PROJECT TEAM

This study could not have been completed without the hard work and dedication of the following people. Project staff would especially like to acknowledge the time and thoughtfulness dedicated to the study by the Ad Hoc Citizen Advisory Committee members. Their volunteer work is greatly appreciated.

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Lisa Palazzi, Pacific Rim Soil and Water
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Kathy Callison, City of Tumwater Public Works Department
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CHAPTER 1
INTRODUCTION

STUDY OVERVIEW

As urban areas develop, more and more land is covered with impervious surfaces, such as buildings, streets, driveways, and parking lots. Historically, these impervious surfaces have created several well-documented water resources problems. These are summarized below.

The 84-square-mile North Thurston County Urban Growth Management Area (North Thurston UGMA) is already experiencing water quality and stream habitat degradation. The entire area depends on groundwater for its drinking water, which is vulnerable to contamination from the surface. In addition, the Squaxin Island Tribe and others are concerned that loss of groundwater recharge is affecting fish habitat by reducing summer stream flows.

Impervious surfaces and inadequate stormwater management have been linked to an increase in excessively high stream flows during winter and harmful low flows during summer (Booth and Reinelt, 1994; Booth, 1990; Hammer, 1972). Local drainage basins (watersheds), such as Woodard Creek and Percival Creek, currently exhibit in-stream habitat losses as a result of relatively high-density development and impervious surface coverage of 17 percent and 25 percent, respectively. The habitat offered by other basins, such as Woodland Creek and Chambers/Ward/Hewitt, which have 12 percent impervious surface coverage in each, reflect the relatively low-density residential and commercial development in these basins. While many human actions affect and degrade local in-stream habitat conditions, the effect of excess stormwater runoff is pronounced. Future growth will require efforts beyond current stormwater management practices if we wish to preserve our local urban creeks.

Over the next 20 years, the population of the North Thurston UGMA is projected to increase by 66 percent, to a total of 184,000 people (Thurston Regional Planning Council, 1993a). If that growth occurs and is accommodated with the current pattern of urban sprawl, the total amount of impervious surface in the Percival, Woodard/ Woodland, and Chambers/Ward/Hewitt basins could increase from an estimated 14 to 29 percent of the land area, with corresponding increases in stormwater runoff and water quantity and quality problems. At 80 percent of buildout (full development) in these basins, it is estimated that the total amount of impervious surface would displace enough water to flood Olympia 2 feet deep. At 80 percent of buildout, it is also estimated there would be 6,200-acre feet of stormwater added to the runoff we currently manage. This new stormwater would be enough to create a 62-acre lake that is 100 feet deep and would need to be managed to ensure recharge of our groundwater supplies and long-term preservation of water resources.

To address these challenges, the Impervious Surface Reduction Study (ISRS) was conducted by the City of Olympia, in cooperation with the neighboring governments of Lacey, Tumwater, and Thurston County, as part of an overall stormwater management strategy. Funding for the study was provided by the Washington Department of Ecology through a Centennial Clean Water Fund grant and Olympia residents through their Storm and Surface Water Utility. The study was initiated in March 1993 and was originally scheduled to be completed in December 1994. In order to accommodate construction of demonstration projects, the grant deadline has been extended to June 1996. At this time, all study tasks, except for the demonstration projects, are complete. A separate technical report summarizing the results of the demonstration project will be completed in May 1996.

GOALS AND OBJECTIVES

Goals

The goal of the study was to *identify and gain community support for future impervious surface reduction techniques that result in increased stormwater treatment and groundwater recharge in the Thurston County region, without causing appreciable increases in development costs*.

Another goal established for the study was a 20 percent reduction in impervious surfaces throughout the North Thurston UGMA stemming from implementation of the recommendations. Based on study results, it seems that a 20 percent reduction could be achieved.

Objectives

Objectives of the study were to:

1. Inform the public of the need for alternatives to impervious surfaces and foster support for necessary policy and development changes.

2. Develop standards to encourage reduction in impervious surfaces in future construction, and develop and initiate policies to support these standards.

3. Provide technical assistance to members of the development community interested in incorporating alternative techniques into proposed site and building plans.

4. Work with other local governments and members of the development community to apply alternative development practices at one or more highly visible sites.

5. Present information to the development and business community, professional organizations, government entities, and other interested parties concerning results of the study.

STUDY APPROACH

In September 1991, the study goal and tasks were conceptualized during an early scoping meeting for a Centennial Clean Water Fund grant application. The meeting was attended by staff from Olympia, Lacey, Thurston County, and the Squaxin Island Tribe. Olympia convened an additional meeting of local jurisdictions once the grant application was selected for funding. In August 1992, about 25 private and public sector representatives participated in a brainstorming session that identified constraints and opportunities and provided additional feedback on the study's approach.

It was decided early on that Olympia's Water Resources Program would be the agency responsible for administering the study, and Lacey, Tumwater, and Thurston County would be involved as advisors to ensure that the study contributed to regional impervious surface reduction. It was also asked by the Olympia City Council that the study be used as a model to test Olympia's sustainability criteria. These guiding parameters of the study are discussed in more detail below.

Regional Perspective

Washington's Growth Management Act of 1990 and 1992 *(Revised Code of Washington*, 36.70A) requires Thurston County and cities within the county to plan cooperatively to accommodate the additional people expected to live here by 2015. The four local governments in north Thurston County are currently updating their comprehensive plans to meet Growth Management Act (GMA) requirements and coordinating their efforts based on countywide growth management policies. A major result of growth management would be a shift in the development pattern in north Thurston County from one of low-density suburban sprawl to a denser urban pattern.

The new development pattern would reduce the per person amount of impervious surfaces for the Olympia, Lacey, Tumwater, and Thurston County area because there would be:

- Less impervious surfaces in outlying rural and low-density areas due to the concentration of development in urban areas.

- More efficient use of impervious surface in the urban areas (more total impervious surface in Olympia, Lacey, and Tumwater due to higher densities, but less impervious surface per person or unit of development for the whole county).

However, the high population growth for the area is expected to result in an ever-increasing total amount of impervious surface. This is expected to jeopardize availability of clean groundwater, in-stream flows, and drinking water supplies for future generations.

Policy Focus and Early Implementation

From the beginning of the study, it was clear that water resources problems associated with impervious surfaces could not be addressed without considering policy issues, such as urban sprawl and transportation management. Therefore, the study initially took a broad look at water resources concerns and proposed preliminary recommendations for reducing impervious surfaces that mirrored the regional growth management planning efforts of the four local governments.

It also became clear that a policy approach would be complementary to other research efforts in the Puget Sound region. During the study, project staff met twice with staff from a Centennial Clean Water Fund grant project administered by the University of Washington's Center for Urban Water Resources Management and King County's Department of Public Works. The meetings' purpose was to coordinate efforts and reduce duplication. As a result of the meetings, Olympia chose to take more of a policy focus that could complement the construction practices focus of the Seattle-based project. Results of the Center's research of on-site infiltration capacity, including mulching techniques and pavers, will be available in 1995 and will be reviewed by Olympia staff for local applicability.

Staff and some Ad Hoc Citizen Advisory Committee members (see Project Team) also participated in the revision of Olympia's street, parking, and development standards being conducted concurrently with the study. The revisions were driven by the need to have local policies and regulations comply with the Growth Management Act and Olympia's Comprehensive Plan. The revisions posed an opportunity to incorporate key recommendations of this study into existing policies. This early implementation of the study's findings provided an arena for considering impervious surface reduction, along with other issues, and provided an opportunity to immediately implement reduction strategies.

Olympia's Sustainable City Philosophy

In March 1992, the Olympia City Council formally decided to evaluate its actions based on two sustainability criteria:

- Criteria 1: *Future generations*

  City actions will meet present needs without jeopardizing future generations.

- Criteria 2: *Interrelationships*

  City actions will take into account the environmental, economic, social, and political requirements for their success and the impact on the natural environmental and human activities.

These criteria are intended to help guide Olympia towards actions that will help create a sustainable community, one that "persists over generations and is far-seeing enough, flexible enough, and wise enough to maintain its natural, economic, social, and political support systems" (City of Olympia, 1993d).

The Impervious Surface Reduction Study was used as a model to see how these criteria could be applied to a complex issue. A sustainability analysis of the study was conducted in two parts. Part One was an initial analysis at the beginning of the study, and Part Two was a more in-depth analysis affiliated with the January 1995 Community Forum. The basic steps for both parts of the analysis were:

Step 1. Define the problem.

Step 2. Define the proposed solution.

Step 3. Envision a future if the solution is successfully implemented (related to Criteria 1).

Step 4. Assess interrelated future impacts of the proposed solution (related to Criteria 1 and 2).

Step 5. Assess what would be required for the proposed solution to be successful (related to Criteria 2).

Part One: Initial Analysis

Early in the study, members of the Project Team conducted an initial analysis. The members went through all five steps of the analysis with the following results:

Step 1.

The problem was generally defined as water quality and flooding impacts of increased stormwater runoff from impervious surfaces.

Step 2.

The solution was generally defined as reducing impervious surfaces associated with new development.

Step 3.

The vision for the future was defined very broadly and reflected a wide range of transportation, housing, land use, economic, and social issues. The vision included higher densities, clustered housing, taller buildings, neighborhoods with services within walking distances, more transportation options, fewer cars, smaller parking lots, multi-

storied and unpaved parking, narrower sidewalks, alternative surfaces, and more green spaces.

This broad vision was the basis of the study's preliminary recommendations, which overlapped with several growth management planning strategies. During additional committee meetings, the focus of the preliminary recommendations was narrowed to address a few general growth management strategies, streets and parking, construction practices and landscaped areas, design and placement of buildings, community involvement and education, and study evaluation.

Step 4 and 5.

Discussion of future impacts and requirements for success was constrained by time, the committee members' confusion over sustainability concepts, and the general difficulty of analyzing a topic connected to such a wide range of issues.

The initial analysis was complemented by a technical and policy analysis (Chapter 2) conducted by staff and the policy consultant (see Project Team). The analysis yielded a number of examples of innovative land use and regulatory practices in other communities, as well as the results of other impervious surface research.

Part Two: Community Forum Roundtable Exercise

Part two of the sustainability analysis included a roundtable exercise. The exercise involved the five attendees of a Community Forum and was facilitated by the policy consultant. The roundtable exercise consisted of a brief presentation on sustainability concepts and Olympia's two criteria, followed by a group discussion that reviewed the main goal of the study—a 20 percent reduction in new impervious surfaces. Objectives of the exercise included:

- Expand citizen understanding of key sustainability concepts.
- Receive input from citizens for use in this final study report.
- Test one method for conducting sustainability analyses.

The roundtable exercise was designed to assess future impacts of and requirements for a 20 percent reduction in impervious surfaces associated with new development. The exercise consisted of figuratively placing the 20 percent goal at the center of a table and the Community Forum participants considering two questions. The questions were:

1. What changes will be needed in natural, social, economic, and political systems to achieve a 20 percent reduction in new impervious surfaces by the year 2012?

2. What will be the impacts on natural, social, economic, and political systems if a 20 percent reduction is achieved by the year 2012?

After a group discussion, the participants wrote responses to the questions on a handout illustrating key natural and human systems. Following a break, the participants shared their responses to the sustainability presentation and exercise. As a follow up to the Community Forum, the policy consultant summarized the participants' responses and performed a more in-depth analysis.

Results of the Sustainability Analysis

Feedback from Community Forum participants indicated that the concepts of sustainability were relatively clear and that looking at something from a new perspective was useful. Feedback also indicated that the roundtable exercise was good, but the link between the exercise and impervious surface reduction was unclear.

To contribute significantly to Olympia becoming a sustainable community, there would need to be a greater effort to reduce impervious surfaces than is laid out in this report, and the effort would need to be maintained over several generations. Such an effort would require greater agreement among sectors of the community about strategies. New information and technology would be needed to enhance groundwater infiltration and minimize impacts on water resources. Such information and technology would need to be complemented by economic incentives and relatively stable climatic conditions (e.g., rainfall).

INVOLVEMENT AND EDUCATION

Broad-based involvement and education of the local and regional community was important to meeting the study's goals. Education was an important avenue for citizens and local jurisdictions to become well informed of the problems addressed by the study. In addition, the education process was used as a two-way street, providing an opportunity to discover community concerns and generate innovative, workable solutions.

Strategy for Involving and Educating Audiences

Olympia used a multifaceted strategy for gaining broad-based support for the study's impervious surface reduction recommendations. The strategy was initially summarized in a public involvement and education plan (Appendix A). The plan contains goals, objectives, activities, and evaluation measures and was implemented consistent with the grant agreement for the study. The strategy focused on a variety of audiences and included many opportunities for citizens and neighboring local governments to influence the direction and outcome of the study.

Audiences included the local development community (developers, contractors, landscapers, architects, realtors, etc.); individual homeowners and neighborhood associations; small business owners and retail and commercial businesses; and city and county governments, including their planning, public works, and parks department

staff, management, and elected officials. Completed involvement and education activities are summarized below.

Communities

Public and private sector representatives were involved in defining the study from its inception (see Project Team). Community, business, and local government representatives assisted in the study through two committees.

Steering Committee

Since long-term success depends on cooperation and coordination among the four local governments in the North Thurston UGMA, Olympia managed the study with the assistance of a Steering Committee comprised of planning, community development, and public works staff from Olympia, Lacey, Tumwater, and Thurston County. The Steering Committee met four times, helped refine the scope of the study, and provided technical review of reports and other products. The committee also shared the results of the study with their management and elected officials and participated in technical assistance activities.

Ad Hoc Citizen Advisory Committee

A six-member committee of community representatives met 14 times during the course of the study. The committee advised staff by reviewing drafts, discussing ideas, and assessing the environmental, economic, social, and political implications of various recommendations. Committee members included a consulting engineer, architect, commercial realtor, soils scientist, private utility manager, and neighborhood association representative. The committee's second meeting (July 1993) consisted of a visioning exercise with the Steering Committee members based on Olympia's sustainability criteria. The Ad Hoc Citizen Advisory Committee subsequently met to review comments on the draft report and provide input to this final report.

Needs Assessment

An informal needs assessment (Appendix B) was conducted over a three-month period (January through May 1994) to identify communication tools and incentives appropriate for reducing impervious surfaces. A secondary purpose was to inform members of the community about the study. The assessment results were incorporated into the Public Involvement and Education Plan (Appendix A).

Of the approximately 125 assessment forms distributed to local business and development community representatives and planning and public works staff, 41 (33 percent) were returned. Survey responses indicate that, with the exception of tours and field trips, technical assistance and education tools developed for the public sector may not be suitable for the private sector. However, newspapers are a good media format for reaching both sectors.

The survey results also indicate that the public sector is more willing to participate in demonstration projects than the private sector. Responses indicate that the private and public sectors agree on the incentives for participating in demonstration projects: training, streamlined permit process, and reduced development costs.

Community Forums

Two community forums were held to discuss the study's recommendations. A meeting with the attendees of the early scoping meetings and additional members of the community was convened to discuss the *Technical and Policy Analysis Report* (City of Olympia, 1994b) in January 1994. Another meeting was held in January 1995 to present the draft study report, provide an opportunity to discuss the draft recommendations, and involve the public in a sustainability review. The comments from the community forums were incorporated into this final study report.

Technical Assistance

To encourage further understanding and actual reduction of impervious surfaces, technical assistance was offered to the local and regional community. Information and training on how to identify and take advantage of impervious surface reduction opportunities was provided to citizens, policymakers, developers, business owners, builders, and others. Technical assistance consisted of two workshops, an alternative surfaces fact sheet (Appendix C), and a model legal agreement for shared parking (Appendix D). In January 1995, information on alternative surfaces and impervious surface reduction techniques was presented to the local chapter of the Ecobuilders Guild. In March 1995, an "Exploring and Understanding Soils" workshop was offered to builders, contractors, excavators, and interested citizens. Both workshops were successful in expanding understanding about impervious surface reduction techniques (Study Results and Appendix E).

The alternative surfaces fact sheet was distributed to 30 soils workshop attendees. An additional 600 copies are scheduled to be printed and distributed during 1995. A model legal agreement for shared parking (Appendix D) is distributed through the Olympia permit counter and was distributed to local governments throughout Washington via the Association of Washington Counties' and Association of Washington Cities' mailing lists.

Sharing the Results

Information was shared with citizens, professional groups, and various jurisdictions within Thurston County, Washington State, and across the United States to encourage application of the study's results. A shared parking fact sheet was developed and over 500 were distributed to local jurisdictions throughout the United States. Nineteen articles about the study were published, including two in national publications and three professional papers. Twelve news releases, one radio announcement, two professional papers, and two ads were also completed.

Printed materials distributed or scheduled to be distributed include approximately 1,575 reports, 1,000 buttons, and 2,000 copies of three different fact sheets (Appendix C). Printed materials were disseminated at two national conferences, at 23 presentations and briefings, and in response to requests. The project mailing list contains 431 names and addresses, including 183 local, 139 within Washington State, 104 out of state, and 5 names and addresses outside the United States.

An informational display board, with illustrations of alternatives, and a flip book, with photos of example designs, were used at the two national conferences and several of the presentations.

STUDY EVALUATION

An evaluation of the study and whether or not it met its goals and objectives was conducted by project staff in March and April 1995. Evaluation of the public involvement and education plan (Appendix A) was an important part of the overall evaluation because it provided data on the amount and distribution of printed materials, numbers of people informed about the study, and knowledge gained from technical assistance workshops. However, actual behavior changes resulting from printed materials, presentations, or other methods were not measured. Without measuring behavioral change, crediting the study with actual impervious surface reduction is difficult. Staff assume that some reduction will occur given the policies that have been changed as a result of the study and because citizens, businesses, development community members, and several jurisdictions nationwide have learned more about impervious surface reduction strategies.

Public Involvement and Education Plan Results

The Public Involvement and Education Plan (Appendix A) contains nine evaluation measures. According to evaluation results, four of the measures were clearly met, three were partially met, one is no longer applicable, and one is difficult to evaluate because it is based on future actions. The evaluation measures and results are listed below:

1. At least 1,000 people were informed of the study through briefings, presentations, etc.

   This objective was met. Approximately 2,190 people attended briefings, presentations, and technical assistance workshops or received printed materials. If 25 percent of these people were at one or more presentations or received printed materials and attended a presentation, then approximately 1,650 different people were informed of the study.

2. Demonstration projects included private-public partnerships.

   This objective was partially met. Although the Project Team was not successful at constructing a demonstration project on private property, Olympia School District No. 111 is participating in a demonstration project. The school district is a separate entity from the city and, thus, a special letter of agreement was required for construction of the project. The Olympia High School project was brought to the team's attention by a citizen and utilized private contractors for soils analysis and sod replacement.

3. At least five site plans submitted to Olympia during 1995 integrated techniques recommended by the study.

   This objective is no longer applicable for two reasons. First, when written, this objective assumed the study would be completed in 1994 rather than 1995. Second, because many of the policy changes that occurred as a result of the study have yet to be adopted, it is too early to see study results reflected in site plans. This evaluation measure has been folded into Olympia's implementation actions for Recommendation 19.

4. At least 20 people were involved in training.

   This objective was met. Forty-six people attended the two training workshops.

5. Results of workshop evaluations indicated that the training workshops were useful.

   Written evaluations were distributed at both training workshops (Appendix E). Participants' responses to both workshops were favorable. Eight of the nine respondents to the Ecobuilders Guild evaluation indicated that "they would reduce impervious surfaces associated with their next construction project." The twelve respondents to the soils workshop evaluation rated the overall quality of the workshop at 4.42 out of 5.00 possible points. Nine of the respondents from that workshop indicated they "certainly did" learn new facts or new ideas that would be helpful on their job.

6. At least 75 percent of the study's recommendations were adopted by Olympia and 50 percent by other local governments.

   This objective will be partially met if draft policies are adopted as proposed. It is expected that at least nine recommendations will be wholly or partially incorporated into Olympia's policies. Three of the study's recommendations were incorporate into City policy prior to the study and are included as guidance for other local jurisdictions outside the North Thurston UGMA. Four additional recommendations may be implemented depending on funding. If funding is

provided for these four recommendations and policies are adopted as proposed, Olympia will implement all or part of 81 percent of the study's recommendations not already implemented.

Only a few of the recommendations are proposed for adoption by Lacey, Tumwater, and Thurston County. As with Olympia, some recommendations had already been wholly or partially incorporated into policy prior to the study, while other recommendations have been incorporated into proposed street standards and other policies. Staff estimate that approximately 10 to 20 percent of the recommendations will be adopted by other local governments in the North Thurston UGMA.

7. At least ten jurisdictions requested study results.

It is difficult to determine the exact number of requests from jurisdictions because phone calls and personal contacts were not always documented. However, those that requested materials were added to the project mailing list. As of March 15, 1995, the mailing list contained 165 names of representatives from various jurisdictions, including 5 tribal representatives, 18 representatives from federal agencies, 47 from state agencies or universities, 44 from county agencies, and 51 from city agencies or ports. Project staff continue to get requests for information. These requests are expected to continue throughout 1995.

8. At least one letter of support for the study was received from a leading business organization.

Staff did not request a letter of support from local business organizations. Informal verbal support of the study was given by the Olympia/Thurston County Chamber of Commerce.

9. The Ad Hoc Citizen Advisory Committee and Steering Committee members generally support the study's recommendations.

The Ad Hoc Committee members have indicated that they support most or all of the study's results and recommendations. Committee members worked well together, sharing ideas and wrestling with challenging issues. The committee came to general consensus concerning many elements of the study's approach and recommendations. Steering Committee support also was achieved, although to a lesser degree. More frequent meetings or direct contact with Steering Committee members could have resulted in greater support for and implementation of the study's recommendations.

Overall Study Evaluation Results

Evaluation measures were not established for the overall study. However, results of an evaluation of the study's goals and objectives (Goals and Objectives) are summarized below.

The study's two goals were generally met.

Goal 1: The Ad Hoc Citizen Advisory and Steering Committees generally support the impervious surface reduction techniques recommended by the study. Many of the recommendations are proposed as part of new street, parking, and development standards. Results of the cost analysis indicate savings associated with some recommendations. However, there will be some costs incurred for alternative surfaces, taller buildings, and other recommendations depending on individual site factors.

Goal 2: Based on the basin and site coverage assessment and expected results from the proposed street, parking, and development standards, an estimated 20 percent reduction in future impervious surfaces is likely to occur. This reduction will be complemented by additional reduction from infill and other growth management strategies currently being implemented.

The study's five objectives (Goals and Objectives) were clearly met.

Objective 1: Over 1,600 people were informed of the need for alternatives to impervious surfaces and encouraged to support impervious surface reduction in their local community. Nineteen articles, 12 news releases, 1 radio announcement, 2 professional papers, and 2 ads were used to inform the public about study results or invite participation. In addition, approximately 1,000 buttons were distributed with a "Save It—Don't Pave it" message, 2,000 fact sheets were distributed, and 23 presentations or briefings were provided to the local and regional community.

Objective 2: Street, parking, and development standards were modified to encourage impervious surface reduction in future construction.

Objective 3: Although not as extensive as initially proposed in the Public Involvement and Education Plan (Appendix A), technical assistance was provided to the development community during the study and will be continued to some degree into the future.

Objective 4: Two demonstration projects are underway. Both are at highly visible sites (Olympia City Hall and Olympia High School) and utilize alternative development practices.

Objective 5: Many of the presentations and briefings noted under Objective 1 were designed specifically to share results. As of March 15, 1995, approximately 875 copies of the *Technical and Policy Analysis Report* and *Impervious Surface Reduction Study Draft Report* had been distributed. Approximately 200 copies of this final report and 1,500 copies of a separate *Executive Summary* will be distributed nationwide.

CHAPTER 2
TECHNICAL AND POLICY ANALYSIS

Research of technical and policy issues was important to understanding the problems caused by impervious surfaces and developing feasible and practical recommendations. The technical and policy analysis element of the study included five main tasks:

1. Literature and Policy Review
2. Demonstration Projects
3. Basin and Site Coverage Assessment
4. Parking Analysis
5. Other Research

LITERATURE AND POLICY REVIEW

The literature and policy review was conducted early in the technical and policy analysis and helped define the study approach (Chapter 1). The review included the following activities:

- A survey of the literature and interviews with knowledgeable people to determine quantifiable relationships between impervious surface and the quality and quantity of stormwater runoff.

- Development of recommendations for reducing impervious surfaces based on (1) Olympia City Council policy direction; (2) initial visioning (brainstorming) and lengthy discussions by the Steering and Ad Hoc Citizen Advisory Committees; (3) a review of literature on sustainable communities and alternative development techniques; (4) input from a forum of select community leaders; and (5) public review and comment.

- Analysis of stormwater runoff quantity, water quality, groundwater recharge, and stream flow information.

The literature and policy review culminated in the publication of the *Technical and Policy Analysis Report* (City of Olympia, 1994b). For the sake of continuity, some of the early analysis has been incorporated into Chapter 3 of this report.

DEMONSTRATION PROJECTS

A key task of the technical and policy analysis was to demonstrate the feasibility and practicality of the recommendations at one or more new development sites.

Numerous proposed developments in the Olympia area were investigated in light of the goals of the study. These proposed developments were evaluated for suitability as demonstration projects by staff and the Ad Hoc Citizen Advisory Committee using the following nine selection criteria:

1. Project provides an opportunity for techniques that are not readily familiar to the development community and at a size that demonstrates their applicability to the local community.

2. Project has high visibility and accessibility to the development and business community.

3. Project provides useful information for an urbanized, intensely used setting.

4. Project provides an opportunity to use techniques that meet stormwater detention and treatment goals.

5. Project provides an opportunity to demonstrate cost-effective techniques.

6. Project provides an opportunity for a public/private partnership.

7. Project provides an opportunity to demonstrate several recommendations.

8. Project provides an opportunity to monitor it long term.

9. Project costs are no more than $50,000.

Recommendations considered the most practical for demonstration included Recommendation 4 (narrow residential streets); Recommendation 5 (use pavers or alternative surfaces); Recommendation 11 (limit soil compacts); and Recommendation 12 (limit land clearing).

Both commercial and residential, private, and public sites were considered for demonstration of the recommendations. Considerable effort was spent investigating potential projects. Barriers associated with identifying a viable demonstration construction project included:

- Many of the recommendations focus on changes in current policies or regulations. A variance would have been required for almost every potential project in order to legally construct an alternative or innovative design that is not currently allowed. Most projects did not come to the attention of staff or the committee until it was too late in the design phase and would have required a construction delay for the developer or builder.

- Because there were only a few techniques identified for demonstration through the study, many of the potential projects offered limited opportunities. Pavers and alternative surfaces were the most obvious items suitable for demonstration,

  but they are suitable for low-use areas, which contradicts with high visibility and other selection criteria.

- Many of the potential projects offered only minor improvements in the infiltration or treatment of stormwater due to site-specific limitations (e.g., soils) and were, therefore, not pursued.

- Potential projects tended to lack long-term viability of the demonstration techniques and/or an opportunity for long-term monitoring of the project.

The above barriers delayed starting the projects until early 1995. Since that time, two projects have been pursued: a sidewalk renovation project at Olympia City Hall, and a soil restoration project at Olympia High School.

The Olympia City Hall sidewalk renovation project will consist of using pavers for bike rack facilities and for replacing segments of existing sidewalk. Approximately three different types of pavers will be used and displayed with information about costs, installation methods, and expected benefits.

The Olympia High School soil restoration project will consist of reducing the soil compaction along one side of a dirt and gravel parking lot in order to increase infiltration of surface water runoff. Runoff is currently flowing from the parking lot into an adjacent soccer field, limiting use of the field. A trench, approximately 3 to 6 feet wide, 4 feet deep, and 100 feet long, will be dug. Rock and other materials will replace the soil removed from the trench. The soils will be reinforced with a layer of plastic cellular confinement material (e.g., Geoweb) just below the surface. The added rock and materials and the cellular confinement layer are expected to help protect the deeper soil from compaction and increase infiltration capacity.

The following six criteria will be used to evaluate the demonstration projects:

1. The new techniques can be implemented without causing appreciable increases in development costs.

2. The amount of impervious surface is less with new techniques than with standard development practices.

3. The new techniques are acceptable to users and provide a safety, aesthetic, or other advantage compared to standard development practices.

4. The new techniques are acceptable to contractors and builders and are easier to construct than standard development practices.

5. The new techniques increase the ease of maintenance and reduce maintenance costs compared to standard development practices.

6. The new techniques increase stormwater treatment and infiltration and reduce flooding compared to standard development practices.

The study grant was recently extended to June 1996 to accommodate completion of the demonstration projects. Because the demonstration projects are not complete in time for this report, a separate technical report that summarizes lessons learned and monitoring results will be submitted to the Washington Department of Ecology in April 1996. Readers interested in information about the demonstration projects are encouraged to contact the Study Coordinator.

BASIN AND SITE COVERAGE ASSESSMENT

Project staff conducted a basin and site coverage assessment to better understand the level of impervious surface reduction that could be expected in the North Thurston UGMA from key study recommendations. The assessment consisted of a site-specific analysis and a two-part analysis of impervious surface coverage at predicted buildout conditions in the Percival, Woodard/Woodland, and Chambers/Ward/Hewitt drainage basins. The three drainage basins total 37,000 acres and were selected for the assessment because:

- Land use and impervious surface coverage information was readily available and fairly current;

- They represent an area that overlaps with the North Thurston UGMA and is equivalent in size to almost 69 percent of the North Thurston UGMA; and

- It is expected that the three basins will experience less development and lower growth rates than the North Thurston UGMA as a whole, and thus, the analysis results are a conservative estimate of reduction we can expect from the study's recommendations in the UGMA.

Information for the assessment was obtained from engineering plans for 11 Olympia-area developments and Hydrological Simulation Program-Fortran (HSPF) models

created for the three basins. The engineering plans provided information on typical coverage for high-density residential (3 to 7 units per acre), multifamily (7 to 30 units per acre), and commercial/industrial land uses. The HSPF models are predictive hydrologic computer models for surface water that provided information on existing and potential future land use. The models also provided information on the effectiveness of various impervious surface types (i.e., streets, sidewalks) at producing runoff from a site. The engineering plan and HSPF information was evaluated to answer the following questions:

- How much impervious surface is associated with typical developments in the North Thurston UGMA?

- What is the amount of impervious surface we can expect at buildout in the three basins, given current development regulations and patterns, as a representation of North Thurston UGMA development trends?

- What reductions in impervious surfaces can be expected with implementation of key study recommendations.

Site-Specific Analysis

The quantity of streets, sidewalks, parking/driveways, roofs, lawn/landscaping, and open space associated with recent Olympia-area developments was calculated from the engineering plans. Numerous developments exhibiting typical but varied site opportunities and constraints were used. The following developments were chosen for the analysis:

- Residential development:

Springfield	16units; 6 units/acre
Mapleview II	49 units; 4 units/acre
North Pointe	38 units; 6 units/acre
Bigelow Park	71 units; 4 units/acre

- Multifamily development: Homeport, Fern Ridge, Cambridge II, Creekwood

- Commercial development: Safeway, Home Depot, Eastside Office Building

The approximate composition of site coverage for the 11 developments is shown in Table 1. The average coverages are also presented graphically in Figure 1.

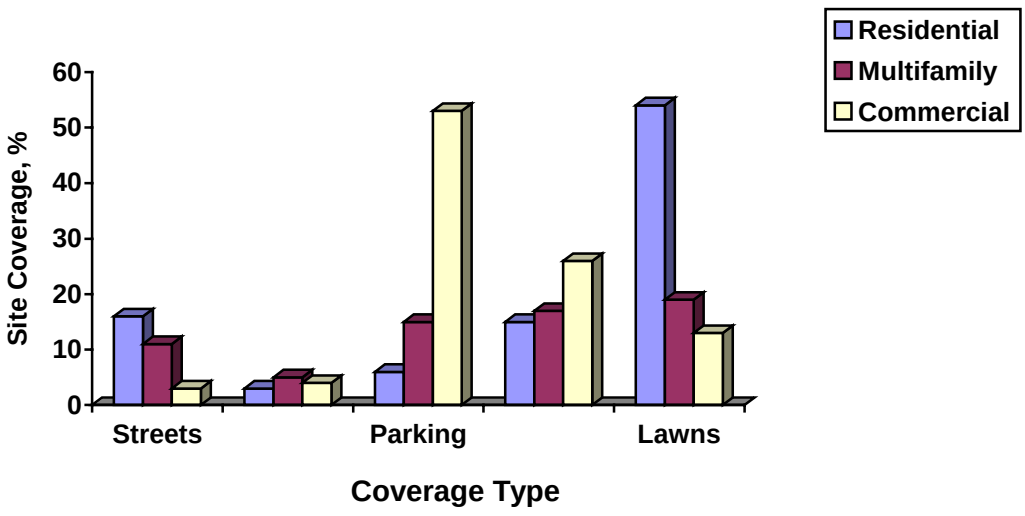
Table 1: Site Coverage for Three Land Uses

Approximate Site Coverage, %

Surface Coverage Type	Residential Average	Residential Range	Multifamily Average	Multifamily Range	Commercial Average	Commercial Range
Streets	16	11-22	11	7-17	3	2-4
Sidewalks	3	2-4	5	2-11	4	2-9
Parking/Driveways	6	4-9	15	10-20	53	39-64
Roofs	15	10-18	17	15-17	26	25-27
Lawns/Landscaping	54	44-65	19	14-22	13	4-26
Open Space		(1) n/a	34	25-40	(1) n/a	
Total Impervious Surface	40		48		86	

(1) Open space typically represents a small portion of residential and commercial developments.

Figure 1: Site Coverage for Three Land Uses



The total impervious surface for each land use category is generally in agreement with accepted Puget Sound values used in the HSPF program (Aqua Terra, 1994). Table 2 compares the estimated HSPF coverage values with the coverage of Olympia-area developments.

Table 2: Comparison of HSPF and Olympia-Area Development Coverage Values

Land Use	Impervious Surface, % HSPF Model	Impervious Surface, % Olympia Developments
Low-Density Residential (<1 unit/acre)	10	(1) n/a
High-Density Residential (3-7 units/acre)	40	40
Multifamily (7-30 units/acre)	60	48
Commercial/Industrial	90	86

(1) Low-density residential developments were not evaluated.

Impervious surfaces can also be evaluated with respect to their effectiveness at producing runoff. For example, a residential roof may be similar in size to a commercial roof, but given the presence of permeable landscaping around the typical residential roof and the presence of impervious surface around the commercial roof, the commercial roof is more effective at producing runoff (produces more runoff) than the residential roof. This evaluation approach can be helpful in defining stormwater problems and opportunities. Commonly accepted HSPF relationships between impervious surface and effective impervious surface (Aqua Terra, 1994) in the Puget Sound area are presented in Table 3.

Table 3: Comparison of Total Impervious Surface and Effective Impervious Surface for Several Land Uses

Land Use	Total, %	Effective, %
Low-Density Residential (<1 unit/acre)	10	4
High-Density Residential (3-7 units/acre)	40	26
Multifamily (7-30 units/acre)	60	48
Commercial/Industrial	90	86

Table 4 indicates that a given unit of impervious surface will produce appreciably more runoff in a commercial setting than in a low-density residential setting. However, these assumed values do not, as stand-alone numbers, reflect the importance of soil type and slope on the effectiveness of the surface. Impervious surfaces discharging to highly pervious soil are ineffective. This evaluation does not address the effect of soil type on effectiveness and, therefore, provides generalized rather than site-specific results.

Table 4: Estimated Impervious Surface Effectiveness for Residential Development

Surface Coverage Type	Surface Type, %	Effective Fraction	Effective Surface, %
Streets	16	.8	12.8
Sidewalks	3	.7	2.1
Parking/Driveways	6	.6	3.6

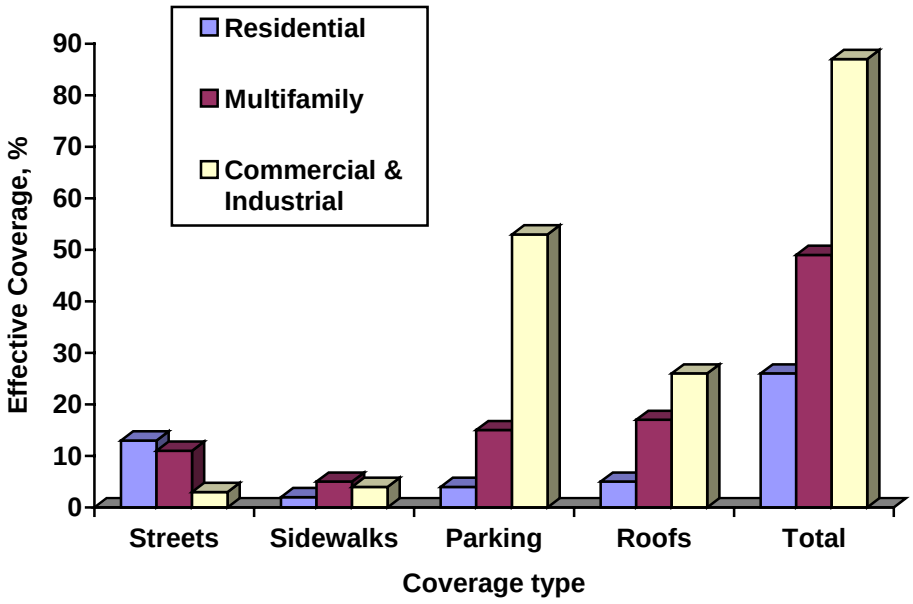
Roofs	15	.35	5.3
Lawns/Landscaping	54	.05	2.7
Total			26.5

Effective impervious surface estimates have also been developed for low-density residential, multifamily, and commercial/industrial land use. Multifamily and commercial/industrial impervious surfaces were assumed to be entirely effective. Lawns and landscaping for all development land uses were assigned an effective fraction of 0.05. Table 5 presents the estimates; Figure 2 illustrates the estimates.

Table 5: Estimated Effective Impervious Surface Coverage for Residential, Multifamily, and Commercial Development February 9, 2000

Land Use	Low-Density Residential	High-Density Residential	Multifamily	Commercial
Streets	3.5	13	11	3
Sidewalks	0.0	2	5	4
Parking/Driveways	0.5	4	15	53
Roofs	0.0	5	17	26
Lawns/Landscaping	0.0	2	1	1
Total	4.0	26	49	87

Figure 2: Estimated Effective Impervious Surface Coverage for Residential, Multifamily, and Commercial Development



The estimated effective impervious surface values for the four land uses closely approximates values used in HSPF modeling (Table 3).

The results of the site-specific analysis include:

- Streets are the primary producers of stormwater runoff in residential areas.
- Sidewalks and lawns/landscaping contribute minimally to effective impervious surface.
- Parking lots are a highly effective impervious surface.
- Streets, parking lots, and roofs generate similar quantities of runoff in multifamily developments.

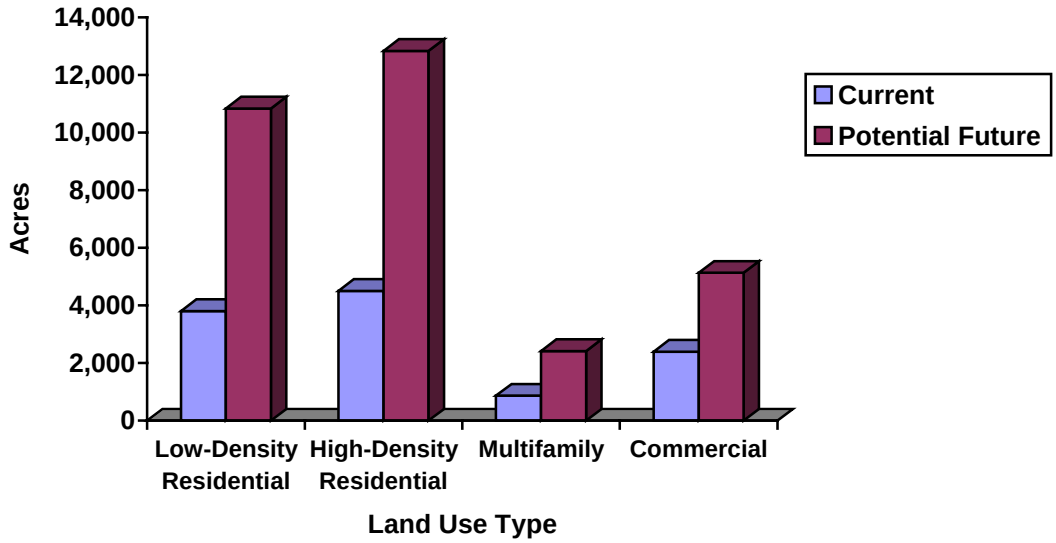
Analysis of Potential Impervious Surfaces in Three Olympia-Area Drainage Basins

Like most areas adjacent to the urban core of Olympia, Lacey, and Tumwater, the three representative drainage basins can expect considerable development growth in the near future. The extent of the basins' growth potential has been thoroughly evaluated through basin plans developed by the local governments and is present below in Table 6 and Figure 3.

Table 6: Current and Potential Future Land Use in Three Olympia-Area Drainage Basins

	Land Use, Acres	
Land Use Category	**Current**	**Potential Future**
Undeveloped	24,663	791
Undeveloped	3,805	12,592
Sparse Residential	3,448	12,492
Medium Residential	1,559	2,409
High Residential	869	2,807
Light Commercial	1,527	2,963
High Commercial	868	2,854

Figure 3: Current and Potential Future Land Use in Three Olympia-Area Drainage Basins



The HSPF model requires consolidation of the seven land uses shown on Table 6 into categories of undeveloped, low- and high-density residential, multifamily, and commercial/industrial land uses. Successful computer modeling and calibration is feasible with the broad level of detail provided by the consolidated land uses. The categories of low-density residential, high-density residential, multifamily, and commercial/industrial are the same categories used on the previous evaluation of total and effective impervious surfaces. The consolidated land uses are presented in Table 7. Additionally, potential future development acreage (expected buildout) in Table 8 has been reduced by 20 percent compared to zoning allowances because sites in the Olympia area typically develop at lower densities than are allowed by zoning.

Table 7: Consolidation of Current and Potential Future Land Use in Three Olympia-Area Drainage Basins at 80 Percent Buildout

	Land Use, Acres	
Land Use	**Current**	**Potential Future**
Low-Density Residential (<1 unit/acre)	3,805	10,835
High-Density Residential (3-7 units/acre)	4,507	12,838
Multifamily (7-30 units/acre)	869	2,419
Commercial/Industrial	2,395	5,133

Table 8: Potential Future Increases in Total and Effective Impervious Surfaces in Three Olympia-Area Drainage Basins

	Impervious Surface Increases, Acres	
Land Use	**Total**	**Effective**
Low-Density Residential (<1 unit/acre)	703	281
High-Density Residential (3-7 units/acre)	3,332	2,166
Multifamily (7-30 units/acre)	915	732

Commercial/Industrial	2,464	2,354

Given these values for current and potential future land use in the drainage basins (Table 7) and total and effective impervious surfaces associated with different development types (Table 3 and Table 6), we can expect the following increases in impervious surfaces for full development conditions (20 percent less than buildout) in the basins.

Tables 9 and 10 show total and effective surfaces in the basins under full development conditions. The information is also presented graphically in Figure 4 and Figure 5. Due to its relatively minor contribution to runoff, lawns and landscaped areas have been omitted from these analyses.

Table 9: Total Impervious Surfaces for Future Potential Development In Three Olympia-Area Drainage Basins

Total Impervious Surface, Acres

Surface Coverage Type	Low-Density Residential	High-Density Residential	Multifamily	Commercial	Total
Streets	225	1,333	168	73	1,799
Sidewalks	37	222	76	119	455
Parking/Driveways	85	506	225	1,460	2,276
Roofs	216	1,281	252	712	2,460

Table 10: Effective Impervious Surface for Future Potential Development in Three Olympia-Area Drainage Basins

Effective Impervious Surface, Acres

Surface Coverage Type	Low-Density Residential	High-Density Residential	Multifamily	Commercial	Total
Streets	211	1,066	168	73	1,518
Sidewalks	0	89	76	119	284
Parking/Driveways	70	304	225	1,460	2,059
Roofs	0	512	252	712	1,476

Figure 4: Acres of Total Impervious Surface for Future Potential

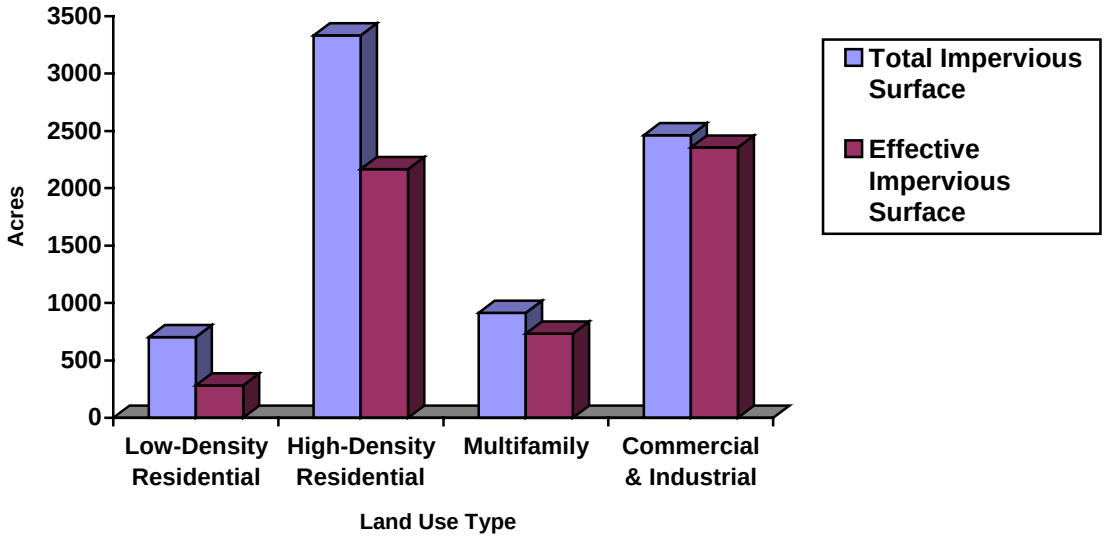
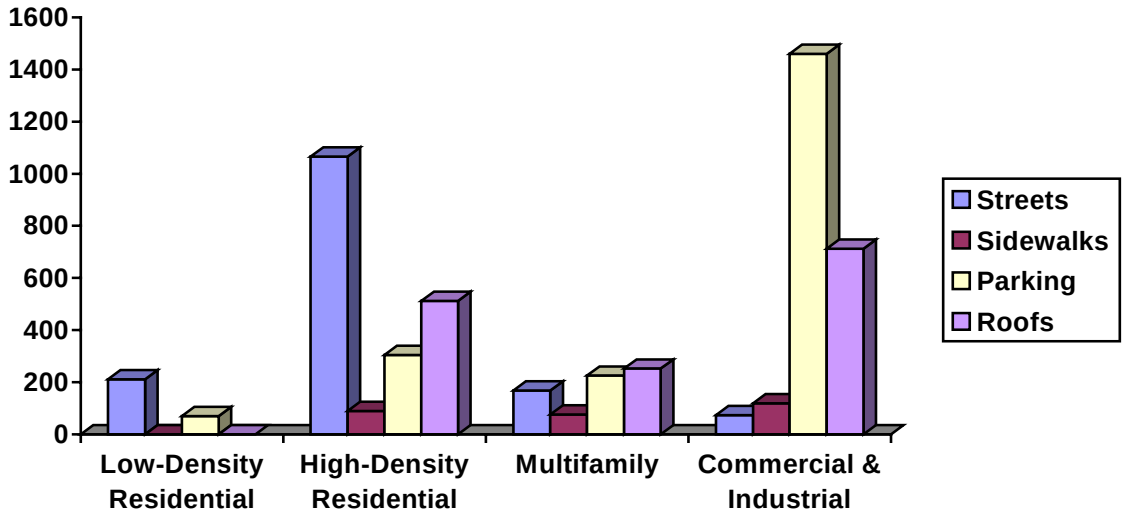

3500
3000
2500
2000
1500
1000
500
0
Acres
Low-Density Residential
High-Density Residential
Multifamily
Commercial & Industrial
Land Use Type
Total Impervious Surface
Effective Impervious Surface

Figure 5: Acres of Effective Impervious Surface for Future Potential Development in Three Olympia-Area Drainage Basins



Reduction Analysis

Based on the previous analysis, six potential strategies for impervious surface reduction were evaluated. The six strategies included:

1. Reduce residential sidewalks by 50 percent by installing sidewalks on only one side of the street.

2. Reduce residential sidewalks from 5 feet to 4 feet in width.

3. Reduce local access street widths from 32 feet to lesser widths.

4. Reduce commercial parking by 5, 10, or 20 percent.

5. Reduce multifamily parking by 5, 10, or 20 percent.

6. Reduce commercial, industrial, and multifamily roof areas by 10 or 20 percent.

For each strategy, two questions were asked:

- What percent of total and effective impervious surface would be reduced for a given development site?

- What percent of total and effective impervious surface would be reduced in the three drainage basins at 80 percent buildout?

The results of the reduction analysis calculations are summarized in Table 11. Results of the reduction analysis include:

- Reducing sidewalks offers minor, possibly insignificant, reductions in total and effective impervious surfaces.

- Major reductions in residential street widths are needed before significant reductions in impervious surfaces can be expected.

- Reducing commercial, industrial, and multifamily parking could readily reduce impervious surfaces.

- Roof reductions imply constructing taller buildings with associated reductions in impervious surfaces.

Table 11: Basin and Site Coverage Assessment
Reduction Analysis Results

Potential Strategy		Impervious Surface Reduction Percentages			
		Site-Specific		Basinwide	
		Total	Effective	Total	Effective
1.	Reduce residential sidewalks by 50 percent by installing the walks on one side of the street only.	1.33	1.00	1.59	0.83
2.	Reduce residential sidewalks from 5 feet width to 4 feet width.	0.53	0.40	0.64	0.33
3.	a. Reduce local access street widths from 32 feet to 27 feet.	2.50	2.00	2.98	3.12
	b. Reduce local access street widths from 32 feet to 25 feet.	3.50	2.80	4.17	4.37
	c. Reduce local access street widths from 32 feet to 20 feet.	6.00	4.80	7.15	7.49
4.	a. Reduce commercial parking by 5 percent.	2.67	2.67	1.04	1.37
	b. Reduce commercial parking by 10 percent.	5.33	5.33	2.09	2.74
	c. Reduce commercial parking by 20 percent.	10.67	10.67	4.18	5.47
5.	a. Reduce multifamily parking by 5 percent.	0.74	0.74	0.16	0.21
	b. Reduce multifamily parking by 10 percent	1.48	1.48	0.32	0.42
	c. Reduce multifamily parking by 20 percent.	2.95	2.95	0.64	0.84
6.	a. Reduce commercial, industrial, and multifamily roof areas by 10 percent.	4.25	4.25	1.38	.094
	b. Reduce commercial, industrial, and multifamily roof areas by 20 percent.	8.50	8.50	2.76	1.89

Assumption of the Basin and Site Coverage Assessment

Results of the basin and site coverage assessment should be considered in light of several important assumptions.

- The street width reduction calculation assumed that all streets in residential areas were minor local access roads and would, therefore, be considered for width reduction. Since all residential streets are not local access roads, this assumption leads to an overestimate of impervious surface reduction.

- Analysis assumes that the area surplused by the parking reduction or other strategies would be landscaped rather than covered by impervious surfaces (i.e., building).

- The estimate of the effective fraction of impervious surfaces was based entirely upon best judgment. The subsequent analysis of impervious reduction strategies for residential sites is directly affected by these estimates.

- The effect of soil type on the effectiveness of impervious surfaces has not been addressed. Site with highly permeable soils may have no effective impervious surfaces even though site coverage is high.

- Impervious surfaces associated with multifamily land use are assumed to be entirely (100 percent) effective at producing runoff.

- Full development conditions were assumed to be 20 percent less than allowed by zoning. This assumption has been commonly used in computer modeling of urban hydrology. It acknowledges that full development at zoning levels is unlikely, especially for residential development.

Even with these assumptions, the methodology used in this assessment provides a justifiable basis for investigating the performance of various impervious surface reduction strategies. Strategies investigated offer basinwide impervious surface reductions ranging from 0.16 to 10.67 percent (Table 11). Once implemented, the performance of the new strategies could be easily quantified.

PARKING ANALYSIS

Special Parking Capacity Study

In order to better understand the parking situation in Olympia, a special parking capacity study was conducted. The purpose of the Special Parking Capacity Study was to assist Olympia's Community Planning and Development Department in revising the parking ordinance and to determine if proposed changes in Olympia's parking ratios (standards) would reduce impervious surfaces. The draft ordinance (City of Olympia, 1994g), if

adopted by the Olympia City Council, would replace the current “minimum” parking ratios with “median” parking ratios.

Methodology

Determining parking ratios for various land uses is not an exact science. The method most often used is to modify ratios from other local governments. Another method is to use the Institute of Transportation Engineers handbook (ITE, 1992). The handbook provides parking ratios that are based on national surveys of select land uses.

These two common methods normally establish the minimum parking ratios necessary to provide sufficient on-site parking to prevent traffic congestion and overflow into residential neighborhoods. However, they do not provide parking ratios that avoid excess parking or allow for specific needs of individual communities.

Direct observation of parking stall occupancy during peak operating hours, though labor intensive, is an effective approach for determining if there is insufficient or excess parking in a community. This method is most helpful when trying to establish parking medians and was the one selected for the Impervious Surface Reduction Study’s Special Parking Capacity Study.

Three tasks comprised the Special Parking Capacity Study:

1. Informational survey
2. Field survey
3. Reduction analysis

These tasks are described in detail below.

Informational Survey:

The first task was to administer an informational survey through phone and personal interviews (Appendix F). Conducted from August 1 to August 14, 1994, this survey was administered to owners or managers of 31 selected sites in the North Thurston UGMA.

The sites were chosen by Olympia’s Community Planning and Development Department, which identified them as representative of 15 different land uses that would be most affected by adoption of the proposed parking revisions. Six sites were located in the cities of Lacey and Tumwater. The remaining sites were located in Olympia. No sites in downtown Olympia were chosen. A committee convened in 1994 will be developing and reviewing a separate Downtown Olympia Parking Management Strategy.

Several respondents indicated that summertime was not the peak season for their respective activities. Caution was used when drawing conclusions about peak occupancy rates for churches, retail stores, schools, and movie theaters, since the

counts were not made during their self-defined peak season. Due to the limited scope of this survey, further surveys using larger samples throughout the year are recommended.

Field Survey:

The second task was a field survey of 15 land uses conducted from August 1 through August 9, 1994 (Appendix G). All existing parking spaces were counted at each site for each land use. Occupied spaces were counted four times for each site, with the exception of the general office site, which was counted only once. Counts were taken during peak hours, twice on weekdays and twice on weekends.

Peak hours were determined by consulting the *Transportation-Traffic Engineering Handbook* (ITE, 1992), consultation with planning staff, and field observations. Peak hours for each land use and the number of occupied spaces during peak hours are listed in Appendix G.

Reduction Analysis:

The third task was to analyze what effect the proposed parking ordinance would have on impervious surfaces. To determine if median parking ratios would reduce impervious surfaces in Olympia, information from 11 of the field survey sites was combined with information taken from plans for 4 additional sites. The number of parking stalls for the 15 sites was determined (Table 12). Then, the number of parking stalls that would exist if they were constructed under the median parking ratios of the draft ordinance was calculated (Table 13).

Parking Capacity Study Results

Results of the surveys and reduction analysis overlap and are divided into three general categories: excess parking, parking deficiencies, and parking reductions.

Table 13: Selected Site for Comparison of Existing, Porposed, and Actual Amount of Parking Stalls

Development Name/Type	Number of Existing Stalls	Number of Stalls Required Under Existing Minimum Regulations	Number of Stalls Required Under Proposed Median Regulations
Home Depot/Commercial Retail	544	324	520
Safeway/Commercial Retail	323	308	248
Top Foods/Commercial Retail	526	148	259
Costco/Commercial Retail	616	588	468
Best/Commercial Retail	[(1)] 211	217	209
Windermere Offices/	21	15	20

Development Name/Type	Number of Existing Stalls	Number of Stalls Required Under Existing Minimum Regulations	Number of Stalls Required Under Proposed Median Regulations
General			
Eastside Office/General	29	23	18
McDonald's Downtown/ Restaurants	[2] 44	73	44
McDonald's West Side/ Restaurants	83	76	46
Brewery City/Restaurants	37	37	37
Lacey Cinema Theaters/ Entertainment	[1] 425	497	442
Pac West Health Club/ Entertainment	117	[3] —	260
Kolb Storage/Warehouse	9	7	10
Homeport/Multifamily	180	96	134
Cambridge Court/Multifamily	316	240	238

(1) Shared parking arrangements skew the totals.
(2) The downtown McDonald's site was allowed to have 29 fewer parking stalls than the minimum required because of its downtown location.
(3) There are no existing regulations specific to health clubs.

Table 13: Comparison of Existing Stalls to Required Stalls Under Existing Regulations and Proposed Regulations

Type of Land Use/ Development	No. of Existing Stalls per Site Calculated From Site Visit or Plans	No. of Stalls Required Under Existing Minimum Regulations	No. of Stalls Required Under Proposed Median Regulations
Commercial Retail	2,220	1,585	1,704
General Office	50	38	38
Restaurants	164	186	127
Entertainment— Theaters/Health Clubs [1]	—	—	—
Multifamily	496	336	372
Total Development	2,939	2,152	2,251

(1) Theaters are not included in the comparison because shared parking arrangements skew the number of existing stalls. Health clubs are not included because there are no existing regulations specific to health clubs.

Excess Parking:

- The majority of respondents (71 percent) indicated that the amount of available on-site parking was adequate (Appendix G).

- Despite parking capacity numbers that indicated as much as 60 and 70 percent vacancy rates, no respondent defined excess parking as a problem (Appendix G).
- Eighteen of the 31 representative sites had less than 75 percent occupancy rates during their busiest peak hour surveyed (Appendix G).

- Respondents from sites with more traditional daytime uses, such as a medical clinic, retail store, and service station, indicated that parking was inadequate, even though occupancy ranged from 46 to 67 percent (Appendix G).

- The majority of sites have more parking than the minimum parking ratios require. There are a total of 809 more parking stalls at 12 of the survey sites than required (Table 14).

- The multifamily and large retail sites have the greatest percentage of parking in excess of the existing minimum parking ratios (Table 14).

Table 14: Difference in the Number and Percent of Parking Stalls Built Compared to Existing Minimum Requirements

Type of Land Use/ Development	No. of Existing Stalls in Excess of Minimum Required	% of Existing Stalls in Excess of Minimum Required	Total No. of Stalls Fewer Than Minimum Required	Total % of Stalls Fewer Than Minimum Required
Commercial Retail	635	40%	—	—
General Office	12	32%	—	—
Restaurants (1)	—	—	29	16%
Entertainment—Theaters/Health Clubs (2)	—	—	—	—
Storage Warehouse	2	29%	—	—
Multifamily	160	48%	—	—
Total Development	809	38%	29	1%

(1) The downtown McDonald's site (Table 12) was allowed to have 29 fewer stalls than the minimum required because of its downtown location.

(2) Theaters are not included in the comparison because shared parking arrangements skew the number of existing stalls. Health clubs are not included because there are no existing regulations specific to health clubs.

Parking Deficiencies:

- Definitions of inadequate parking varied among respondents. Inadequate parking seems to be occurring at developments serving seniors, including both senior housing and institutional care facilities. Interview results indicate that there are more senior drivers now than in previous years, and seniors receive more visitors and care providers in these facilities now than in the past (Appendix G).

- Seven representative sites exceeded 75 percent parking occupancy rates during their busiest peak hour surveyed (Appendix G).
- Churches, theaters, health clubs, and motels all had above 75 percent peak occupancy, yet reported that parking was adequate for their needs the majority of the time. Each of these land uses have evening peak hours (Appendix G).

- Prior to August 1994, health clubs were not included as a land use under Olympia's parking ordinance. The health club that was surveyed had an 87 percent occupancy rate at peak hours with six cars choosing to park on the street (Appendix G).

- Parking for storage warehouse would increase by 11 percent under the proposed median parking ratios (Table 15).

Table 15: Change in Number and Percent of Parking Stalls Built Under Proposed Regulations Versus Existing Stalls

Type of Land Use/Development	No. of Stalls Reduced	% of Reduction	No. of Stalls Increased	% of Increase
Commercial Retail	516	23%	—	—
General Office	12	24%	—	—
Restaurants	37	23%	—	—
Entertainment—Theaters/Health Clubs (1)	—	—	—	—
Storage Warehouse	—	—	1	11%
Multifamily	124	25%	—	—
Total Development	689	23%	1	<1%

(1) Theaters are not included in the comparison because shared parking arrangements skew the number of existing stalls. Health clubs are not included because there are no existing regulations specific to health clubs.

Parking Reductions:

- If the proposed median parking ratios had been applied instead of the existing minimum parking ratios, there would be fewer parking stalls and less impervious surface at 10 of the 15 sites used in the analysis (Table 12).

- Four of the six land use categories analyzed would have fewer parking stalls and less impervious surface associated with them if the proposed median parking ratios had been applied instead of the existing minimum parking ratios (Table 13).

- If the proposed median parking ratios had been applied instead of the existing minimum parking ratios, the parking for the multifamily, general office, commercial retail, and restaurant sites would have been reduced by 23 to 25 percent (Table 15).

Parking Capacity Study Conclusions

The results of the parking analysis indicate that most land uses have more parking than currently required. This finding confirms what planners have known for some time—that current parking ratios are artificially low and do not reflect the parking needs of various land uses. The results also indicate that the majority of sites have excess parking stalls under the minimum parking ratios. However, due to the limitations of this analysis, further studies of median parking ratios are recommended. Future studies should include a greater number of observations conducted throughout the year.

Using minimum parking ratios has encouraged planners and developers to think of parking as negative only when there is not enough. This “bigger is better” view of parking lots has created excess impervious surface, particularly at large commercial

retail and multifamily sites. This preliminary parking analysis indicates that using median parking ratios is an effective strategy for reducing impervious surfaces while providing parking ratios, which are neither too high nor too low. Further studies are recommended for continued analysis of median parking ratios.

Cooperative Parking Survey

Smaller and fewer parking lots can result when separate land uses share parking. The Cooperative Parking Survey of Local Jurisdictions was used to assess existing local cooperative parking policies or regulations and to identify incentives that may increase the use of shared parking.

The informational survey was administered through phone interviews of five selected jurisdictions during the month of August 1994. The survey tool used can be found in Appendix H. The jurisdictions surveyed included the cities of Olympia, Tumwater, Lacey, and Bellevue and Thurston County. Respondents were planners in Community Development Departments. Responses to Questions 1 through 7 are summarized in the Results Summary (Appendix H). Responses to Question 7 were used to generate a list for a separate Cooperative Parking Participant Survey (City of Olympia, in preparation).

Results

Results of the Cooperative Parking Study can be divided into two categories: incentives and barriers. Incentives for participating in cooperative parking that were mentioned by the respondents included:

- Reduced construction, landscaping, and maintenance costs.
- Decreases in required parking, ranging from 5 to 25 percent, if developers agree to share parking.
- An increased ability for developers to complete projects that would otherwise have been denied due to parking deficits.

Barriers to cooperative parking that were mentioned by the respondents included:

- Inflexible regulations and rigid regulatory language that limit locations appropriate for some cooperative parking and require a shared property line.
- Developer's perceptions that large parking lots are a necessity, particularly for large retail and commercial uses.

- The lack of model cooperative parking agreements. Local governments require legal agreements between some cooperative parking partners but do not provide prototypes as part of technical assistance.

- Local governments do not document the benefits from cooperative parking or maintain records of cooperative parking arrangements.

- Though regulatory language allows cooperative parking, it is not highly promoted.

- Participation or exploration of cooperative parking options is not required as an option to building excess parking.

Cooperative Parking Survey Conclusions

Smaller and fewer parking lots can result from cooperative parking regulations. Developers and local governments can reduce parking by joining, sharing, or coordinating parking facilities. Parking ordinances that contain cooperative parking policies are an excellent avenue for jurisdictions to promote the reduction of impervious surfaces. Parking ordinances that require the exploration of cooperative parking, such as shared parking, can prove an effective educational tool, moving public thinking towards reducing impervious surfaces.

Language used for cooperative parking varies from local government to local government. Developing common language for the various types of cooperative parking arrangements may facilitate a clearer understanding of parking options for developers. Some suggested language and accompanying parking reductions are as follows:

- Shared parking reduces parking for land uses with noncompeting hours of operation. Suggested parking reductions are 100 percent reduction of the smaller parking requirement for complimentary daytime and nighttime land uses and 50 percent of the smaller parking requirement for land uses with some overlap of hours.

- Joint parking reduces the total parking required for multi-tenant retail and commercial facilities. The possibility of captured trips and increased overflow parking allows for overall reductions for each land use at these sites. Suggested parking reductions are 10 percent for developments with two buildings and 25 percent for developments with three or more buildings.

- Coordinated parking reduces total parking by using large retail or commercial overflow parking for safe, convenient park-and-ride or trailhead locations.

OTHER RESEARCH

In addition to the literature and policy review, demonstration projects, basin and site coverage assessment, and parking analysis, staff also researched other issues related to the recommendations.

Cost Analysis

The study goal includes a commitment to determine strategies that do not increase development costs (Chapter 1). In order to compare recommended strategies with current practices, staff researched costs for many of the recommendations. The resulting information is summarized in Chapter 3 in the Incentives and Barriers sections for each recommendation.

A formal cost/benefit analysis was not conducted due to the breadth of the recommendations and complexity of the issue. Although a formal cost/benefit analysis was not conducted, the information contained in this report does provide some useful guidance. However, the cost calculations reflect a large measure of best professional judgment and are based on numerous assumptions. In a real-world development, soils and other site characteristics would greatly influence actual costs. Any conclusions or application of the costs to other locations or uses should be done with caution.

Paver Places and Faces Survey

During the study, several citizens, members of the development community, and others noted their support for using pavers as a solution to the infiltration blockage caused by impervious surfaces. However, there is widespread misunderstanding about the limited usefulness of pavers. Pavers have limited usefulness for three main reasons. First, the use of pavers should be restricted to low-use areas because of the need to infiltrate only clean water and avoid groundwater contamination. Second, pavers are two to four times as costly as asphalt, making widespread use of pavers an expensive alternative. Third, most pavers do not meet the Americans With Disabilities Act (ADA) standards and pose a liability problem for local governments and businesses.

Appropriate applications for pavers include emergency or stormwater facility access roads, overflow parking areas, and non-handicapped parking stalls. Residential driveways, walkways, patios, and other areas are some of the most appropriate locations for pavers. Residential areas generally do not receive extensive use or pollutants. Residential applications do not need to meet ADA standards.

In order to better understand how well pavers have worked in residential settings, staff conducted an informal survey of homeowners. Residential applications of pavers were identified during staff field activities. Six homeowners were sent letters requesting they contact the Study Coordinator for a phone interview. The three homeowners that responded were asked six questions concerning how long the pavers had been installed; ease of installation, costs, and source of materials; use of the area;

maintenance required or problems encountered; the motivation for putting in pavers; and willingness to recommend pavers to others. The results include:

- The period of time that the pavers had been installed ranged from one month to ten years.

- All three homeowners said the pavers were easy to install and required no professional assistance. All three installed them on a sand base and purchased the pavers from Mutual Materials Company, Tumwater. Exact costs were unavailable but were estimated at $600 to $3,000, depending on size and type of paver used.

- All three homeowners are using the pavers for parking. One homeowner used them to replace a center area of his driveway where a tree was removed. The area is now used for washing cars and parking. Two other homeowners use the pavers for overflow parking of boats and extra cars.

- All three homeowners had not experienced significant maintenance problems.

- The main motivation for installing the pavers for all three homeowners was aesthetics. All three had seen pavers in other locations (Tumwater Falls Park, South Puget Sound Community College, Thurston County Courthouse) and liked the look of them. Two homeowners also installed the pavers to increase filtration due to poor soils or topography of their yard.

- All three homeowners would recommend pavers to others. One homeowner has integrated pavers into his new house plan.

CHAPTER 3
RECOMMENDATIONS FOR OLYMPIA, NORTH THURSTON COUNTY URBAN GROWTH MANAGEMENT AREA, AND OTHER LOCATIONS

This chapter summarizes study results and presents 19 recommendations. The recommendations are grouped into six categories:

- Overall Recommendations
- Vehicle-Oriented Pavement
- Construction Practices and Landscaped Areas
- Design and Placement of Buildings
- Community Involvement and Education
- Study Evaluation

The information contained in this chapter is derived from the technical and policy analysis described in previous chapters, interviews with representatives of local governments, input from the Ad Hoc Citizen Advisory and Steering Committees, and input received through community forums and other public involvement and education activities. Each recommendation is presented, followed by discussion of technical and policy issues, incentives and barriers to implementation, policy trends, specific actions for implementation, and implementation costs for Olympia.

SCOPE OF RECOMMENDATIONS

It was recognized early on by the project team that recommendations designed for Olympia may not work for all of the North Thurston UGMA or other locations because of the specific mix of public goals in Olympia. It also was recognized that recommendations not suitable for Olympia may work elsewhere. Consequently, efforts have been made to document the process and results so others may learn from Olympia's successes and challenges and to provide useful policies and techniques that can be readily applied in Olympia, the North Thurston UGMA, or other locations throughout the state and nation.

As you review the recommendations, please keep in mind that this report summarizes a study, not a planning process. The recommendations and information contained in this report are provided as guidance to Olympia and other communities and will not necessarily be adopted by the City Council. Integration of most recommendations into policies or regulations will occur or have occurred through separate processes, such as revision of the parking, street, and development standards. These processes will provide or have provided opportunities for the public to weigh impervious surface reduction with other public goals and ensure that recommendations are applied in a reasonable and practical manner. Other local governments that implement some or all of the recommendations are highly encouraged to solicit early and abundant involvement from the community.

This report signifies a beginning for reducing impervious surfaces in Olympia and leaves as many unanswered questions as it has answered. More research could be done to better define hydrological relationships, costs, and incentives. When applying the recommendations to Olympia, the North Thurston UGMA, or other locations, it is important to keep in mind that impervious surface reduction is still an experiment—one that needs to begin so that we can find real-world solutions. Evaluation is an essential step to understanding the success and limitations of the study (Recommendations for Study Evaluation). Communities working to reduce impervious surfaces are encouraged to contribute to a study evaluation by contacting the Study Coordinator and sharing their experience.

STRATEGIES CONSIDERED AND IN NEED OF FURTHER ANALYSIS

The Ad Hoc Citizen Advisory Committee and project staff spent several meetings exploring possible impervious surface reduction strategies. Many of these strategies are summarized in the *Technical and Policy Analysis Report* (City of Olympia, 1994b),

which contains 11 more recommendations than this report. Many of the preliminary recommendations were dropped due to conflicts with other public goals or because of overlap with other planning processes. The substantial changes made to the recommendations during the course of the study reflect the lessons learned by the committee and project staff concerning community goals.

Many strategies contained in the initial recommendations and resulting from recent committee discussions may have value for other location, depending on site-specific public goals, soils, precipitation, and population or community structure. However, these strategies are not recommended at this time because they require further discussion and research. To assist other local governments in applying the study's findings, these strategies are briefly described below. More detail is available from the Study Coordinator.

- In recognition that impervious surface reduction strategies are new and will need refinement, develop performance-based standards for sidewalks, parking, and landscaping to encourage innovation and provide flexibility in meeting impervious surface reduction goals.

- Provide public support and sponsorship of private developments meeting impervious surface reduction goals, such as higher-density development, reduction in vehicle-oriented pavement, use of pervious surfaces, and less land clearing and soil compaction. Use tax increment financing, redevelopment loans, density credits, and other public funding mechanisms and encourage private funding of such developments. Meet with the development and business community to identify practical incentives.

- Use zero or narrower setbacks, consolidate landscaped areas and perimeter planting into one large area, count undisturbed areas and native vegetation towards landscaping requirements, and/or give density credits for pocket parks to encourage large blocks of undisturbed areas that infiltrate runoff. Convert large parking lots into parks and restore infiltration capacity (where possible).

- Identify opportunities for retrofitting existing paved areas. Some suggestions include placing vegetated islands designed to treat stormwater in cul-de-sacs and intersections where safety will not be jeopardized; reducing the size of parking areas, using pervious surfaces, or building taller building when redeveloping a site; and reducing street widths by replacing existing pavement with street trees.

OVERALL RECOMMENDATIONS

Several of the recommendations reflect the growth management planning being done in the North Thurston UGMA. Growth management strategies are being applied or considered to varying degrees by Olympia, Lacey, Tumwater, and Thurston County through their comprehensive plans (Thurston County, 1988; City of Tumwater, 1993;

City of Lacey, 1994c; City of Olympia, 1994d) and the Regional Transportation Plan (Thurston Regional Planning Council, 1993b). During the study, several growth management strategies were evaluated to determine their effectiveness in reducing impervious surfaces and to ensure that study recommendations are consistent with the local policy direction.

In the early stages of the study, the project team developed preliminary recommendations that overlapped the growth management planning occurring in the North Thurston UGMA. Several of the preliminary recommendations restated transportation and land use planning decisions being made in larger public forums, rather than providing new or specific direction to reducing impervious surfaces. To reduce duplication of planning efforts, many of the preliminary recommendations were grouped into the following three overall recommendations.

Recommendation 1.
Integrate impervious surface reduction into policies and regulations.

Discussion

Local stormwater management practices are designed to manage stormwater runoff and remove pollutants but do not directly address a significant source of runoff—impervious surfaces. A whole host of development, transportation, urban design, and other policies and regulations affect the land use pattern in our communities and the resulting amount of impervious surfaces. General review of local policies and regulations and conservation with other jurisdictions revealed that it is unusual to find impervious surface reduction mentioned or considered in local government policies or regulations.

Although most city and county staff contacted during the study seemed aware of the water resources problems related to impervious surfaces, reduction of impervious surfaces generally has not been implemented through formal policies and regulations or considered an explicit public goal by local governments. Integrating impervious surface reduction into several policies and regulations ensures that it will be put before the public for comparison with other public goals and with other strategies for achieving water resource protection and enhancement.

Incentives and Barriers

Most policies and regulations address a single issue such as parking, streets, or clearing and grading practices. Even though this may be practical for other reasons, this poses a barrier to implementing impervious surface reduction strategies. Because the problems with impervious surfaces are not related to just one issue, it is important to make lots of small changes to several policies and regulations in order to achieve a

measurable reduction. The common practice of revising only a few policies or regulations a year requires several years to accomplish a significant level of implementation and results and vigilance on the part of staff and concerned citizens keep the issue "on the table."

Inadequate involvement of the business and development community in decisions that directly affect them is a barrier to successful policies and regulations. Having the development and business community involved in land use decisions that reduce impervious surfaces is important. What may intuitively sound feasible and rational on paper may not always work in the real world given financing and construction constraints. The development and business community can help identify incentives and barriers to specific strategies.

Policy Trends

Local comprehensive drainage basin plans contain a recommendation to revise development standards to minimize impervious surfaces by such measures as requiring narrower streets, increasing the use of porous pavements, reducing parking requirements, and revising landscaping requirements. The plans recommend adoption of common standards by the four local governments in Thurston County (City of Olympia, 1993b).

Olympia

The Olympia City Council has pledged to evaluate all city policy decisions based on the city's Sustainable City Criteria (see Olympia's Sustainable City Philosophy). The criteria ask that policies and regulations not jeopardize future generations and take into account environmental, economic, and social implications. Applying the criteria results in taking a long-term view of decisions and using an integrated or holistic approach to community planning. Having impervious surface reduction as a stated goal or objective of policies and regulations reminds decision makers, staff, and the public of one way to achieve sustainability.

During the study, project staff have participated in the revision of parking, street, and development standards as a means to implement early findings of the study. Many of the recommendations contained in this report have already been incorporated into versions of Olympia's parking, street, and development standards (City of Olympia, 1994e; 1994g; 1994h). These regulations will be or have been presented for public review and comment in separate forums.

Olympia's Community Planning and Development Department is considering conducting a consolidated annual review of proposed revisions to city policies and regulations. A consolidated review would be more cost effective and time efficient and allow an opportunity to resolve inconsistencies. An annual review would give Water Resources Program staff and citizens an opportunity to identify economic incentives and additional areas where impervious surface reduction could be integrated.

Lacey

Current comprehensive plan policies do not explicitly refer to impervious surface reduction as a goal (Carr, pers. comm.).

Tumwater

The transportation element of the comprehensive plan includes policies to reduce the amount of impervious surface to the extent practicable and to use alternative surfaces and natural design methods to reduce total surface runoff, slow concentrations, and capture pollution (Bauer, pers. comm.).

Thurston County

Adopted city/county joint comprehensive plans will apply city policies on parking and development to appropriate locations within the unincorporated portion of the North Thurston UGMA (Dosheery, pers. comm.). The current comprehensive plan, adopted in 1988, and proposed revisions now being considered to not explicitly refer to impervious surface reduction. However, the natural environment chapter includes a policy that existing and new development should minimize increases in total runoff quality and maximize infiltration. A proposed revision would discourage increases in peak stormwater runoff and alteration of natural drainage systems to prevent flooding and water quality degradation (Morrison, pers. comm.).

Implementation Actions

Olympia

Many policies and regulations are being revised to bring them into compliance with Olympia's comprehensive plan (Chapter 1, Policy Focus and Early Implementation). The commercial, multi-family, and residential development standards; landscaping ordinance; parking ordinance; and street standards are currently being revised. Such revisions have provided or will provide a cost-effective opportunity to integrate impervious surface reduction.

Several changes to the parking ordinance goals statement, ratios (standards), shared parking section, and variance requirements are being proposed as a direct result of this study. Proposed changes to the draft street standards include narrower residential streets and alleys (Table 16). If these regulations are adopted as proposed, Olympia should experience an almost immediate reduction in future impervious surfaces from what is expected under the current trend.

Because every community adopts policies and regulations as a way to define its character and land use, every community could consider impervious surface reduction regardless of its size or growth management framework. Public hearings and meetings, document review and comment periods, and other community involvement and

education activities are readily available opportunities for involving the public in impervious surface reduction issues. Even if a community is not currently creating or revising regulations, it may want to conduct a one-time review of all policies and regulations to see how local laws or practices could be changed to encourage impervious surface reduction. Important to successful impervious surface reduction is the early participation and collaboration of all segments of the community in identifying strategies and avenues for implementation.

Implementation Costs for Olympia

No additional costs.

Table 16: Olympia Proposed and Current Street and Sidewalk Design Standards and Federal Minimum Design Standards

DESIGN STANDARDS	Proposed (1)		CURRENT		PROPOSED (1)					CURRENT	PROPOSED (1)		CURRENT		PROPOSED (1)		CURRENT		PROPOSED (1)	
	ARTERIAL BLVD	ARTERIAL	PRINCIPAL ARTERIAL	MINOR ARTERIAL	MAJOR INDUS COLL	MAJOR COMM COLL BLVD	MAJOR COMM COLL	MAJOR COLL BLVD	MAJOR COLL	COLL ARTERIAL	NGHB HOOD COLL BLVD	NGHBHOOD COLL	NGHBHOOD COLL	COMM COLL	LOCAL ACCESS BLOCK >350	LOCAL ACCESS BLOCK <350	LOCAL ACCESS COMM	LOCAL ACCESS RES	ALLEYS	
																			COMM	RES
Lane Widths	2 lane = 18' per lane; 4 lane = 11' per lane; 5 lane = 11' per lane	2 lane = 11' per lane	4 lane = 12'-14' per lane (4)	4 lane = 12' per lane	2 lane = 11' per lane	2 lane = 18' per lane; 4 lane = 11' per lane	2 lane = 11' per lane	2 lane = 18' per lane; 4 lane = 11' per lane	2 lane = 11' per lane	2 lane = 12'-14' per lane	2 lane = 18' per lane	2 lane = 10' per lane	2 lane = 9'=10' per lane	2 lane = 12'-14' per lane	1 lane = 13' per lane	2 lane = 9' per lane	2 lane = 12'-14' per lane	2 lane = 9'-10' per lane	1 lane = 12' per lane	2, 30"-36" ribs
Parking Lanes	None	None	None	None	None	8' both sides	8' both sides	None	None	8' one or two sides or none	None	7' one side	6'-8' both sides	8' one or both sides or none	7' one side	7' one side	8' one or two sides or none	8' two sides	None	None
Total Travel and Parking Lane Width (2)	2 lane = 36' per lane; 4 lane = 44' per lane; 5 lane = 55' per lane	2 lane = 22' per lane	4 lane = 52' per lane	4 lane = 48' per lane	2 lane = 22' per lane	2 lane = 52' per lane; 4 lane = 60' per lane	2 lane = 38' per lane	2 lane = 36' per lane; 4 lane = 44' per lane	2 lane = 22' per lane	2 lane = 28'-40' per lane	2 lane = 36'	2 lane = 27'	2 lane = 32'	2 lane = 24'-40'	1 lane = 20'	2 lane = 25'	2 lane = 24'-40'	2 lane = 32'	1 lane = 12'	2, 30"-36" ribs
Sidewalks	8' both sides 10' both sides in CBD	8' both sides 10' both sides in CBD	8' both sides in CBD	5' both sides	6' both sides	5' plant area 5' awning area	5' plant area 5' awning area	6' both sides	6' both sides	5' both sides 8' core	5' both sides	5' both sides	5' both sides	5' both sides 8' core	5' both sides	5' both sides 8' core	5' both sides 8' core	5' both sides 8' core	None	None
Federal Minimum Design Standards (3)	2 lane = 11'-12' per lane	2 lane = 11'-12' per lane	2 lane = 11'-12' per lane	2 lane = 11'-12' per lane	2 lane = 11'-12' per lane	2 lane = 11'-12' per lane	2, 12' lanes = 11-12' per lane	2 lane = 11'-12' per lane	2 lane = 11'-12' per lane	2 lane = 10'-12' per lane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Recommendation 2.
Establish growth management policies that encourage infill of urban areas and reduce urban sprawl.

Discussion

The recommendations in this report are designed to raise awareness and complement the growth management policies being developed and implemented for Olympia and the rest of the North Thurston UGMA. The local growth management strategies encourage, among other things, infill of urban areas and use of congestion reduction programs, public transit, and other alternative modes of transportation. Infill reduces the amount of impervious surfaces per capita (person) and complements the goal and objectives of this study.

The basic premise of infill is that higher densities in urban areas allow rural areas to remain in low-density or resource-based land uses, requiring fewer roads and other impervious surfaces regionwide. Successful implementation of this recommendation would increase total impervious surface in the region, but at a slower rate than with the current development trend. In rural areas, impervious surfaces would increase less than the current trend because the current low-density land uses would not be replaced with suburban or commercial development. In urban areas, more impervious surfaces, such as buildings, would occur to accommodate higher commercial and residential densities. However, there would be less impervious surface per capita (person) or per development unit.

This recommendation includes developing vacant residential or commercial lots in the urban growth management area and redeveloping underused areas to a higher density. Possibilities include redevelopment of lots with deteriorating structures to higher density and building in parking areas or vacant lots.

Water quality and quantity impacts depend on several factors, including soil type, previous site disturbance, population, and traffic levels. Building on a vacant lot that has been largely undisturbed usually results in more runoff from the site, requiring installation of a stormwater management system. Redeveloping a previously developed lot usually does not appreciably change the amount of runoff unless the amount of impervious surface is increased.

Incentives and Barriers

Reducing the costs of public services is a communitywide incentive for infill. Infill results in reduced impervious surfaces and less low-density residential sprawl into previously rural areas. The costs of sprawl have been documented in certain studies (American Farmland Trust, 1986). These studies have concluded that the public economic and

environmental costs are higher for low-density development than for high-density development.

The costs of public services required to serve low-density residential areas usually exceeds the tax revenues generated by them. For example, a study in Loudoun County, Virginia, concluded that the net public cost to the county would be approximately 40 percent more for low-density residential (1 unit per 5 acres) than for high-density residential (4.4 units per acre). The higher public cost for low-density residential development primarily results from inefficient use of schools and transportation services and high liabilities for roads and future water and sewer services. Annual road maintenance costs were estimated to be four times greater for low-density residential than for high-density residential (American Farmland Trust, 1986).

Higher densities are a key to infill and reducing urban sprawl. However, infill may change the existing character of neighborhoods or other areas. Such change is a barrier to public acceptance of increasing densities. Undeveloped lots in urban areas are often the most expensive to develop, creating a barrier to infill. Developers may avoid infill projects because they anticipate neighborhood resistance or because lots located elsewhere are less expensive to develop.

When encouraging infill, it is important to have coordination among neighboring cities and counties. Such coordination reduces the chances that one community will concentrate its urban growth next to another community's rural area and create a patchwork land use pattern. The long history of independent legal authority of local governments may be a barrier to regionwide growth management planning that results in impervious surface reduction. Incentives for coordination include saving money by providing joint public services, such as arterial streets and regional stormwater, sewer, and water systems, and providing consistent regulations for the development and business community.

Policy Trends

Olympia

The existing Planned Residential Development Ordinance is intended to promote infill and more economic, efficient use of urban land by allowing more site coverage than would normally be allowed by the zoning code (City of Olympia, 1991). The ordinance is being revised to encourage both infill and mixed use development, and it is intended to be easier to implement (City of Olympia, 1994j).

Consistent with the Growth Management Act requirements and urban design strategy recommendations, the recently adopted comprehensive plan (City of Olympia, 1994c) encourages infill development and redevelopment that is compatible with the surrounding area. Policies for maximum and minimum densities and allowing

accessory units, zero lot line development, and small conventional lots support this goal.

Plan policies also support infill strategies, such as mixed uses and cluster housing. Plan policies allow increased site coverage, especially in downtown Olympia and along high-density corridors. Olympia is currently updating its zoning code and other regulations to implement these policies.

The current zoning code (City of Olympia, 1991) disallows accessory dwelling units in single-family zones. Minimum lot sizes and setback requirements also restrict the possibility of infill. For example, the zoning code allows only 35 to 50 percent site coverage in residential zones.

Lacey

The housing element of the comprehensive plan (City of Lacey, 1994c) allows accessory units in all residential areas and higher density in exchange for providing affordable housing. The transportation element of the comprehensive plan encourages development of parking that can be redeveloped later to a more intense use.

Tumwater

The comprehensive plan (City of Tumwater, 1993) proposes to prohibit development at less than the minimum net densities for a given area in order to promote cost-effective services, affordable housing, and alternative transportation. The plan also recommends allowing accessory units in all residential zones.

Thurston County

City policies allowing accessory units, small lot sizes, and minimum densities in residential districts are also proposed for the unincorporated portion of the North Thurston UGMA as part of the city/county joint plans (Dosheery, pers. comm.).

Implementation Actions

Olympia

Complete growth management planning process and implementation. Adopt the Draft Unified Development Code (City of Olympia, 1995) as proposed.

North Thurston UGMA and Other Locations

Complete growth management planning process and implementation. If a growth management framework is not in place, consider conducting a comprehensive land use planning process that designates areas for infill and urban growth concentration and increases densities and building heights, where possible, as a way to reduce sprawl.

Consider relaxing setback standards and modifying other policies or regulations to encourage infill.

Implementation Costs for Olympia

No additional costs.

Recommendation 3.
Provide a public transit system and other alternative modes of transportation that reduce the need for streets and parking.

Discussion

The basin and site coverage assessment (Chapter 2) identified streets and parking as key contributors of impervious surfaces. Providing public transit and other alternative modes of transportation, promoting parking management, and using other strategies can reduce our reliance on cars and the need for more vehicle-oriented impervious surfaces in the future.

Reducing the current growth trend of vehicle-oriented impervious surfaces depends upon having facilities that support public transit and alternative transportation, such as buses, carpools, and bikes. Facilities, such as park and ride lots, bike lanes, sidewalks, bus stops, and trails, will contribute to the total amount of impervious surface. However, pollution from these facilities is expected to be less than from streets and parking areas because of the low or non-existent use by cars.

Incentives and Barriers

There are numerous incentives and barriers to providing, maintaining, and using a public transportation system and alternative transportation. Increased use of public transit would reduce the number of single-occupant vehicles and auto-related contaminants in stormwater and maximize use of existing streets. Achieving reduced auto dependence will take a full range of actions, including land use changes, incentives, and disincentives. Specific actions include infill of city centers and high-density corridors, carpool and vanpool programs, and parking management. The Regional Transportation Plan (Thurston Regional Planning Council, 1993b) for the North Thurston UGMA presents detailed discussion on incentives and barriers.

Providing positive incentives is essential to encouraging the use of public transit and alternative transportation. Also essential is providing alternatives that are convenient, safe, and practical that will provide adequate access by customers to businesses. Ensuring the viability of businesses, especially in city centers like downtown Olympia, is crucial to community support and use of transportation alternatives.

Policy Trends

The Regional Transportation Plan (Thurston Regional Planning Council, 1993b) recommends emphasizing the needs of pedestrians, transit riders, cyclists, and carpoolers in urban core areas and high-density areas.

Olympia

Comprehensive plan (City of Olympia, 1994c) policies encourage development of transit and bicycle/pedestrian facilities on arterials and off-street bicycle/pedestrian trails. The land use and transportation elements of the comprehensive plan emphasize land use patterns, densities, site designs, and facilities that encourage public transit and alternative transportation.

Several draft policies or regulations encourage alternative transportation. The draft parking ordinance (City of Olympia, 1994g) includes incentives to encourage use of mass transit, bicycles, pedestrian, and carpool facilities. Draft street standards require bicycle facilities (Class II or Class III) on all major collectors and arterials (City of Olympia, 1994d). The draft zoning (City of Olympia, 1994f, 1994g, 1994i) encourages alternative transportation.

The Transportation Demand Management (TDM) Ad Hoc Committee was convened in 1994 to guide the application of TDM measures to the 4th/5th Avenue Corridor. The committee will complete the following tasks:

1. Develop a TDM strategy for the corridor;

2. Develop and review the Downtown Olympia Parking Management Strategy Update Study; and

3. Coordinate and participate in efforts by Intercity Transit, the Olympia Bicycle/ Pedestrian Advisory Committee, the Washington State Department of General Administration, and the Energy Outreach Center to implement commute trip reduction and TDM measures. The TDM measures applied to the 4th/5th Avenue Corridor will serve as a model for further TDM efforts the city may undertake in the future (Stimson, pers. comm.).

Lacey

Existing zoning for the Lacey Central Business District requires pedestrian and transit facilities and site designs that cluster buildings to reduce walking distance between each building. The recently adopted comprehensive plan requires and encourages alternative transportation (Carr, pers. comm.).

Tumwater

The transportation element of the comprehensive plan emphasizes a mixed transportation system, including roadways, transit, bicycle, and pedestrian facilities, as well as policies promoting TDM and nonmotorized transportation. A system of bicycle lanes is included in the draft transportation element, and an urban trails system is included in the parks and recreation element of the comprehensive plan (Bauer, pers. comm.).

Thurston County

Adopted city/county joint comprehensive plans will apply city policies on alternative transportation to the unincorporated portion of the North Thurston UGMA (Dosheery, pers. comm.).

Implementation Actions

Olympia

Implement the Regional Transportation Plan and complete the TDM Ad Hoc Committee's tasks (*Downtown Olympia Parking Management Strategy Update Study*).

North Thurston UGMA and Other Locations

Implement the Regional Transportation Plan. If no regional plan is in place, consider working with the local and neighboring communities in the planning and implementation of regional public transit and facilities for alternative transportation.

Implementation Costs for Olympia

No additional costs.

The following seven recommendations address vehicle-oriented pavement, such as streets and parking areas. According to the basin and site coverage assessment (Chapter 2), streets and parking areas make up a significant portion of Olympia's impervious surfaces. Reducing vehicle-oriented pavement can result in impervious surface reduction but needs to be done in cooperation with the local business and the development community in order to identify cost-effective strategies.

RECOMMENDATIONS FOR VEHICLE-ORIENTED PAVEMENT

According to the basin and site coverage assessment (Chapter 2), streets and parking areas make up a significant portion of Olympia's impervious surfaces. Reducing vehicle-oriented pavement can result in impervious surface reduction.

Since the *Impervious Surface Reduction Study* was completed in June 1996, the City of Olympia's Storm and Surface Water Utility has worked to continue the impervious surface reduction efforts initiated by the City Council and stakeholders.

- From 1996 to 1999, efforts mainly focused on providing technical assistance to developers, homeowners, architects, and others. The study was reprinted twice during the period, and over 2,000 copies of the full study and Executive Summary were distributed to interested parties throughout North American and overseas. The full study is now out of print, but copies of the Executive Summary and other information is still available. **Contact: Cedar Bouta, Senior Program Specialist, (360) 753-8454.**

- In 1999, Olympia's Storm and Surface Water Utility began a City Stream and Wetland Project that identified priority watersheds and reviewed City policies and regulations to see if they impede or encourage impervious surface reduction. At this time, the study is still underway and includes modeling and subdivision design work. **Contact: Andy Haub, Project Manager, (360)-753-8475.**

- Also in 1999, the City's Engineering Division constructed a porous pavement sidewalk demonstration site near its Olympia High School Geoweb Demonstration project. The North Street Enhancement project was presented the 2000 Excellence in Concrete Construction—Special Applications, Environmental Merit award from the Washington Aggregates and Concrete Association. **Contact: Craig Tosomeen, Project Engineer, (360) 709-2737.**

Council
Update #5
June 16, 2000

City of OLYMPIA

CITY STREAMS & WETLANDS

A project to define the balance between human activities and protecting habitat in Olympia's watersheds

This monthly update provides the City Council and other internal partners a summary of our work on the City Streams and Wetland project.

In February, the Olympia City Council adopted interim measures (stormwater standards, tree protection, zoning) to protect the Green Cove Creek basin while additional land use studies are being completed. The Thurston County Board of Commissioners also adopted interim measures (stormwater standards) to protect the basin within the urban growth boundary.

Our current analysis focuses on the tools needed to implement "low-impact development" within the basin. This includes a thorough technical, regulatory, and financial analysis of development scenarios that would minimize development impacts to Green Cove Creek. The analysis is moving along well, and we have plans to bring the results to the City Council in a study session on July 25.

At the study session, Council will get a chance to see alternative development proposals, review the analysis conducted, and discuss the next steps for the project. Potential next steps include 2001 Comprehensive Plan amendments, public discussion, and Board of County Commissioners' coordination.

ACTION ITEMS

Low-Impact Development Analysis. City planning, regulatory, and technical staff met in May to rough out a conceptual subdivision design that meets urban zoning expectations and preserves natural conditions on the parcel. The design outcome was promising. Given our initial success, our work has shifted from hosting an idea-generating design workshop as previously planned to creating and testing an engineered site design for low-impact development. Our approach includes the following tasks:

- A simulated low-impact design for a forested parcel in Green Cove will be submitted to the City's Site Plan Review Committee (SPRC) in July for regulatory review. The design will be produced by SCA Engineering, Community Planning and Development Department (CP&D), Thurston Regional Planning Council (TRPC), and the Public Works Department.

- TRPC is analyzing zoning and urban growth area options for the basin. TRPC is evaluating the implications of potential land use decisions on public services and population distribution.

- Current and potential future flows in Green Cove Creek are being modeled. The hydrologic model will help define the magnitude of in-stream problems in the basin and help evaluate the potential effectiveness of management options. The benefits associated with low-impact development and zoning changes will be assessed. TRPC is providing technical support for the effort.

- Consulting biologists are defining likely environmental outcomes of the potential local decisions.

- Property development and financial organizations will evaluate the low-impact development work with respect to implementation feasibility. This work will happen after the July 25 study session.

RELATED WORK PLAN ACTIVITIES

Interim Stormwater Requirements. Interim stormwater requirements are in place for Green Cove basin, as well as Percival, Ellis, and Woodard basins. Requirements for the latter three basins include a 50 percent increase in stormwater detention for new developments.

Revisions to Stormwater Regulations. Local and state revisions to stormwater storage and treatment requirements are proceeding. The state regulations are expected to be considerably more rigorous than current requirements.

Green Cove Basin Plan Adoption. Council will be asked to hold a public hearing later this summer for adoption of the 1998 Green Cove Basin Plan. The County-led plan is consistent with City goals for the basin.

Review of New Development Proposals in the Green Cove Basin. CP&D expects to receive a proposal for a new subdivision in the Green Cove basin in the immediate future. The proposal has not been evaluated for consistency with the adopted interim measures.

Interjurisdictional Endangered Species Act (ESA) Response. Public Works staff is helping shape a Thurston County and TRPC-sponsored effort to identify regional responses to the ESA salmon listing. Considerable public involvement is anticipated. Council will be kept informed.

Citywide Stormwater Planning. Olympia's Utility Advisory Committee supports improved long-term stormwater and aquatic habitat planning. The effort is consistent with Council goals for 2000/2001 (Goal No. 5). Scoping work will be initiated this summer.

PUBLIC INVOLVEMENT UPDATE

Public involvement activities have been minimal since the interim measures were adopted. A flier for developers is located at our permit counter, and we have made the interim zoning map widely available. We have received few inquiries about the measures. The Cooper Point Neighborhood Association was briefed on the project and interim measures in May. We will revisit overall public involvement goals during the Council study session in July.

PROJECT MANAGEMENT UPDATE

Critical tasks of the project work plan are on schedule and within budget. Less important tasks are being pursued as time and budget allows.

Additional project funding for public involvement will remain available within the Storm and Surface Water Utility budget. The use of funds is contingent upon Council discussion of the next steps and public involvement needs.

COMMENTS & QUESTIONS?

If you need additional information or would like to suggest other approaches we could use to keep you updated, please call Andy Haub, Project Manager, at (360) 753-8475 or e-mail him at ahaub@ci.olympia.wa.us.

City of
OLYMPIA
P.O. Box 1967, Olympia, WA 98507-1967

SUMMARY OF POROUS CONCRETE SIDEWALK

By Craig Tosomeen
Project Engineer
November 3, 1999

Project Description

The City of Olympia, Washington, recently completed a street enhancement project on North Street. The project involved rehabilitating the existing roadway pavement, striping two new 5-foot bicycle lanes, and building 1,500 feet of new sidewalk.

Because the new sidewalk area has added impervious surface, the addition of the sidewalk required mitigation of the increased runoff under the rules of the City's Drainage Manual. To provide the required detention, property would need to be purchased for a pond. The cost estimate for the property acquisition and pond was about $110,000. As an alternative, the project team decided to install porous concrete sidewalk.

Description of Porous Concrete and Placement

Porous concrete is a mixture of aggregate, cement, and water (no sand). Because aggregate contains a significant amount of voids, the addition of the cement does not close off all of the voids. Up to 25 percent of the complete concrete can be void space; simply by random association, some of these voids are flow paths through the material. Water flow rates through porous concrete material are in the order of several hundred inches per hour.

The porous concrete mix design is very aggregate-specific. Crushed material tends to have larger void contents but were not readily available in Olympia. For the North Street project, a 3/8-inch to Number 10 washed round aggregate was used. The aggregate to water ratio (pound/pound) was 0.32. The aggregate to cement ratio (pound:pound) was 4.5:1. Polypropylene fibers, air entrainment, and water reducing/retarding admixtures were used in the design mix. Final void content was around 12 percent and the 28-day compressive strengths were 2400 pounds per square inch. The final appearance of the porous concrete material is similar to exposed aggregate or Rice Krispie treats.

The final mixture is a very stiff, zero-slump concrete. The material must be raked into the forms, as it does not tend to flow well. The mixture is leveled to half an inch higher than final grades. A weighted roller is used to compress the excess material to the final grade. Expansion joints were placed every 200 feet, while crack control scores were placed every 20 feet before the concrete set. The finished surface was immediately covered with plastic and left to cure for up to seven days.

Challenges

1. Satisfying concerns about the durability and maintenance requirements of the material. Porous concrete does require, at a minimum, annual sweeping, and care should be taken to keep leaves and debris off the surface. Education was required since detention pond maintenance was really being transformed into porous concrete surface maintenance. The jury is still out on the durability of the material, waiting for a few seasons to pass.

2. Determining a workable mix design. Several bench tests were required to determine the final cement, water, and aggregate ratios. Local aggregate supplies and materials were tested for suitability in the mix.

3. Gaining adequate experience in placing porous concrete required pouring a test panel. The City hired a contractor with porous concrete placement experience and invited all local concrete contractors to a demonstration project. The subcontractor's laborers who eventually placed the material were required to watch a demonstration video on placing porous concrete prior to beginning the work.

Costs (The Bottom Line)

As noted previously, the cost for a detention facility was estimated to be $110,000. The City of Olympia typically pays $35 per square yard for regular concrete sidewalk. The 1999 construction season bids were lower than expected, even for regular concrete; the average of the bids was $20 per square yard. The average bid price for porous concrete was $25 per square yard. Additional engineering costs were associated with the mix design and construction inspection for the porous concrete. The increased cost of the sidewalk was about $10,000; the estimated savings by eliminating the detention facility is $100,000.

Final Word

Porous concrete is a new material for this area, so although it is used extensively in other parts of the country, it must demonstrate its ability to perform in this part of the country. Trial and demonstration projects are the only true way we can evaluate the benefits of this material. With an increased awareness of stormwater runoff impacts on street water quality and fish habitat, porous concrete could be a valuable addition to the designer's toolbox to minimize the adverse impacts of the development. Care should be taken in where porous concrete is used, special attention should be paid to the mix design, and experience is needed to place the material correctly. If all of these elements are considered, the use of this material can significantly reduce the cost of projects while improving stormwater runoff water quality.

Resources

Chattin, Bruce (Director), Washington Aggregate and Concrete Association
1605 116th Avenue, NE, Suite 208, Bellevue, WA, 98004-3034, (425) 453-7832.

Pervious Pavement Manual, Florida Concrete Products Association, Inc.
649 Wasson Street, Orlando, FL, 32804-5387, (407) 423-8279.

APPENDICES

APPENDIX A
PUBLIC INVOLVEMENT AND EDUCATION PLAN

For information, please call Cedar Bouta, Study Coordinator, at (360) 753-8454.

APPENDIX B
NEEDS ASSESSMENT

For information, please call Cedar Bouta, Study Coordinator, at (360) 753-8454.

APPENDIX C
FACT SHEETS

IMPERVIOUS SURFACE REDUCTION STUDY
FACT SHEET #1: STUDY OVERVIEW

For information, please call Cedar Bouta, Study Coordinator, at (360) 753-8454.

IMPERVIOUS SURFACE REDUCTION STUDY
City of Olympia Public Works Department • P.O. Box 1967 • Olympia, WA 98507-1967

CT SHEET #2: STRATEGIES FOR REDUCED PARKING

Why Reduced Parking?

Parking lots provide an important opportunity to reduce impervious surfaces—those hard surfaces that don't let water soak through to the ground. The more commercial and multifamily development you have in your watershed, the more important it is to reduce parking to achieve the goal of reducing impervious surfaces.

For example, parking lots cover approximately 53 percent of commercial sites and 15 percent of multifamily sites in the Olympia area. Reducing Olympia's commercial parking by 20 percent can reduce the impervious surface by almost 11 percent per site.

Shifts In Thinking

Parking policies have traditionally adopted the "bigger is better" view of parking lots. Regulations have focused on providing enough parking to avoid traffic congestion or overflow into residential neighborhoods but have resulted in too much parking in some cases. Although smaller parking lots reduce development costs, developers need to provide adequate parking for customers and tenants. Parking lots can be reduced in creative ways that are good for both business and the environment.

Strategies For Local Jurisdictions To Reduce Parking

Make reduction of impervious surfaces a goal of parking policies and regulations.
Use site plan reviews and policy revisions as opportunities for addressing the problem of excess parking.

Establish parking requirements that accurately reflect parking needs for various land uses.
Typically, parking regulations are based on artificially low "minimum" parking ratios that do not accurately reflect parking needs. Developers have built up to 51 percent above these ratios in the Olympia area. Parking regulations should accurately reflect parking needs of various land uses and be based on a high average use—instead of single peak-day projections.

Strategies (continued)

Suggested ways to accomplish this goal include:

- Establish "median" parking ratios that reflect parking needs.
- If "minimum" ratios are used, establish "maximum" ratios in conjunction with minimums.
- Encourage the use of transportation demand management techniques as an alternative to exceeding "median" or "maximum" ratios.

Establish cooperative parking regulations to reduce impervious surfaces.

Smaller and fewer parking lots can result from cooperative parking. Developers and local jurisdictions can reduce the size of parking lots through shared, joint, or coordinated parking.

- Shared parking reduces the parking area for land uses with noncompeting hours of operation. Suggested parking reductions are a 100 percent reduction of the smaller parking requirement for complimentary daytime and nighttime land uses and 50 percent of the smaller parking requirement for land uses with some overlap hours.
- Joint parking reduces the total parking area required for multi-tenant retail and commercial facilities. The possibility of captured trips and increased overflow parking allows for overall reductions for each land use at these facilities. Suggested parking reductions are 10 percent for developments with two buildings and 25 percent for developments with three or more buildings.
- Coordinated parking reduces the total parking area by using large retail or commercial overflow parking for safe, convenient Park and Ride locations.

Water Resources Program mission:
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Cedar Bouta, Study Coordinator • City of Olympia Public Works Department • Water Resources Program • (360) 753-8454

IMPERVIOUS SURFACE REDUCTION STUDY
City of Olympia Public Works Department • P.O. Box 1967 • Olympia, WA 98507-1967

CT SHEET #3: GUIDANCE FOR USING ALTERNATIVE SURFACES

Impervious Surface Reduction Hits the Streets!

Olympia's Water Resources Program is conducting an Impervious Surface Reduction Study (ISRS) to identify alternatives to hard, water-resistant surfaces, such as asphalt, concrete, and compacted soils. Impervious surfaces block rain from recharging our groundwater and drinking water supplies, increase the potential for flooding and erosion, and contribute to the degradation of our local streams and lakes.

'Perkin' To The Ground...Helps Puget Sound!

As long as we depend on cars, we will need roads, streets, and driveways. Asphalt and concrete are the most common types of driving surfaces but are very impervious (hard and water resistant). Alternative surfaces are more pervious than asphalt or concrete. Some let a little rain seep (infiltrate) into the ground, while others let 100 percent of the rain infiltrate. The more rain we infiltrate, the less runoff we create. The less runoff, the fewer pipes and storage systems we need to build in order to prevent flooding.

Types of Alternative Surfaces

Alternative surfaces include paving blocks, plastic matting, gravel, bark, and similar materials.

Paving Blocks: Interlocking, high-strength blocks made of cement or recycled plastic with open areas for grass or gravel are commonly referred to as paving blocks. These blocks are typically set on a compacted base of sand or a mix of sand and gravel. No mortar is required. Sand is vibrated into the space between the units, causing them to interlock and form a tough, attractive surface the provides easy access to underground utilities. Their structural behavior and load- spreading ability is similar to asphalt. These systems can be a solution for highly used lawn areas, overflow or low-use parking areas, or emergency access roads. They support fairly heavy traffic and concentrated loads, reduce stormwater runoff, enhance groundwater recharge, and increase infiltration.

Types of Alternative Surfaces (continued)

Plastic Matting: This type of system is usually a form of easily laid locking tiles made from recycled rubber tires and PVC, permitting thick grass to grow up through holes in the matting. It is often used to create safer, more natural playground, recreational, and sport surfaces and can be an excellent application for pedestrian walkways. It typically infiltrates 100 percent and can be easily disassembled and relocated. Some plastic matting meets the Americans With Disabilities Act guidelines for wheelchairs.

Gravel, Bark, and Similar Materials: As long as these are placed over soil that is not already compacted, they will allow water to infiltrate back into the ground. Gravel, bark, and similar materials are practical for trails, bike paths, and walkways.

Where Can Alternative Surfaces Be Used?

Alternative surfaces are appropriate for low-traffic areas where they are few sources of pollutants, including:

- Fringe or overflow parking areas.
- Emergency parking and stopping lanes.
- Private roads, easement service roads, and fire lanes.
- Driveways in residential or light commercial zones.
- Bike paths, walkways, and patios.

Ways to Avoid Common Problems With Alternative Surfaces

There are some common problems that can arise if alternative surfaces are no installed and maintained properly. To avoid problems:

- Select the appropriate alternative surface to meet your objective (infiltration; reduce runoff, flooding, and erosion; aesthetics; soil stabilization; etc.).
- Locate paving blocks where they will not become clogged with dirt. If it is a new site, make sure the soil is stabilized before installing the blocks.

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Ways to Avoid Common Problems With Alternative Surfaces (continued)

- Use alternative surfaces where there are few pollutants and where the water table is well below the ground surface. This will keep our groundwater and drinking water free from pollutants.
- Use alternative surfaces on gentle slopes and where the soil is porous or loose enough to let water soak in.
- Avoid using alternative surfaces for high-traffic walkways and handicapped parking areas. Select paving blocks or plastic matting with small holes and locate them in "local-traffic areas."

How Much Do Alternative Surfaces Cost?

Material and installation costs for paving blocks are typically more expensive than conventional asphalt or concrete. However, some manufacturers or vendors will sell discounted seconds that are suitable for home use. Plastic matting is typically more expensive than asphalt, concrete, and paving blocks. When comparing prices, one must consider the costs associated with man-made stormwater systems, which in some cases can be reduced if alternative surfaces are used.

Where Can I Purchase Alternative Surfaces?

Most building supply and home improvement stores carry a variety of paving blocks. Gravel, bark, and similar materials can be purchased from local dealers. See the attached for some sources. Please note that the list does not represent all possible sources. Homeowners and builders are encouraged to explore additional sources of these materials.

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SELECTED SOURCES OF ALTERNATIVE SURFACES

Paving Blocks:

H. D. Fowler Company, 3011 Marvin Road, NE, Olympia, WA 98516
(360) 459-7300 Product: GeoBlock (concrete)

Mutual Materials Company, 3150 29th Avenue, SW, Olympia, WA 98501
(360) 357-3343 Product: Westcon Pavers, Turfstone (concrete)

Bayview Building Materials, 3520 Martin Way, Olympia, WA 98506
(360) 491-5440 Product: Holland-Stone (concrete)

Trendset Custom Pavers, 6820 176th Avenue, NE, Redmond, WA 98502
(425) 869-1632 Product: Eco-Stone*, Turfstone, Holland-Stone (concrete)

Local firms that are familiar with installation of paving blocks:

Sun & Rain Landscaping
(360) 866-9749

Organic Land & Water Works
(360) 754-4050

Western Washington Landscape Service
(360) 459-5711

Hulbert Landscaping
(360) 786-0486

Plastic Matting:

SiteLines, 626 128th Street, SW, #104-A, Everett, WA 98204
(360) 755-682 Product: gravel

Gravel, Bark, and Similar Materials:

Holroyd Co., Inc., 828 Pacific Highway, SE, Olympia, WA 98503
(360) 491-260 Product: gravel

Mike Todd Construction, Site Delivery Only
(360) 352-7412 Product: gravel, bark

Great Western Supply, 9418 Old Highway 99, SE, Olympia, WA 98501
(360) 754-3722 Product: gravel, bark

Olympia Sand & Gravel, 1838 Carpenter Road, Lacey, WA 98503
(360) 491-7777 Product: gravel

Alpine Sand & Gravel, 7141 Rixie Road, SE, Olympia, WA 98503
(360) 491-2822 Product: gravel

* Infiltrates 100 percent and meets ADA standards

APPENDIX D
MODEL LEGAL AGREEMENT FOR SHARED PARKING

NOTE: What follows is a shared parking easement that is offered as an example of an agreement, which may be acceptable to the City of Olympia under the provisions of Section 18.38.180 - Shared Parking Facilities of the Olympia Municipal Code. This is not to say that other methods and approaches would not be acceptable to the City of Olympia, however, such agreements need to be reviewed by the City Attorney's office.

EASEMENT FOR SHARED PARKING

WHEREAS, the parties to this easement wish to take advantage of the shared parking provisions of Chapter 18.38 of the Olympia Municipal Code.

1. For consideration of Ten Dollars ($10.00) paid in hand, present and future benefits to be derived by Grantor and other good and valuable consideration, receipt of which is hereby acknowledged, Grantor, _____, (Name)
doing business as _____, (Name)
hereby conveys and warrants to Grantee, _____, (Name)
doing business as _____, (Name)
its successors, heirs and assigns, a nonexclusive, perpetual easement for motor vehicle parking on the following described real property:

[*Legal Description of Servient Estate]*

situated in the City of Olympia, Thurston County, Washington for the benefit of Grantee's property described as:

[*Legal Description of Dominant Estate*]

situated in the City of Olympia, Thurston County, Washington.

Such parking easement shall be applicable only to the following parking lot(s) located on the above-described servient estate. [*Include a map or sketch of the lots or parking facilities applicable to this easement, should more than one exist upon the subject property.*]

SUBJECT TO THE FOLLOWING:

1. This easement shall not be altered or terminated without the express written permission of the Director of Community Planning and Development of the City of Olympia or his/her designee.

2. Grantor covenants that there are _(#)___ of motor vehicle parking spaces on the above-described property and that Grantor shall not decrease that number of parking spaces without the express written permission of the Director of Community Planning and Development of the City of Olympia or his/her designee.

3. Grantee shall post and maintain signage on the dominant and servient estates directing its customers and employees to parking.

4. Grantor may temporarily close the subject parking lot(s) for maintenance and repair. Cost of repair and maintenance shall be paid by _____.

5. Neither Grantee nor Grantor shall change, alter or expand the use of their respective properties described above so as to require additional parking under the provision of the Olympia Municipal Code in excess of existing parking spaces without the express written permission of the Director of Community Planning and Development of the City of Olympia or his/her designee.

DATED this _____ day of _____, 200___.

GRANTOR

_____
(Signature)

_____
(Print Name)

GRANTEE

_____
(Signature)

_____
(Print Name)

APPENDIX E
WORKSHOP EVALUATIONS

For information, please call Cedar Bouta, Study Coordinator, at (360) 753-8454.

APPENDIX F
PARKING AND INFORMATIONAL SURVEY

For information, please call Cedar Bouta, Study Coordinator, at (360) 753-8454.

APPENDIX G
PARKING FIELD SURVEY DATA RESULTS

For information, please call Cedar Bouta, Study Coordinator, at (360) 753-8454.

APPENDIX H
COOPERATIVE PARKING SURVEY

For information, please call Cedar Bouta, Study Coordinator, at (360) 753-8454.

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