIMINARY ENGINEERING			25%	\$653,680
	PERMITTING			5%	\$130,736
	CONSTRUCTION ENGINEERING			20%	\$522,944
SUBTOTAL, Implementation					\$3,922,080
	LAND ACQUISITION for Regional Stormwater Facilities	SF	160929	\$17	\$2,735,793
	STAFFING COSTS			17%	\$465,085
	APPRAISAL COSTS			5%	\$136,790
GRAND TOTAL					\$7,259,747

Assumptions: 1) Unit Costs are presented in 2007 U.S. Dollars

2) Infrastructure quantities do not include conveyance systems associated with site development beyond the framework illustrated in the SWIP.

3) Costs for conveyance facilities located within road right-of-ways shown in the concept plan are included in the transportation cost estimate.



## Appendix D – Water Sanitary and Sewer







# Technical Memorandum



17355 SW Boones Ferry Rd.  
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Fax (503) 635-5395

**To:** Julia Hajduk—City of Sherwood

**From:** Jerry Markesino, PE  
Ian Fabik, PE

**Copies:** Project File

**Date:** April 16, 2008

**Subject:** Brookman Addition Concept Plan—Water Supply and Sanitary Sewer Infrastructure

**Project No.:** 14156

## Introduction

Otak has reviewed the existing and proposed water and sanitary sewer infrastructure projects for the Brookman Addition Concept Plan area. The primary source of this information is the City's *Water System Master Plan* (August 2005) and the *Sanitary Sewer Master Plan* (Draft, May 2007). From these documents we have identified the costs related to providing water supply and sanitary sewer facilities to the concept plan area.

Otak has developed a preliminary infrastructure plan for the draft hybrid alternative. We have also created cost estimates to build the infrastructure needed to serve the draft hybrid alternative of the Brookman Addition Concept Plan area at full build-out. The cost estimates are based on unit cost factors provided in the appropriate master plan.

## Water System

The existing water system currently provides potable water to the area immediately north of the Brookman Addition Concept Plan area. It is part of the 380-foot pressure zone, the largest pressure zone in Sherwood, and it serves all customers below an approximate ground elevation of 250 feet above mean sea level. The zone includes residential, commercial, and industrial land uses. It is served by the Main Reservoir at SW Division Street east of South Pine Street. All four of the City's groundwater wells and the City's Tualatin Supply Connection provide water to this pressure zone.

## Programmed Capital Improvement Projects – Water System

The Water System Master Plan identifies the need for several major improvements to extend water service to the concept plan area. These projects include: the seismic upgrade to the existing reservoirs; construction of new reservoirs; installation of a pressure reducing valve; and the addition of several pipeline segments. These improvements are required to provide a “backbone” network that will serve the concept plan area.

The City’s Water System Master Plan has programmed the existing Main Reservoir for a seismic upgrade in year 2009/2010, in order to extend the reservoir’s service life until additional storage facilities are constructed. It also identifies the need for a new reservoir to be located adjacent to the current main reservoir. This new reservoir will be constructed with a 4.0 million gallon capacity. This project is programmed for year 2012/2013.

The Southwest Sherwood Pressure Reduction Valve (PRV) station and associated piping will be constructed in the right-of-way of Old Highway 99 at the border of the 455-foot pressure zone. This connection will provide service to the western portion of the concept plan area, located in the 380-foot pressure zone. The PRV reduces the water pressure in the piping as it moves from the 455-foot pressure zone to the lower pressure, 380-foot pressure zone. This project is programmed for 2024/2025.

### **Programmed Capital Improvement Projects – Pipeline Segments**

The master plan has programmed the construction of approximately 17,000-feet of 12-inch water main that would bring service into the concept plan area. The connections to the existing system will occur at designated locations along the northern edge of the Brookman Addition Concept Plan area. These connections to the existing system are planned to occur at the 12-inch stub located in S.W. Ladd Hill Road, the existing 8” stubs located in S.W. Redfern Drive and Swordfern Lane, and at the proposed Southwest Sherwood PRV.

In the development of the hybrid plan for the Brookman Addition Concept Plan area, Otak developed a system layout that would provide the backbone pipeline system that is envisioned in the Master Plan. The 12-inch water main system will be approximately 14,854-feet long with an expected cost of \$1,931,000. However, according to the Master Plan, the construction of these pipe segments is not expected to occur until year 2023/2024. The 12-inch main backbone pipeline system includes a crossing of Cedar Creek along the northern border of the concept plan area. This area will need further investigation during the design phase of the system to determine best method of affecting this creek crossing to balance costs and environmental effects.

**Non-Programmed Capital Improvement Projects – Pipeline Segments**

The 12-inch water main will provide direct service to many of the properties fronting Brookman Road in the hybrid plan, but most importantly, it will provide water to a network of 8-inch mains that will serve the remainder of the properties identified in the concept plan area. The 8-inch system will include 33,884-feet of connected pipe lines with an expected cost of \$3,321,000.

The water mains will be installed within the proposed public rights-of-way of the hybrid plan. The estimated costs for the improvements required to provide water services to the Brookman Addition Concept Plan Area will be approximately \$10.5 million, based on the Master Plan data and our recent estimates. The costs have been broken down in the following table:

Capital Improvement Project	Project Description	Project Cost
Main Reservoir Upgrade	Seismic upgrades to the existing Main reservoir	\$400,000
Reservoir No. 2	Construction of new 4.0 million gallon reservoir	\$4,700,000
SW Sherwood PRV	New Pressure reducing valve	\$190,000
12-inch Water Main pipes	New piping system to provide water supply to the Brookman area	\$1,931,000
	<b>Subtotal</b>	<b>\$ 7,221,000</b>
8-inch Water Main pipes (not in Master Plan)	New piping system to provide full service within the Brookman area	\$3,321,000
	<b>Total Cost</b>	<b>\$10,542,000</b>

## **Sanitary Sewer System**

The sanitary sewer system infrastructure to serve the Brookman Addition Concept Plan area is assumed to be a traditional gravity flow municipal system. It will be an extension of the existing system that is documented in the *Sanitary System Master Plan* (Draft, May 2007). Design, construction, and operation of the proposed infrastructure will follow current city and state standards.

The master plan anticipated the expansion of the Urban Growth Boundary (UGB) to include the Brookman Addition Concept Plan area. The concept plan area is served by the Cedar Creek Basin. The Cedar Creek sanitary sewer basin drains to the Sherwood Trunk Interceptor Sewer, operated and maintained by Clean Water Services (CWS). The Sherwood Trunk Interceptor extends to the Sherwood Pump Station, also owned and operated by CWS. Wastewater is then pumped to the Durham Advanced Wastewater Treatment Plant for final treatment and disposal.

### **Programmed Capital Improvement Projects – Sanitary Sewer System**

Like the Water System, basic system extensions are needed to bring the sewer pipes to the concept plan area. There are three projects identified in the Sanitary System Master Plan that are needed to serve the area. Two of these projects upgrade a small portion of the existing 12-inch collector sewer. One of the projects extends the 12-inch collector sewer along Cedar Creek and into the Urban Growth Boundary Areas 54 & 55, which comprise the Brookman Addition Concept Plan area.

In order for the Cedar Creek basin to accept the additional flows from the Brookman area, two capacity upgrades are needed. A 537-foot section of the existing 12-inch pipe near SW Sunset Boulevard needs to be upsized to an 18-inch pipe. Further, an adjacent 533-foot section also needs to be upsized to a 15-inch pipe. These two projects are identified as projects # 2 and # 3 in the Recommended Capital Improvements section of the Sanitary Sewer master plan.

To bring sanitary sewer service to the concept plan area, a 12-inch gravity sewer collector pipe line extension (project # 4 in the Sanitary Sewer master plan) will need to be constructed. From Manhole 236NSan, which is located in the right-of-way of SW Sunset Boulevard just west of SW Redfern Place, a 12-inch pipe will be extended southerly and parallel to Cedar Creek. It will travel south and west along the Cedar Creek drainage and cross under SW Brookman Road. It will extend westerly to the vicinity of SW Brookman Road and SW Middleton Road.

The two system upgrades and the 6,430-foot extension project will provide the “backbone” sanitary sewer system for the Brookman Addition Concept Plan area. A local network of sanitary sewers will need to be constructed in order to completely serve the Brookman Addition.

**Non-Programmed Capital Improvement Projects – Sanitary Sewer System**

Otak has developed a preliminary sanitary sewer system design that will serve the properties in the hybrid alternative of the Brookman Addition Concept Plan area. It will be composed of six sub-basins and consist of almost 45,000-feet of 8-inch diameter sanitary sewer pipes. The approximate cost for this sewer system is \$8,465,000 in 2007 dollars.

Sanitary Sewer Master Plan Project No.	Capital Improvement Project	Project Description	Project Cost
4	Collection System Extension Area 54/55	6,430-feet of new piping for the system expansion	\$1,292,430
3	Capacity Upgrade Area 54/55	533-feet of new 15-inch pipe, capacity upgrade from 12-inch to 15-inch	\$113,176
2	Capacity Upgrade Area 54/55	537-feet of new 18-inch pipe, capacity upgrade from 12-inch to 18-inch	\$133,176
		<b>Subtotal</b>	<b>\$1,538,602</b>
NEW	Local sewer network	44,900 feet of 8-inch sanitary sewers	\$8,465,000
		<b>Total</b>	<b>\$10,003,602</b>

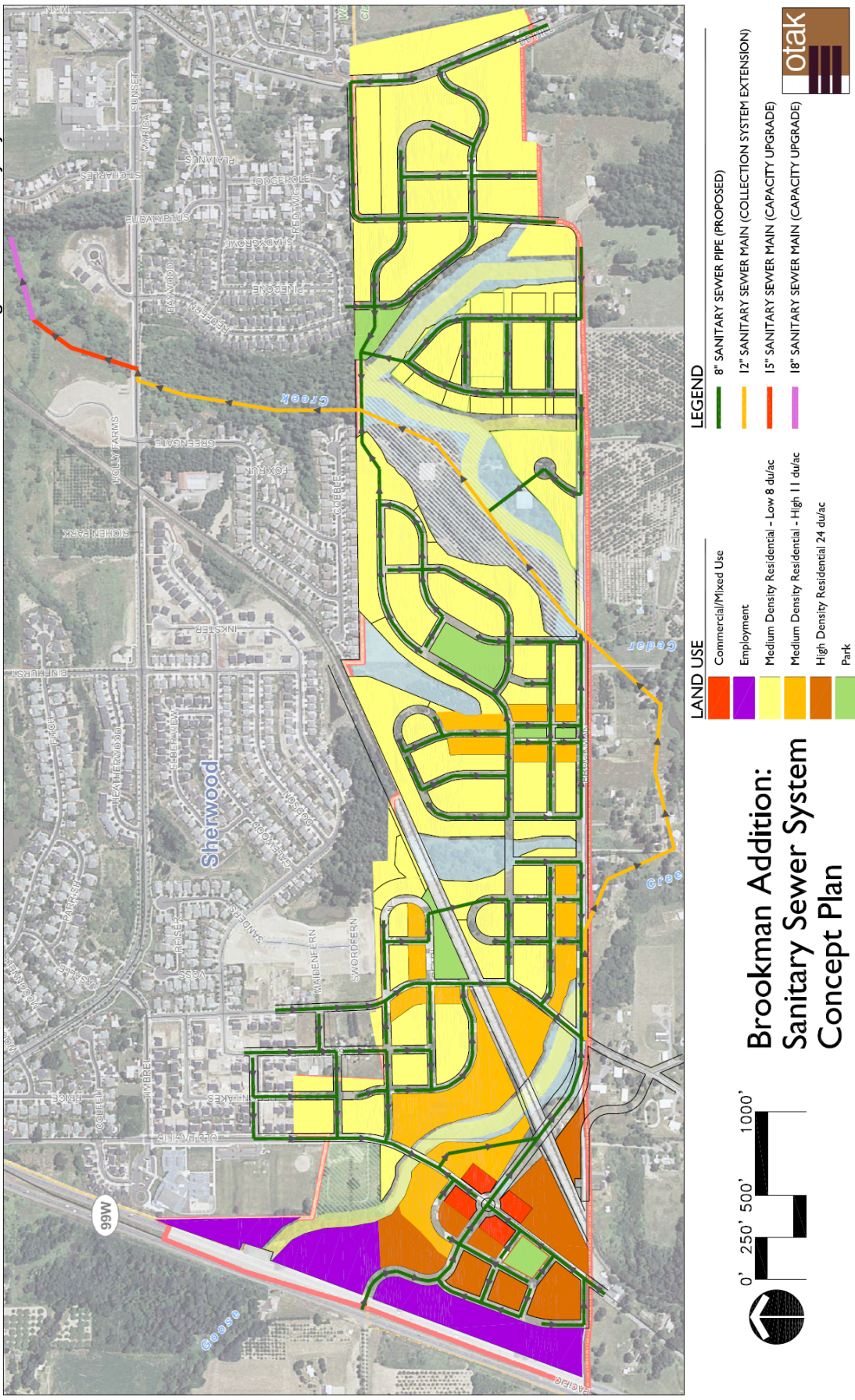
### Figure 9 Water System Network





# BROOKMAN ADDITION DRAFT CONCEPT PLAN REPORT

Figure 10 Sanitary System Network







## Appendix E – Fiscal Impact Analysis





**J O H N S O N**  
**G A R D N E R**

**MEMORANDUM**

---

**DATE:** April 18, 2008

**To:** Joe Dills  
Otak

**FROM:** Anne Fifield  
JOHNSON GARDNER

**SUBJECT:** Fiscal impact analysis for the Brookman Addition-Final

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JOHNSON GARDNER was retained by Otak and their client, the City of Sherwood, to conduct a fiscal impact analysis of a hybrid concept plan for the Brookman Addition. This memorandum summarizes the results of the analysis.

A fiscal impact analysis estimates the costs and revenues to a local jurisdiction directly associated with new development. This analysis estimates the costs and revenues associated with the development of infrastructure and operations. It is based on Otak's *Brookman Addition Concept Plan, Steering Committee Recommended Draft*, dated March 28, 2008, and data supporting the Concept Plan.

This memorandum is organized into four sections:

- I. Summary of Key Issues** summarizes the analysis and describes different tools the City can use to fund infrastructure.
- II. Assumptions and Methods** discusses the basic elements of the Concept Plan that affect costs and revenues.
- III. Infrastructure** describes estimated costs to build expanded infrastructure and projected revenue from System Development Charges. The section discusses transportation, water, sanitary sewer, stormwater, and parks.
- IV. Property Tax Revenue** estimates the property tax revenue generated by new development in the Brookman Addition.

**I. SUMMARY OF KEY ISSUES**

**A. Costs and Revenues**

This analysis compares the cost of constructing infrastructure to serve the Brookman Addition, and compares costs to revenues generated to pay for those costs. Costs are based on analyses by Otak and DKS Associates. Revenues are based on analysis conducted by Johnson Gardner.



Please see Section III, Infrastructure, for a detailed discussion of how the figures were determined.

The costs shown in this summary are those typically borne by the City, not the developer. There are additional costs that developers would fund. The text in Section III, Infrastructure, discusses the costs for local infrastructure that developers typically build.

The revenue calculations are focused on those generated by System Development Charges, or SDCs. SDCs are one-time fees levied on new development to recover a fair share of the costs of existing and planned future improvements to infrastructure to serve that development. The City of Sherwood also collects a Traffic Impact Fee (TIF) for Washington County, which is a countywide charge to fund transportation infrastructure. SDCs vary by development type, and this analysis is a reasonable estimate of expected revenues.<sup>1</sup>

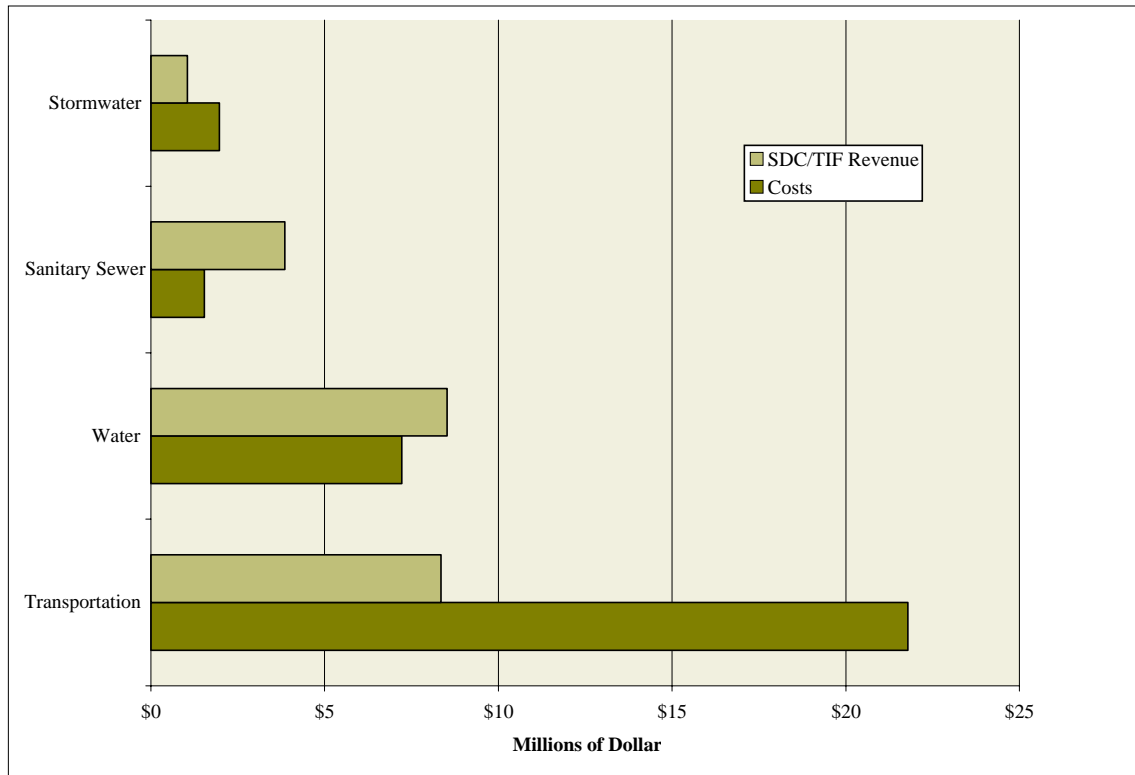
Figure 1 and Table 1 shows the total costs and revenues for four basic urban infrastructure types. The data show only the costs that are expected to be paid by the City. The numbers do not include costs typically paid by developers. The following text explains the reasons for the funding gap in stormwater and transportation, and then discusses potential funding sources to fill the gap.

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<sup>1</sup> SDC revenue for non-residential development may be significantly different from what is estimated in this analysis. The SDCs will vary with size of building and type of use. Residential SDCs, however, are likely to be roughly equivalent to the estimates in this analysis, if build-out is similar to the Concept Plan. The great majority of the development in the Brookman Addition is residential, and the great majority of SDC revenue is from residential development. Therefore, total SDC revenue projections are likely to be fairly accurate.



**Figure 1**  
**Total Costs and SDC/TIF Revenue**



**Table 1**  
**Total Costs and SDC/TIF Revenue**

	Cost	SDC/TIF Revenue	Cost - Revenue	% Funded by SDC/TIF
Transportation	\$21,790,000	\$8,349,051	\$13,440,949	38%
Water	\$7,221,000	\$8,517,869	-\$1,296,869	118%
Sanitary Sewer	\$1,538,782	\$3,853,792	-\$2,315,010	250%
Stormwater	\$1,965,160	\$1,042,449	\$922,711	53%
Parks	not estimated	\$8,105,625	n/a	n/a

- **Transportation.** There is a large funding gap for transportation. The large gap is not unexpected. SDC and TIF revenue is not intended to cover 100% of costs. The City of Sherwood reduced its transportation SDC in November 2007 because of complaints from developers in the City. The County is working now to expand the revenue generated by the TIF, but how the revised TIF will be calculated is not known at this time. The City's transportation SDC is expected to be reduced proportionate to any increases in the County TIF.
- **Water.** SDCs fund just over 100% of expected infrastructure costs for the Brookman Addition. Revenues exceed costs because the Brookman Addition is able to connect to existing capacity.



- **Sanitary Sewer.** SDCs fund 250% of expected infrastructure costs for the Brookman Addition. Revenues exceed costs because the Brookman Addition is able to connect to existing capacity. The excess revenues support capital improvements to the entire system.
- **Stormwater.** SDCs fund about half of expected costs for the Brookman Addition. The City may be able to apply revenue generated by a parks SDC to stormwater services—open space can provide recreation and stormwater infiltration services. If the open space is designed to do so, parks SDC revenue can help fund the stormwater infrastructure.

The funding gap for transportation and stormwater is about \$14.3 million, or about \$11,600 per residential unit in the Concept Plan.

## **B. How Can Sherwood Close the Gap?**

Sherwood is not alone with its gap for transportation and stormwater. Other urban reserve areas have large funding gaps for infrastructure, and there are no obvious or easy solutions. Infrastructure is expensive, and nobody likes to pay for it. Sherwood will have to consider all funding options, and work to identify which funding mechanisms will be politically palatable to Sherwood residents.

The following is a brief discussion of some potential funding sources. The first two funding mechanisms, a Local Improvement District and a County Service District, are the most appropriate funding solutions, given the relatively small funding gap.

### ***Local Improvement District (LID)***

The landowners could create a taxing district of the Brookman area, where the revenue funds infrastructure improvements. Future property owners in the area would pay the tax. The funding gap is less than \$12,000 per household, and that amount could be financed with a LID in the Brookman District.

### ***County Service District***

This is a special district that can fund construction, operation, and maintenance of public facilities and services. Similar to a LID, but the tax does not need to be based on property value, but some other factor (e.g., square feet of structure). Such a tax structure avoids statewide property tax limitations. The funding gap is small enough that it could be financed with a County Service District.

### ***Expand Developer Requirements***

The City could require that developers build infrastructure in addition to the local infrastructure. Although the developer pays for developer requirements, the expenditures do not necessarily come from the developers' pocket. The total cost will affect how much developers are willing to pay current landowners for the land, likely reducing the purchase price. The increased cost of development will affect the type of housing the developer is willing to build due to the potentially sizeable impact to development financial feasibility.



### ***Expand SDCs***

The City is already working on an update of the sanitary sewer and stormwater SDC and Washington County is considering an expansion of the TIF. It is expected, however, that the City's transportation SDC will be reduced proportionate to any increases in the County TIF.

As with developer requirements, the total cost of SDCs will affect how much developers are willing to pay current landowners for the land, and the increased cost of development will affect the type of housing the developer is willing to build due to the impact to financial feasibility.

### ***Fuel Tax***

A fuel tax is levied when drivers buy fuel for vehicles. In Oregon, the tax ranges between 1 and 5 cents per gallon. The revenue typically funds road maintenance. It would be impossible to tax only the residents of the Brookman for their fuel, and existing residents of Sherwood would be unlikely to approve a city-wide tax to fund improvements to one part of town.

### ***Transportation Utility Fees***

A Transportation Utility Fee (TUF) is a monthly charge assessed to households and businesses, based on the average number of trips generated by types of land uses. The fee is often collected as part of a utility bill. The revenue typically funds road maintenance.

### ***Bonds***

A General Obligation (GO) Bond is a traditional tool used to fund capital improvements. The voters of Sherwood would have to approve a bond, which would be secured by property tax revenue. GO Bonds are not subject to property tax limitations established by Measures 5, 47, and 50.

Revenue bonds are typically secured by water/wastewater/stormwater billing revenue. The City could institute a transportation utility fee to secure a bond for roads.

### ***Urban Renewal District***

Urban Renewal allows a jurisdiction to use tax increment financing to fund infrastructure. Tax increment financing 'freezes' the assessed value of the district, and all property tax revenue associated with any incremental growth in assessed values goes to the UR District. It is likely that the value of improvements in the Brookman Addition are currently low enough to legally permit the establishment of an UR District. The primary disadvantage with Urban Renewal, is that existing taxing district do not collect property tax revenue generated by the new, higher value development. That revenue funds operations for the City, the County, and any special districts. However, compromises, such as dedicated matching funds and/or projects mutually beneficial to the City/District can be planned to mitigate potential negative effects of foregone revenues. By State statute, school districts do not forego property tax revenues with establishment of urban renewal.

### ***MSTIP***

The Major Streets Transportation Improvement Program (MSTIP) is a funding mechanism for roads in Washington County. The MSTIP was originally a countywide serial levy, but as a result of statewide property tax limitations, the levy became part of the County's permanent rate. Funds



are now transferred from the County's General Fund to the MSTIP at the discretion of the County Board of Commissioners. The Board of Commissioners has approved projects to be funded between 2007 and 2012, and none of the improvements identified in the Brookman Addition Concept Plan are included.<sup>2</sup> At this time, the MSTIP is *not* an option for the Brookman Addition.

### ***State funds***

The roads identified in the Concept Plan are *not* eligible for funds from ODOT. That could change, depending on *if* the Highway 99/I-5 connector is built, and where that connector is located. If it is built, it will affect traffic volumes on Highway 99 and what improvements on Highway 99 can be funded by ODOT. ODOT is in the planning process now, to determine the future of that connector.<sup>3</sup>

## **II. ASSUMPTIONS AND METHODS**

Otak provided Johnson Gardner with land uses, densities, and other descriptive data for the 143-acre Brookman Addition. Table 1 summarizes the development data used in the fiscal analysis.

The Concept Plan shows the number of acres for each use. Otak provided Johnson Gardner with the estimates of square feet of space required per employee and the total number of employees for non-residential uses. Johnson Gardner used those estimates to calculate the square feet of built space for retail, office, and industrial uses.

**Table 2**  
**Projected acres, built square feet, jobs, and dwelling units in the Brookman Addition**

Non-Residential Land Uses	Built Square		
	Acres	Feet	Jobs
Retail	2.07	27,550	29
Office	6.01	78,525	349
Industrial	6.01	78,540	102
Parks	6.21	0	
<b>Total</b>	<b>20.3</b>	<b>184,615</b>	<b>480</b>
Residential Land Uses	Dwelling		
	Acres	Units	
Medium-Density Residential Low	90.43	723	
Medium-Density Residential High	20.01	220	
High-Density Residential	12.32	296	
<b>Total</b>	<b>122.76</b>	<b>1,239</b>	

Source: Otak, Brookman Addition Concept Plan-Metrics, April 2, 2008.

<sup>2</sup> Personal communication with Dan Brown, Washington County Capital Project Management, December 11, 2007.

<sup>3</sup> Personal communication with Marah Danielson, ODOT Development Review Planner, December 12, 2007.





All figures reported in this analysis are in 2007 dollars.

### **III. INFRASTRUCTURE**

This analysis compares the cost of constructing infrastructure to serve the Brookman Addition to revenues generated to pay for those costs. The primary funding mechanism for funding infrastructure for new development is the System Development Charge, or SDC. SDCs are one-time fees levied on new development to recover a fair share of the costs of existing and planned future improvements to infrastructure to serve that development. In Oregon, local governments have legal authority to collect SDCs for five types of infrastructure: transportation, water, sanitary sewer, stormwater, and parks. The Oregon Legislature recently enabled school districts to charge a tax on new construction based on square footage. While not technically a SDC, the construction tax is imposed on new development and the revenue is limited to funding capital improvements for K-12 schools.

The City of Sherwood also collects a Traffic Impact Fee (TIF), which is a countywide charge to fund transportation infrastructure.

This analysis compares the costs and SDC and TIF revenue for transportation, water, sanitary sewer, and stormwater. At this time, there are no cost estimates for parks, but Johnson Gardner calculates the revenue the parks SDC will generate.

#### **A. Transportation**

Transportation infrastructure in the Brookman Addition has three funding sources: developer requirements, system development charges (SDCs), and Washington County's Traffic Impact Fee (TIF).

##### ***Costs***

DKS Associates provided planning cost estimates for transportation, summarized in Table 3. The table shows a low and high estimate, and identifies how each project will be funded, either by developers or through the City's SDC and the County's TIF.

Johnson Gardner worked with City staff to identify which improvements could be funded by the City's transportation SDC and the County TIF.<sup>4</sup> Table 3 identifies which projects will be built and paid for by developers, and the remainder will be funded by the SDC and the County TIF. Based on that data, total transportation cost that will be funded by SDCs and the TIF is between \$21 and \$22 million.

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<sup>4</sup> Personal communication with Gene Thomas, City of Sherwood Civil Engineer, December 11, 2007.



**Table 3**  
**Transportation Planning Cost Estimates, Non-local Roads**

Location	Project	Built and Paid for by Developer	Funded by TIF/SDC	Estimated Cost	
				Low	High
Concept Plan Infrastructure Projects					
Concept Area	Construct new 2-lane local roadways	x		\$80,400,000	\$80,400,000
Old Hwy 99	Upgrade to collector standards		x	\$1,235,000	\$1,235,000
Brookman Rd east of Middleton Rd	Urbanize and rebuild existing roadway		x	\$10,855,000	\$10,855,000
Brookman Rd west of Middleton Rd	Construct new collector with rail crossing		x	\$6,770,000	\$6,770,000
Brookman Rd/Old Hwy 99	Construct a roundabout		x	\$800,000	\$800,000
Traffic Calming/Neighborhood Cut-through Reduction Projects					
Redfern Dr/Pinehurst Dr/Inkster Dr	Install speed cushions	x		\$50,000	\$50,000
Intersection Mitigation Projects					
Hwy 99W/Sunset Blvd	Add eastbound right turn overlap phase		x	\$10,000	\$10,000
	Add westbound right turn lane		x	\$250,000	\$250,000
	Add westbound right turn overlap phase		x	\$10,000	\$10,000
Hwy 99W/Brookman Rd	Add a traffic signal		x	\$250,000	\$250,000
Sunset Blvd/Timbrell Ln	Construct a roundabout		x	\$800,000	\$800,000
Sunset Blvd/Redfern Dr	All-way stop control		x	\$10,000	\$10,000
Brookman Rd/Ladd Hill Rd	All-way stop control		x	\$10,000	
	Add a southbound right turn lane		x	\$250,000	
	-or- Construct a roundabout		x		\$800,000
Totals	Total Cost			\$101,700,000	\$102,240,000
	Built and Paid for by Developer			\$80,450,000	\$80,450,000
	Funded by TIF/SDC			\$21,250,000	\$21,790,000

Source: DKS Associates, Draft Memorandum, December 5, 2007. Funding method based on personal communication with Gene Thomas, City of Sherwood Civil Engineer.

### ***SDC Revenue***

Johnson Gardner estimated the transportation SDC revenue associated with the development described in the *Concept Plan*, based on current SDC rates in the City of Sherwood, as reported in the City of Sherwood Rates and Fees Schedule, posted on the City's website. In November 2007, the City reduced its transportation SDCs by 25%.<sup>5</sup> To estimate SDC revenue, Johnson Gardner made the following assumptions:

- **Retail.** The concept plan estimates there will be 27,550 square feet of retail space. The SDC is the average (mean) of "commercial/services" SDCs based on gross floor area. SDCs excluded from the average calculation are those based on the numbers of rooms (hotels and motels) and vehicle fueling positions (e.g., gas stations).<sup>6</sup>
- **Office.** The concept plan estimates there will be 78,525 square feet of office space. The estimate is based on the SDC for "general office building" uses.
- **Industrial.** The concept plan estimates there will be 78,540 square feet of industrial space. The estimate is based on the SDC for "general light industrial" uses.
- **Medium-density residential.** All units are detached, single-family homes.

<sup>5</sup> Personal communication with Debra Czysz, City of Sherwood Development Program Coordinator, December 13, 2007.

<sup>6</sup> Square footage figures are based on the number of jobs and square feet per job figures provided by Otak. Square feet per job estimates are: retail, 950; office, 225; industrial, 770.



- **High-density residential.** All units are condominiums/townhouses.<sup>7</sup>

**Table 4**  
**Transportation SDC Revenue**

Land Use	SDC	Unit	Number of 1,000 S.F. Units	Total SDC Revenue
Retail	\$18,367	1,000 s.f.	28	\$506,020
Office	\$4,065	1,000 s.f.	79	\$319,204
Industrial	\$2,328	1,000 s.f.	79	\$182,841
Single Family (medium density-low and high)	\$2,721	dwelling unit	943	\$2,565,903
Multi-Family (high density)	\$1,726	dwelling unit	296	\$510,822
<b>Total</b>				<b>\$4,084,790</b>

Source: Johnson Gardner based on City of Sherwood SDCs and Brookman Concept Plan.

### ***Traffic Impact Fee Revenue***

The City of Sherwood collects Washington County's Traffic Impact Fee (TIF) and directs the revenue to the County. The TIF can only be used to pay for road capacity improvements that serve future growth, and is limited to funding arterials and collectors on the TIF list. The TIF cannot be used to address existing capacity deficiencies. The TIF revenue must be spent within the TIF jurisdiction where it is collected, or to the direct benefit of that district.

The TIF is calculated based on the estimated number of weekday trips generated by different land uses, multiplied by a fee and thousand gross square feet of the development. The number of trips per use is based on standard data produced by the Institute of Transportation Engineers, as reported by Washington County.<sup>8</sup> To estimate TIF revenue, Johnson Gardner made the following assumptions:

- **Retail.** The average number of trips is the average (mean) of weekday average trip rate for "business & commercial". The calculation of the average number of weekday trips excludes shopping centers larger than 50,000 square feet and those not based on thousand gross square feet of space, such hotels and motels (based on numbers of rooms) and gas stations (based on number of vehicle fueling positions).
- **Office.** The average number of trips is for "general office, under 100,000 gross square feet".
- **Industrial.** The average number of trips is for "general light industrial".

In this analysis, we assume that 100% of the TIF generated in the Brookman Addition will be applied to funding improvement in the Brookman Addition.

<sup>7</sup> The SDC for apartments is slightly higher than the SDC for condominiums and townhouses. This analysis uses the SDC for condominiums and townhouses, to be consistent with other parts of the analysis.

<sup>8</sup> Washington County memorandum from Kathy Lehtola, "Traffic Impact Fee Rate Increase", dated April 25, 2007.



**Table 5**  
**Washington County TIF Revenue**

Land Use	Fee per Average Weekday Trip	Average Weekday Trips	Unit	Number of Units	Total TIF Revenue
Retail	\$81	65.63	1,000 s.f.	28	\$146,457
Office	\$294	16.31	1,000 s.f.	79	\$376,538
Industrial	\$308	6.97	1,000 s.f.	79	\$168,607
Single Family (medium density-low and medium density)	\$320	10	dwelling unit	943	\$3,017,600
Multi-Family (high density)	\$320	5.86	dwelling unit	296	\$555,059
<b>Total</b>					<b>\$4,264,261</b>

Source: Johnson Gardner based on Washington County TIF and Brookman Concept Plan.

The transportation and TIF generate just under 40% of expected public costs for roads.

## **B. Water**

### ***Costs***

Otak provided planning cost estimates for water capital improvement projects to serve the Brookman Addition, summarized in Table 6. Total cost for water infrastructure to service the Brookman Addition is \$10.5 million.

Otak identifies ‘programmed’ and ‘non-programmed’ capital improvements. ‘Programmed’ improvements are those that are in the City’s Water System Master Plan, and can be funded with the City’s SDC for water. The total cost for programmed improvements is \$7.2 million, and non-programmed improvements is \$3.3 million.

**Table 6**  
**Water Planning Cost Estimates**

Project	Built and Paid for by Developer	Funded by SDC	Cost
Main Reservoir Upgrade		x	\$400,000
Reservoir No. 2		x	\$4,700,000
SW Sherwood PRV		x	\$190,000
12-inch Water Main pipes		x	\$1,931,000
8-inch Water Main pipes	x		\$3,321,000
<b>Total</b>			<b>\$10,542,000</b>
<b>Built and Paid for by Developer</b>			<b>\$3,321,000</b>
<b>Funded by SDC</b>			<b>\$7,221,000</b>

Source: Otak, Technical Memorandum, “Brookman Addition Concept Plan—Water Supply and Sanitary Sewer Infrastructure,” November 28, 2007.

### ***SDC Revenue***

Table 7 shows estimated revenue generated by the City’s current water SDC rates. Sherwood’s water SDC includes an improvement and installation charge, which varies by meter size. The



City also charges a per-building fee for fire flow-sprinklered buildings and a single administrative set-up charge. To estimate SDC revenue, Johnson Gardner made the following assumptions:

- **Retail.** The concept plan estimates there will be 27,550 square feet of retail space. This analysis assumes that every 5,000 square feet of built retail space uses a one-inch meter (rounding total square feet to the nearest 5,000). We assume that each 5,000-square foot space has a fire flow sprinkler.<sup>9</sup>
- **Office.** The concept plan estimates there will be 78,525 square feet of office space. This analysis assumes that every 10,000 square feet of built office space uses a one-inch meter (rounding total square feet to the nearest 10,000). Each 10,000-square foot space has a fire flow sprinkler.
- **Industrial.** The concept plan estimates there will 78,540 square feet of industrial space. This analysis assumes that every 20,000 square feet uses a two-inch meter (rounding total square feet to 20,000). Each space has a fire flow sprinkler. Industrial development has widely varied demands for water service dependent upon the nature of industrial user on-site, therefore actual demand could be significantly lower or higher than this assumption.
- **Residential.** All residential units use a 5/8 x 3/4-inch meter.

**Table 7**  
**Water SDC Revenue**

Land Use	SDC	Unit	Number of Units	Total SDC Revenue
Retail	\$18,976	1" meter	6	\$113,858
Office	\$18,976	1" meter	8	\$151,811
Industrial	\$54,718	2" meter	4	\$218,871
Residential	\$6,484	dwelling unit	1,239	\$8,033,329
<b>Total</b>				<b>\$8,517,869</b>

Source: Johnson Gardner based on City of Sherwood SDCs and Brookman Concept Plan.

SDCs generate more than 100% of expected costs for water infrastructure.

## **C. Sanitary Sewer**

### ***Costs***

Otak provided Johnson Gardner with planning cost estimates for sanitary sewer improvements, summarized in Table 8. Total costs for sanitary sewer are about \$10.0 million.

Similar to the water cost estimate, Otak identifies ‘programmed’ and ‘non-programmed’ capital improvements. ‘Programmed’ improvements are those that are in the City’s Sanitary System Master Plan and can be funded by the City’s sanitary sewer SDC. The total cost for programmed improvements is \$1.5 million, and non-programmed improvements is \$8.5 million.

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<sup>9</sup> Square footage figures are based on the number of jobs and square feet per job figures provided by Otak. Square feet per job estimates are: retail, 950; office, 225; industrial, 770.



**Table 8**  
**Sanitary Sewer Planning Cost Estimates**

Project	Built and Paid for by		Cost
	Developer	Funded by SDC	
Collection System Extension Area 54/55		x	\$1,292,430
Capacity Upgrade Area 54/55		x	\$113,176
Capacity Upgrade Area 54/55		x	\$133,176
Local sewer network	x		\$8,465,000
<b>Total</b>			<b>\$10,003,782</b>
<b>Built and Paid for by Developer</b>			<b>\$8,465,000</b>
<b>Funded by SDC</b>			<b>\$1,538,782</b>

Source: Otak, Technical Memorandum, "Brookman Addition Concept Plan —Water Supply and Sanitary Sewer Infrastructure," November 28, 2007.

### ***SDC Revenue***

Table 9 shows estimated revenue generated by the City's current sanitary sewer SDC rates. Sherwood's water SDC includes a connection charge of \$2,700 per dwelling unit equivalent and reimbursement and improvement charge based on estimated gallons of sewerage flow per day. Non-residential developments use the number of fixture units to determine the number of dwelling unit equivalents. There are 16 fixture units in one dwelling unit equivalent. To estimate SDC revenue, Johnson Gardner used the same estimates of the number of units as calculated in the Water section. The analysis uses the following additional assumptions:

- **Retail and Office.** Each unit has 60 fixture units and generates 2,000 gallons of sewerage flow per day.<sup>10</sup>
- **Industrial.** Each unit has 200 fixture units and generates 5,000 gallons of sewerage flow per day. Industrial development has widely varied demands for sewer service based on industrial use, therefore actual demand could be significantly lower or higher than this assumption.
- **Residential.** Each residential unit is a dwelling unit equivalent and generates 535 gallons of sewerage flow per day.

<sup>10</sup> Retail, office, and industrial assumptions are based on recent development in Sherwood.



**Table 9**  
**Sanitary Sewer SDC Revenue**

Land Use	Connection Charge	Per Gallon		Total Gallons per Day	Total SDC Revenue
		Reimbursement & Improvement Charge	Equivalent Dwelling Units		
Retail	\$2,700	0.326	23	12,000	\$64,662
Office	\$2,700	0.326	30	16,000	\$86,216
Industrial	\$2,700	0.326	50	20,000	\$141,520
Residential	\$2,700	0.326	1,239	662,865	\$3,561,394
<b>Total</b>					<b>\$3,853,792</b>

Source: Johnson Gardner based on City of Sherwood SDCs and Brookman Concept Plan.

The City of Sherwood is in the process of evaluating its SDC for sanitary sewer. The current SDC is based on old data, and is likely to be significantly changed. When the revised SDC is established, the SDC revenue estimates in this analysis will be invalid.

Under the current SDC structure, sanitary sewer SDCs revenue exceed cost, leaving no funding gap.

## **D. Stormwater**

### ***Costs***

Otak provided Johnson Gardner with planning cost estimates for stormwater infrastructure, summarized in Table 10. Total costs, including construction, engineering, and land acquisition, equal \$7.3 million.

Otak staff reported that the cost items identified as “regional stormwater management facilities” are detention facilities, typically paid for by the developer. Johnson Gardner assumed that developers will pay for the full costs of these detention facilities, plus land acquisition.

Otak estimated base construction items, construction contingencies, engineering, and permitting costs as percents of total construction costs. To identify costs covered by the developer, Johnson Gardner assumed that the same percents for those costs would apply the developer

Total costs to the City of Sherwood are about \$2.0 million.



**Table 10**  
**Stormwater Planning Cost Estimates**

Project	Built and Paid for by		TotalCost
	Developer	Funded by SDC	
Base Construction Items	\$341,173	\$181,771	\$522,944
Conveyence Infrastructure		\$467,412	\$467,412
Detention Facilities	\$877,301		\$877,301
Construction Contigencies	\$487,389	\$259,673	\$747,063
Engineering & Permitting	\$852,932	\$454,428	\$1,307,360
Land Acquisition	\$2,735,793		\$2,735,793
Staffing & Appraisal		\$601,875	\$601,875
<b>Total</b>			<b>\$7,259,748</b>
<b>Built and Paid for by Developer</b>			<b>\$5,294,588</b>
<b>Funded by SDC</b>			<b>\$1,965,160</b>

Source: Otak, Technical Memorandum, "Brookman Addition Stormwater Infrastructure Plan," April 9, 2008.

### ***SDC Revenue***

Table 11 shows estimated revenue generated by current stormwater SDC rates for the City and Clean Water Services. Sherwood's stormwater SDC is \$0.043 per square foot of impermeable surface. Clean Water Service's SDC is \$619 per Equivalent Service Unit (ESU), which equals 2,640 square feet. To calculate impermeable square feet, this analysis uses the following percent impervious for each land use type, as reported by Otak.<sup>11</sup>

- **Retail, Office, and Industrial.** 85% of land will be impermeable.
- **Medium-density Residential-low.** 55% of land will be impermeable.
- **Medium-density Residential-high.** 60% of both medium-density categories will be impermeable.
- **High-density Residential.** 65% of land will be impermeable.

<sup>11</sup> As reported in a Technical Memorandum dated April 9, 2008, subject "Brookman Addition Stormwater Infrastructure Plan," from Ashley Cantlon, EI, and Kevin Timmins, PE.





**Table 11**  
**Stormwater SDC Revenue**

Land Use	Clean Water				Total SDC Revenue
	City Charge per S.F.	Services Charge per ESU	Impermeable Square Feet	ESU	
Retail, Office, Industrial	\$0.043	\$619	521,696	197.6	\$144,755
Medium-density Residential	\$0.043	\$619	2,886,460	1,093.4	\$800,905
High-Density Residential	\$0.043	\$619	348,828	132.1	\$96,789
<b>Total</b>					<b>\$1,042,449</b>

Source: Johnson Gardner based on City of Sherwood SDCs, Brookman Concept Plan, Otak's impervious area calculations.

The City of Sherwood is in the process of evaluating its SDC for stormwater. The current SDC is based on old data, and is likely to be significantly changed. When the revised SDC is established, the SDC revenue estimates in this analysis will be invalid.

Under the current SDC structure, stormwater SDCs generate just over half of expected costs. The City may be able to apply revenue generated by a parks SDC to stormwater services—open space can provide recreation and stormwater infiltration services. If the open space is designed to do so, parks SDC revenue can help fund the stormwater infrastructure.

## **E. Parks and Recreation**

At the writing of this memorandum, there are no cost estimates for parks infrastructure. Table 12 shows estimated revenue generated by current parks and recreation SDC rates for the City. This analysis used the following assumptions to estimate SDC revenue:

- **Retail, Office, and Industrial.** Sherwood's SDC for non-residential development is \$72 per employee, which we applied to the employment estimates generated by Otak, shown in Table 2.
- **Low and medium-density residential.** All units are detached, single-family homes.
- **High-density residential.** All units are multi-family.

**Table 12**  
**Parks and Recreation SDC Revenue**

Land Use	SDC	Unit	Number of Units	Total SDC Revenue
Retail, Office, Industrial	\$72	employee	480	\$34,560
Single Family (medium density)	\$6,927	dwelling unit	943	\$6,532,161
Multi-Family (high density)	\$5,199	dwelling unit	296	\$1,538,904
<b>Total</b>				<b>\$8,105,625</b>

Source: Johnson Gardner based on City of Sherwood SDCs and Brookman Concept Plan.

As noted by Otak in its technical memorandum on the Stormwater Infrastructure Plan, stormwater facilities should be integrated to provide habitat or public open space for recreation. If designed to meet the two functions, the City could use combined parks and stormwater SDC revenue to fund stormwater and open space in the Brookman Addition.



#### **IV. PROPERTY TAX REVENUE**

Property tax revenue is calculated by multiplying the City's permanent tax rate by total assessed value (i.e., taxable value). Assessed value is based on the real market value of property according to guidelines established by Measure 50. A new building's assessed value is determined by multiplying its market value by the local 'changed property ratio' (CPR). The CPR is the ratio of the assessed value to market value for a land use type (such as residential).

In Oregon, the assessed value is limited to 3% annual growth. Although property prices may grow at a higher rate, assessed value escalation may not exceed 3%, per Measure 50. A local government's tax base increases when new construction comes onto the tax rolls, but the assessed value of new construction is constrained. If market values grow at a higher rate than 3% a year, the CPR becomes a smaller ratio and diminishes over time. As the CPR diminishes, the assessed value of new construction brought onto the tax rolls becomes smaller.

The City of Sherwood's tax rate is \$3.2975 per \$1,000 of assessed value. Property owners in Washington County receive a 3% discount on their property tax if they pay the full amount by November 15. This analysis assumes all property owners in the Brookman Addition pay their taxes by November 15, so total revenue is discounted by 3%.

To estimate real market values for residential units, Johnson Gardner used the median list price (rounded to \$1,000) for detached and attached homes in Sherwood region in January 2008. We applied the CPR for residential property in Washington County, 0.572, to the market value.<sup>12</sup>

To estimate assessed values for non-residential property, Johnson Gardner relied on per-acre assessed values of existing commercial property in the Sherwood area, provided by the Washington County Assessor's Office. We calculated the median assessed value, per acre, and applied those values to the acres of non-residential land in the Concept Plan.

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<sup>12</sup> CPR reported by the Washington County Department of Assessment and Taxation in "Summary of Assessment & Tax Roll", Fiscal Year 2006-07.



**Table 13**  
**Annual Property Tax Revenue to the City of Sherwood, 2007 dollars**

			Revenue per	Total Property
		Assessed Value	Acre (with	Tax Revenue
Non-Residential Land Uses	Acres	per Acre	Discount)	(with Discount)
Retail	2.07	\$599,477	\$1,917	\$3,969
Office	6.01	\$701,690	\$2,244	\$13,489
Industrial	6.01	\$385,455	\$1,233	\$7,410
<b>Non-Residential Total</b>				<b>\$24,868</b>
			Revenue per	Total Property
	Dwelling	Market Value	Unit (with	Tax Revenue
Residential Land Uses	Units	per Unit	Discount)	(with Discount)
Detached units (medium density)	943	\$485,000	\$887	\$836,770
Attached units (high density)	296	\$230,000	\$421	\$124,558
<b>Residential Total</b>				<b>\$961,328</b>
<b>Total Property Tax Revenue</b>				<b>\$986,196</b>

Table 13 shows the estimated property tax revenue that the Brookman Addition would generate to the City of Sherwood at full build-out. The area is in the jurisdiction of other taxing districts, but this analysis focuses on the City, the jurisdiction with primary responsibility for basic infrastructure provision. The table shows that the developed Brookman Addition will generate about \$990,000 a year in property tax revenue to the City of Sherwood.



## Appendix F – Existing Conditions



## BROOKMAN ADDITION DRAFT CONCEPT PLAN REPORT

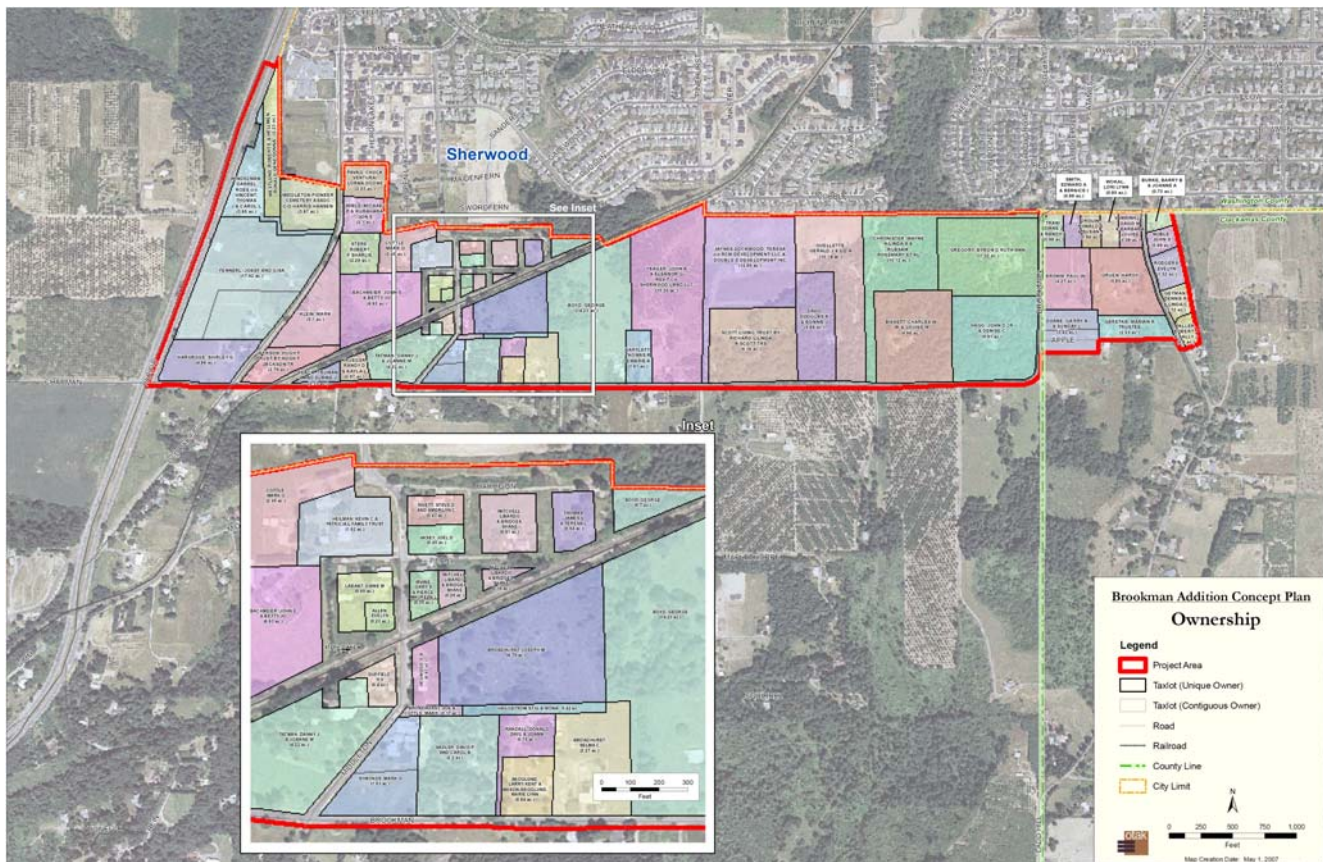
### Appendix F - Existing Conditions, Opportunities & Constraints Summary

The following is a synopsis of existing conditions and opportunities in the Brookman Addition Concept Plan area. Eight subject areas are summarized: land availability; market assessment; parks and open space; natural resources; water and sanitary sewer; storm water and water quality; and transportation. Complete reports for each of these subject matters are contained in the Concept Plan Report Technical Appendix.

#### Land Availability

##### *Ownership*

The area is characterized by multiple property ownership. Ranging in size from 0.1 to 17 acres, there are 66 total properties with 59 different owners. Forty eight (48) of those properties have buildings or structural improvements ranging in size from just under 800 square feet to nearly 6,000 square feet. Of these developed properties, 14 are considered single family residential with the remainder coded as agricultural or rural land uses. The median year of construction for these improvements is 1966.



The remaining 18 properties are undeveloped.

##### *Buildable Lands*

Estimating the location and amount of buildable land is an important early step in the concept planning process. It establishes a building envelope for development or redevelopment by considering lands constrained by steep topography, hydrology, wetlands, and habitat areas. The exercise also estimates the amount of land required for public rights-of-way and facilities such as schools. The net yield of buildable lands ultimately is used in preparing land use programs of housing, mixed use, commercial, employment, and parks and open space. Its



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spatial organization informs, guides and shapes the arrangement of concept plan neighborhoods, districts, and corridors.

The estimating process starts with the total gross acreage of the Brookman project area and subtracts out constrained, committed and nonresidential land. The total Brookman Concept land area is approximately 247 acres. Of this gross acreage, approximately 48 acres, or 20 percent of the total area, contains environmentally sensitive lands in its potential wetlands, floodplain areas, slopes of over 25 percent, and its vegetated corridor proxy as defined by the Tualatin Basin Natural Resources Protection Program. Committed lands in Brookman Addition include existing road and railroad rights-of-way, homes that will not likely redevelop the Middleton Pioneer Cemetery, and 10 acres for a potential school. These committed lands account for another 48 acres and 20% of the total area that is not available for development. This leaves approximately 150 acres available for urban use.

Table 4 Buildable Lands Summary

	Estimated Acres	Percent of Total Acres
<b>Total Planning Area</b>	<b>247.0</b>	<b>100%</b>
<b>Constrained Lands</b>		
Less >25% Slope	0.8	0%
Less Natural Resources	47.7	19%
<b>Committed Lands</b>		
Less Existing Street/Railroad Rights-of-Way	27.9	11%
Less 1/4 acres for each taxlot with a building value that is over half the land value	7.8	3%
Less Middleton Cemetery	3.0	1%
Less Potential School	10.0	4%
<b>Gross Development Area</b>	<b>149.9</b>	<b>61%</b>

To inform the planning process, an initial working estimate of land available for residential development was developed. Naturally, as concept plan alternatives were created and refined, this acreage would change. The initial estimate was determined by first deducting lands for nonresidential uses such as commercial, mixed use, industrial (27 acres) and parks (8 acres). Based on these land use assumptions, land was then taken out for the right-of-way of all of the future streets (33 acres). In total, these deductions equal approximately 68 acres, or 28% of the total area. Thus, the initial estimate for residential land amounted to 82 net acres. This number increased by approximately 40 acres over the course of the concept plan development phases as nonresidential lands were reprogrammed for residential uses and project constraints limited the amount of land identified as public rights-of-way.

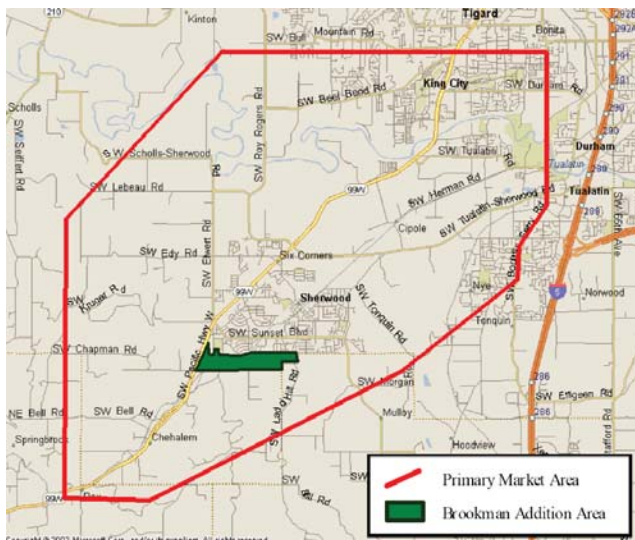
### Market Factors

#### Primary Market Area

Brookman Addition is partially defined by the surrounding market area and its associated demographics. The Primary Market Area (PMA) of Brookman Addition covers the area of the city of Sherwood, King City and the unincorporated area of Bull Mountain to the north, and much of Tualatin to the east. The PMA had an estimated population of 51,105 residents in 2007 and an average income that is significantly higher than the region (\$79,000). The majority of households in 2007 have an age of 25 to 45, with a shift to the age of 45 to 75 within the next ten years, reflecting the regional Baby Boomer demographic shift. The current estimated employment in the PMA is 25,900, and employment in the area has recovered from pre-recession levels.

#### Market Trends

Market statistics about existing residential, commercial, and industrial lands surrounding Brookman Addition provide insight on potentially appropriate uses for the area. Residential homes in Washington County have a





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median price of \$480,950. In Sherwood, over 95% of new dwelling units permitted between 2000 and 2006 were single family, compared to 67% countywide. Retail centers in the area are experiencing very low vacancy, but the households in the PMA spend almost \$158 million on retail items outside of the area per year, which indicates sales leakage. However, Sherwood is attracting external business in home furnishings, building and gardening materials, and grocery/convenience stores. The Sherwood area is not an epicenter of existing office development, but there is currently a relative scarcity of office space to meet the projected demand. In the Southwest I-5 submarket, there exist significant industrial lands between Sherwood and Tualatin as well as some along Highway 99W. Industrial and flex-space buildings have lower than average vacancy rates, indicating a healthy market and the scarcity of industrial lands elsewhere in the region.

### *Development Strategy Considerations*

In order to determine potential land use in Brookman Addition, the market analysis considered the types of development that will most likely thrive in that market. According to the market assessment, the study area is excellently suited for residential development. The study area is not the ideal location for retail development, but it would be a natural place to serve the needs of the surrounding neighborhoods and travelers on Highway 99W. The study area presents some challenges for large-scale office development, but should support smaller-scale office development to suit the needs of the south Sherwood market. The Brookman location might be well-suited for some light industrial uses, although it is further from the freeway than industrial lands along Tualatin-Sherwood Road.

### ***Key Market Findings***

#### ***Residential***

- *Excellent location for housing development*
- *Market for low to mid-density owner-occupied housing*

#### ***Retail***

- *The Brookman Addition location is on the periphery of the UGB is not ideal for significant retail development*
- *Market potential for retail supporting the new community located near Highway 99w*

#### ***Employment (Office & Industrial)***

- *Location of periphery of UGB creates challenges for employee commuting, freight and access to market*
- *Flat areas abutting Highway 99w are best alternative for employment uses*
- *An aggressive amount of planned employment lands would likely depend on economic development activities to promote them*

### Parks & Open Space

#### *Inventory*

The City of Sherwood has seven parks, open spaces, linear parks, and natural areas within a two mile radius of Brookman Addition. Six public regional school grounds also provide shared park space in the Sherwood School District. In the region, the Tualatin National Wildlife Refuge includes the Tualatin River Water Trail and seasonal trails that could potentially link to Sherwood's local trail system. In addition, the Tonquin Trail and the Lower Tualatin River Greenway Trail are projects listed in the Metro Trails Master Plan that could also create connections to Brookman Addition.

#### *Level of Service*

The level of service for parks is outlined in "Chapter 5- Environmental Resources" in the *Sherwood Comprehensive Plan, Part 2*. The level of service indicates the amount of acres and location to meet the needs of the community. The City of Sherwood defines several types of park and the facilities and activities necessary in each park designation. Types of parks include tot lots, neighborhood parks, community parks, general open space, nature trails, conservation and management areas, cultural facilities, historic sites, and community sites. After determining the buildable residential land acres, it was estimated that Brookman Addition will need to have at a minimum 2.25 acres of Tot Lots/Mini-Parks, 4.5 acres of neighborhood parks, and 2.25 acres of community parks. For the purposes of the concept plan, it is assumed that the Tot Lots/Mini-Parks will be incorporated within residential subdivision plats and site plans.

#### *Strategies*

Several strategies could be considered to increase the viability and strength of the parks system in Brookman Addition. These strategies include park and open space connectivity, creation of a unique park system, coordination with existing park facilities, and the integration of parks with natural systems.

Connectivity will be the most important factor in creating a seamless and integrated open space system. Key connectivity strategies include reserving open space along vegetated corridors, creating greenways between districts, using parks as access points, keeping trail access along the rail corridor, and planning for tree-lined streets. Sidewalks could have adjacent storm water swales and direct links to parks or trail heads, seamlessly weaving urban and natural pedestrian corridors.

The perception of a park, open space, or trail as a special and unique feature builds pride and ownership in the users of the amenities. Strategies include building on the history of the agrarian landscape, associating parks with Cedar Creek, placing parks near a village center or schools, or locating linear parks next to the vegetated stream corridors.

Coordination with the existing parks and open space network off the site optimizes facilities and avoids duplication. Brookman Addition has the opportunity to capitalize on the three schools within a half-mile and a nearby YMCA facility. Additional strategies for integrating parks, open spaces and trails with natural systems include preserving the tree canopy, locating storm detention in the parks, green streets and connecting habitat areas.

### Transportation

#### *Existing System*

With low intensity land uses such as large lot (average size is 3 acres) single family residential, the plan area is currently served by a limited transportation system. Primary access to the area is by a small number of public and private vehicular roads. The system currently lacks transportation routes and choices for bicyclists, pedestrians and transit users.

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Given the area does not currently possess the primary generators of walking and biking trips including schools, parks and mixed use shopping areas, pedestrian and bicycle activity is limited within the plan area. The closest schools, Middleton and Archer Glen Elementary Schools, are respectively located outside of the northwest and northeast corners of the plan area. Within Brookman Addition, existing sidewalks are located along Middleton Road. Ladd Hill has sidewalks that end at the entrance to the Brookman Addition. No designated bike lanes are found in the project area.

TriMet bus service does not currently reach Brookman Addition. Local and commuter service is provided from downtown Sherwood. Route 94, the Sherwood-Pacific Highway Express offers express service to downtown Portland with short 6 to 15 minute headways during the morning and evening peak periods. Route 12, Barbur Boulevard, offers more local connections en route to Portland through the day.

The existing study area roadway characteristics are listed in Table 5. Most roads are posted at 25 mph and have two lanes. Forming the western edge of Brookman Addition, four-lane Highway 99W exhibits posted speeds of 45 and 55 mph. Highway 99W is a state highway and subject to the standards of the Oregon Highway Plan. According to the Oregon Highway Plan, at 45mph posted speed, access points should be spaced no closer than every 990 feet and at 55 mph posted speed, access points should be spaced no closer than every 1,320 feet. Currently, segments of Highway 99W do not meet these standards as a result of frequent roadway intersections or driveways located along the highway.

Table 5 Study Area Roadway Characteristics by Functional Classification

Corridor	Functional Class	Posted Speed	Street Width <sup>1</sup>	Right-of-Way Width	Number of Lanes	Lane Width
Highway 99W	Principal Arterial	45-55	132'	174'-184'	4	12'
Sunset Boulevard	Arterial	35	52'	75'-85'	2	12'
Ladd Hill Road	Arterial	25	39'-45'	65'-70'	2	12'
Old Highway 99	Collector	25	20'	60'	2	10'
Brookman Road	Collector	25-35	22'-24'	40'-50'	2	11'-12'
Timbrel Lane	Collector	25	27'	50'	2	12'-13'
Middleton Road	Neighborhood Route	25	20'	40'	2	10'
Redfern Drive	Local	25	30'	50'	2	15'

<sup>1</sup> Street width includes traffic island.

Level of Service (LOS) and volume to capacity (v/c) ratios are both used as performance standards, or measures of effectiveness, for intersection operation. Seven intersections within Sherwood were selected for existing and future operations analysis. Each of the studied seven intersections meets performance standards under existing conditions.

### *Future No-Build Scenario*

The future year 2030 no-build scenario was also analyzed for intersection performance. The 2030 no-build scenario represents development and growth of the region without a change in existing zones in the Concept Plan area. With the forecasted growth, many of the seven intersections will degrade in performance, but continue to meet operating standards. However, the all-way stop at Sunset Boulevard and Ladd Hill Road would cease to function within acceptable standards. The intersection of Highway 99W and Brookman Road would fail to meet ODOT standards. The failure of both of these intersections could be mitigated with the installation of traffic signals. The intersection at Sunset Boulevard and Ladd Hill Road could also consider a roundabout as a solution.

Please refer to the Appendix B for the complete transportation technical memorandum.

## Natural Resources

### *Planning Goal 5*

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According to Oregon Statewide Planning Goal 5, “local governments shall adopt programs that will protect natural resources and conserve scenic, historic, and open space resources for present and future generations. These resources promote a healthy environment and natural landscape that contributes to Oregon’s livability.” Goal 5 Resources include wetlands, streams and their riparian areas, wildlife habitat and other resources. Oregon’s statewide planning guidelines require that natural areas be inventoried and evaluated, and that natural areas with high resource values be protected from development.

### *Inventory*

The evaluation of natural resources within Brookman Addition consisted primarily of an examination of existing resource information including a review of existing documents such as Metro Goal 5 Inventory maps, National Wetlands Inventory maps, Natural Resource Conservation Service (NRCS) Soils Survey, StreamNet fisheries data, and other sources of existing information. Site visits to the Plan Area were also conducted where some of the resource areas were observed.

### *Stream Corridors*

The study area occupies 247 acres within the Cedar Creek watershed. Cedar Creek is a tributary to Chicken Creek, which enters the Tualatin River approximately two miles north of Sherwood. Cedar Creek enters the eastern portion of the Plan Area from the southwest. Two unnamed tributaries of Cedar Creek are located near the eastern boundary of the Plan area. Riparian corridors and forest habitat associated with Cedar Creek and these two unnamed tributaries occupy most of the eastern one third of the Plan Area.

Goose Creek, which is also a tributary to Cedar Creek, enters the Plan Area from the northwest at Highway 99W. Goose Creek flows southeast across the western part of the Plan Area to its confluence with Cedar Creek south of the Plan Area boundary. The riparian corridor and upland habitat associated with Goose Creek is less extensive than the habitat areas adjacent to Cedar Creek and its unnamed tributaries.

### *Habitat Areas*

In addition to the stream corridors and their associated upland habitats, natural features in the Plan Area include significant pockets of forest habitat centrally located between Goose Creek and Cedar Creek. Cedar Creek, its unnamed tributaries and their associated riparian areas possess extensive tree and shrub cover, and appear to provide high value wildlife habitat according to Metro inventories. Much of the reach of Goose Creek that flows through the Plan area is degraded, and historic disturbances such as clearing and grazing have reduced habitat values.

Upland forest communities adjacent to the Cedar Creek riparian corridors provide additional high quality wildlife habitat within the Plan Area, and enhance the habitat value of these riparian areas. Upland areas adjacent to the Goose Creek riparian corridor possess limited habitat value.

### *Wetlands*

Potential wetlands were also determined to be present within the Plan Area. A substantial portion of these potential wetland areas overlay Metro-designated habitats, particularly the Goose Creek and Cedar Creek riparian corridors. While some of these areas, particularly those areas adjacent to existing stream reaches, are almost certainly jurisdictional wetlands, other areas may not currently have wetland characteristics due to historic draining, filling or other disturbances. Further investigation would be required to confirm whether jurisdictional wetland criteria are met in any of these areas.

### *Endangered Species*

According to the Oregon Department of Fish and Wildlife (ODFW), it is not likely that anadromous fish such as salmon and steelhead currently use any of the stream reaches within the Plan Area. Upper Willamette River steelhead, a species listed as *Threatened* under the Federal Endangered Species Act, are present in the Tualatin River, and may use Cedar Creek for rearing as far upstream as SW Washington Street in Sherwood, which is north (downstream) of the Plan Area limits.

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Passage barrier removal efforts such as those under Clean Water Services' Healthy Streams Plan will provide access for these fish to the upper reaches of Cedar Creek in the near future. For example, the City of Sherwood has completed a feasibility study and is currently in preliminary design for a project to replace the existing culvert at Washington Street, which has been identified as a passage to juvenile fish, with a fish-passable bridge structure.

Table 1 provides additional information on mapped resource areas. These areas are identified by location (west half or east half of the Plan Area), size, type of resource and Goal 5 designation. The Class 1 and Class A designations identify a resource of high value, while the Class 2 and Class B designations identify resources of lesser value. Within the Plan Area, approximately 61 acres are designated as Class 1 or Class A resource areas, while about 21 acres are designated as either Class 2 or Class B.

### ***Development Constraints***

The presence of natural resources within Brookman Addition may present a number of constraints to development. Clean Water Services designates buffer areas ("vegetated corridors") adjacent to water features including wetlands; rivers, streams, and springs with year round or intermittent flow; and impoundments including natural lakes and ponds. The purpose of these buffer areas is to preserve the natural function of water features from surrounding development. The width of these areas can vary from as little as 15 feet to as much as 200 feet, depending on the type of water feature and steepness of adjacent slopes. Development is restricted within these areas. Preliminary evaluation of the water features present within the Plan Area indicate that most if not all of these features would require a buffer of 50 feet.

Development in natural areas such as streamside habitats, floodplains and wetlands is also subject to Metro's Title 13 rules. These rules were developed to protect the water quality and ecological benefits these resources provide. The level of development constraint in these areas varies with the type and quality of the resource. Resources considered to be of high quality receive a greater level of protection, and development in these areas may be highly restricted or prohibited. Resources considered to be of lower quality may provide some level of development opportunity. In Sherwood, Title 13 compliance was achieved by implementing the Tualatin Basin Program which relied on CWS buffers for protection and flexibility and encouragement for low impact development techniques for remaining areas.

Disturbances to wetlands and streams within the Plan Area would also require authorization from the US Army Corps of Engineers (USACE) and/or the Oregon Department of State Lands (DSL). Formal studies for wetlands and stream areas proposed for disturbance would need to be conducted, and findings of these studies would need to be submitted for agency concurrence to support wetland fill permit applications to USACE and DSL. Mitigation would also need to be provided to address any development impacts to these areas.

### ***Enhancement Opportunities***

In addition to identifying natural resource areas, it is consistent with Metro's Urban Growth Management Functional Plan to identify natural resource areas that call for maintenance, restoration, or enhancement. Resource areas with high enhancement potential are those resources that are highly degraded and provide few habitat functions. Since most of the resource areas within in the Plan Area are of high value, these are likely to offer few enhancement opportunities. Of all the resources present, the lower two-thirds of Goose Creek as it passes through the Plan Area may provide the greatest opportunity. A reach of Goose Creek approximately 2,300 feet in length is identified as having a degraded riparian corridor. Enhancements to this area could include invasive plant species removal, additional native plantings, or structural improvements such as channel meandering.

## **Water, Sanitary Sewer and Stormwater Infrastructure**

### ***Stormwater***

Brookman Addition contains 100-year floodplains, potential wetlands, and Cedar and Goose Creeks. The City of Sherwood has recently adopted a Storm Water Master Plan (July 2007). This plan recommends three regional storm water quality facilities in the area. These potential sites are reflected on the draft concept plan.

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The Brookman Concept Plan is an opportunity to plan for the integration of development of the area with the infrastructure needed to manage storm water runoff while protecting natural resources. The plan could do this by imposing more rigorous storm water design standards; applying flow duration based design standards; creating regional detention facilities that blend with other natural resources, open space, or recreation areas; or by situating low impact development near the storm water source.

### *Water*

The City of Sherwood's current water distribution system has three separate water pressure zones supplied by two storage facilities and two pumping stations. The Brookman Addition plan area is within the 380-foot pressure zone. The 380-foot pressure zone is the largest pressure zone in Sherwood, and it serves all customers below an approximate ground elevation of 250 feet above mean sea level. The zone includes residential, commercial, and industrial land uses. It is served by the Main Reservoir at SW Division Street east of South Pine Street. All four of the City's groundwater wells and the City's Tualatin Supply Connection provide water to the 380-foot pressure zone.

The City of Sherwood Water System Master Plan indicated the need for several major improvements including reservoirs, several pipeline segments, and the Southwest Sherwood pressure reducing valve (PRV) in Brookman Addition. Most of the water mains will be installed within the existing right-of-way.

### *Sanitary Sewer*

The sanitary sewer system to serve Brookman Addition will most likely be a traditional gravity flow municipal system. The City of Sherwood Sanitary System Master Plan lists a future 12-inch collector sewer extension along Cedar Creek and two capacity upgrade projects downstream of the extension as future improvements.

Please refer to Appendices C and D for the complete stormwater, water, and sanitary sewer technical memorandums.

