W.7.h.
04-4-14-14

AGENDA COVER MEMO

DATE: May 19, 2004

TO: Lane County Board of Commissioners

FROM: Public Works, Engineering Administration

PRESENTED BY: Sonny P. A. Chickering, County Engineer

AGENDA ITEM TITLE: **IN THE MATTER OF APPROVING THE ALIGNMENT, RIGHT-OF-WAY WIDTHS AND OTHER DESIGN FEATURES FOR THE MARTIN LUTHER KING JR. PARKWAY, PREVIOUSLY KNOWN AS THE PIONEER PARKWAY EXTENSION, AS ADOPTED AND RECOMMENDED BY THE CITY OF SPRINGFIELD.**

I. MOTION

MOVE APPROVAL OF BOARD ORDER CONCURRING WITH THE ALIGNMENT, RIGHT-OF-WAY WIDTHS AND OTHER DESIGN FEATURES FOR THE MARTIN LUTHER KING JR. PARKWAY PROJECT AS ADOPTED AND RECOMMENDED BY THE CITY OF SPRINGFIELD WITH RECOMMENDATIONS TO RECONSIDER SPECIFIC ITEMS AS OUTLINED IN THE BOARD ORDER.

II. ISSUE OR PROBLEM

The Springfield City Council adopted a preliminary alignment and right-of-way width for the project by Resolution 98-35 (Attachment 1). The City has also taken recent action on several issues related to the project. The City has requested that the county concur with their decisions pursuant to the Gateway Refinement Plan.

III. DISCUSSION

A Background.

The Board held a public hearing on this agenda item on April 14, 2004. This memo is intended to summarize the comments heard from the public and frame the staff presentations planned for the Board's work session on May 12, 2004.

B. Analysis.

Sixteen people testified before the Board at the April 14, 2004 hearing. Five major topics were identified by both the verbal and written testimony as summarized below.

1. **Intersection design at Harlow/Hayden Bridge and MLK Parkway -** Five people testified that they did not support constructing a multi-lane roundabout at this intersection citing concerns with operation and safety. Conversely, three people testified in support of the roundabout, stating operational efficiencies and accommodation of a connection to Wayside Loop.

2. **Connecting Seward to Manor Drive -**
   Four people testified in support of opening Seward Avenue permanently citing connectivity benefits, while three testified against opening Seward identifying deficiencies in the ability of existing side streets to carry increased traffic volumes.

   A petition was submitted that listed 69 names indicating support for opening Seward Avenue.

3. **Dedicated lane for Bus Rapid Transit (BRT) -**
   One person testified in favor of an 86-foot right-of-way width along the southern segment of the Parkway citing the operational benefits for BRT. The person also said that the establishment of a soundwall at a narrower right-of-way width would act as a permanent barrier to future widening.

4. **Hayden Bridge Way widening –**
   One person testified against widening Hayden Bridge Way citing adverse impact to property values, pedestrian and bicycle safety, difficulty entering/exiting driveways, and vehicle crashes.

   A petition was submitted that listed seventeen names indicating opposition to the plan for Hayden Bridge Way.

5. **North Link Stakeholders process –**
   On person testified that the North Link Stakeholders process was unfair in that the residents of Patrician Mobile Home Park only had one vote on the final recommendation.

The complete written testimony submitted in conjunction with the hearing is attached for your reference in Attachment 1. There were two additional documents submitted under the extension granted by the Board for keeping the public record open. They are attached in Attachment 2.

The Board should expect a brief summary from the County Engineer and then staff presentations from both the City of Springfield and Lane Transit District at the work session. The material submitted in conjunction with the April 13 and 14 Board agenda items should be used as the base packet for the Board's deliberations on this matter. It includes the recommended Board Order and supporting attachments.

The Board did ask the County Engineer to research or clarify five items of concern for report back.

1. Cost of Utility Relocation Options –

   You will find this information in a table on page 18 of Attachment 10 - a City of Springfield Agenda Memo dated March 15, 2004 – included in your April 13/14 Board Packet.

   The table shows four transmission line relocation options with costs of

$120,000 fixed for SUB, and City costs ranging from $120,000 to $3 Million.

2. Level of Service expected for each intersection form considered for Martin

   Luther King Jr. Parkway at Harlow/Hayden Bridge Way –
   This information is also in Attachment 10 on page 13.

   The table shows that a two-lane roundabout is expected to have a level of service of "B" in 2007, while the traditional signalized intersection is expected to have level of service "D/E".

3. County Engineer's Opinion of the Project –

   The Board asked for a general statement from the County Engineer regarding his thoughts on the project. This will be done in the oral report introducing this agenda item on May 19, 2004.

4. Relate Air Quality Discussion had with Delta/Beltline Interchange to this Project –

   The Board asked if the County Engineer could clarify the relationship of the numbers given for the Delta/Beltline study to the MLK Parkway project, specifically at the intersection of MLK Parkway and Harlow/Hayden Bridge Way.

   As it turns out, the City of Springfield has specific data and results from a study done for the MLK Parkway intersection with Harlow/Hayden Bridge Way. Please refer to the attached memo dated April 28, 2004.

   According to the information, the roundabout is expected to consume about 12% to 16% less fuel and produce 6% to 24% less total air pollution at the p.m. peak hour conditions in years 2007 and 2018.

5. How does going to an 86-foot right-of-way width, preferred by Lane Transit District for the Bus Rapid Transit facility, impact the efficiency of the MLK Parkway and Harlow/Hayden Bridge Way intersection? –

   The essence of the question is related to providing a dedicated lane for BRT. The accommodation of BRT in this way will slice into the cycle time of a signalized intersection, as BRT will be given signal priority. The City of Springfield has preliminarily identified a 120 second cycle time for a signalized intersection. A BRT priority will make part of that 120 seconds unavailable and will further reduce the capacity and efficiency of the intersection.

   For the roundabout alternative, the City expects that BRT will experience much less delay than just given priority time at a signal. Further refinement of how BRT is accommodated through the roundabout is needed. However, the efficiency of the roundabout intersection should not be significantly impacted if BRT is treated as a regular participant at the roundabout.

C. **Alternatives/Options. (from April 13/14 Agenda Cover Memo)**

1. Approve the Resolution and Order as proposed.

2. Approve specific portions of the Order, and continue discussion of the remaining items.

3. Approve specific portions of the Order and engage the City Council in discussion of remaining items.

4. Deny the resolution and engage the City Council in discussion of alternatives.

D. **Recommendation. (from April 13/14 Agenda Cover Memo)**

Approve the Order as requested by the City of Springfield except as follows:

1) Recommend Council consider adoption of specific pedestrian and bicycle accommodations at and near the roundabout.

2) Recommend Council reconsider and provide additional right-of-way sufficient for a dedicated BRT lane within the southern segment.

IV. IMPLEMENTATION/FOLLOW-UP

Staff will continue to coordinate discussion of issues with City staff and present any Board recommendations to the City Council for consideration.

ATTACHMENTS

Attachment 1 – Written Testimony submitted at April 14, 2004 Public Hearing
Attachment 2 – Written Testimony submitted between April 14 and April 28, 2004

ATTACHMENT 1

Written Testimony
Submitted at April 14, 2004
Public Hearing

I am Joyce Brooker, 75 Hayden Bridge Way. April 11, 2004
I am speaking in behalf of my neighbors and myself

WE ARE AGAINST THE WIDENING OF HAYDEN BRIDGE WAY.
WE ARE AGAINST THE DOUBLE ROUND ABOUT.

Why widen the street to four lanes when it narrows down to two lanes again in 1000 feet? It is my understanding that only one lane of traffic can exit a round about at a time. In our opinion the same thing could be accomplished by:

a. Eliminating one parking lane and putting in a left turn lane at Manor Drive.
b. Using the existing roadbed for car traffic and diverting bike traffic to the bike path or to another street (as they have or will do on Hayden Bridge Road and MLK Blvd.

The two-lane round about motion was passed by a 3 to 2 vote. Councilor Ballew"s comment was that she had to trust the experts on this. Who are these experts? Can they explain how this round about will work and why they think it is best in this setting?

I know that traffic has reached a critical point but I feel that efforts should be concentrated on the MLK Blvd and doing it comprehensively including underground power lines. Then later if and when Hayden Bridge Way is widened, it should be done right.

Widening of Hayden Bridge Way on the South side would require moving of power poles from the easement. Is it legal to move these high power transmission lines closer to our homes? Will owners be willing to give or sell an easement for the purpose of moving utilities? I would not!

If Hayden Bridge Way is widened for those 1000 feet it will be at great expense, have many consequences for us and we don't see the benefits of it for the public at this time.

1. Our property will be devalued with traffic closer to our homes.
2. Safety of cyclists and pedestrians will be compromised as our driveways would be shortened and combined with a neighbor's driveway. A car parked in the driveway would hamper vision in entering the street.
3. Entering traffic will be difficult at busy times with a continuous stream of traffic coming from the round about.
4. We are concerned about more accidents very close to our homes as drivers become accustomed to the change

Recommendations if and when Hayden BridgeWay is widened:

1. Springfield could offset devaluation of residents property by offering something in return.
   a. Work with us on sewers and utilities before easement is paved over, including underground power lines.
   b. Give us some incentive to be annexed to Springfield (maybe reduced assessments on sewers and new curb cuts and driveways that would facilitate a zone change for commercial use).

For any use it would be important that there be modifications in Springfield's present plan for driveways for safety reasons. I would recommend refining the plan to include semi-circle drive if resident felt that was safer for all concerned.

Care should be taken to match the grade of driveways so that there would be no dragging of the rear end of the cars on exiting or entering.

Since we aren't Springfield residents, we are appealing to you, our county commissioners, about wise use of tax dollars and safety of residents.

I have attached a copy of signatures, which were given to the Springfield Trans. Dept. at the first planning meeting.

COMMENT FORM
(HAYDEN BRIDGE PARKING OPEN HOUSE)
JULY 22, 2003

"TED"

NAME: VERNON NICHOLS

ADDRESS: 129 Hayden BRD. Way Spfld.

Comments: DO YOU AGREE OR DISAGREE WITH THE CITY OF SPRINGFIELDS PLANS FOR HAYDEN BRD. WAY

DISAGREE	AGREE
Kenneth Climer 128 Hayden Br Way	
Daphne Climer 128 Hayden Br Way	
Margaret Kenold 114 Hayden Bridge Way	
Jason Hensley 2485 Shadycane Dr. Springfield OR. 97477	
John W Hammond 75 Hayden Br. Wy	
Rachel Magnuson 14 Hayden Bridge	
Sue Lynch 83 Hayden Br Way	
David Lynch — —	
Ralph L. Carson 141 Hayden Br. Way	
Betty J. Carson 141 Hayden Br. Way	
Leona Smith 165 Hayden Br. Way	
Louanne Garland 184 Hayden Bridge	
John G Garland	
[illegible] #140	
[illegible] #142	
[illegible] 156	
Joyce E. Brokker	

1-3

DUANE KNOLL

3020 ID

THIS IS A PETITION TO OPEN THE BLOCKED OFF ROAD LOCATED ON SEWARD STREET. BETWEEN WAYSIDE LANE AND MANOR DRIVE.

2999 Wayside Lp. Spfld	Kathrine Knoll Duane Knoll
2980 Wayside Loop Spfld	Frank D. Long & Dee Long
3124 WAYSIDE LOOP SPFLD	DAVID WALKER
2995 Wayside Loop	[illegible]
21 Kathleen Ct 97477	[illegible]
19 Kathleen Court	[illegible] Thomas
19 Kathleen Court	Floyd C Thomas
3065 Wayside Loop Spfld.	Gloria J. Rose
3098 Wayside Lp. Spfld.	[illegible]
Walt Hake	45 ANN CT
45 Ann Ct Spfld	Irene E. Hake
3076 Wayside Loop Spfd	Dorothy C. Chase
3131 Wayside Lp Spfld	Cheri Miller
3163 Wayside Lp. Spfld.	[illegible]
2885 Wayside Loop	Donald Bennett
2885 Wayside Loop	Lucille Bennett
2889 Wayside Loop	Lily Laxton
45 Lorie Court	Henrietta Brown
65 Lorie Court	Kenneth J Vigney
2915 Wayside Lp.	Linda Lee Moon
2930 WAYSIDE Lp.	Thomas R. Barchers
2931 Wayside Lp.	Betty L. Rasmussen
2947 " "	Robert J. Trachsler
2947 " "	[illegible]
2963 " "	Reggie + Frances Cline
35 Kathleen Ct Springfield	Grace Detlefsen
2785 Wayside Lane	[illegible]
2882 WAYSIDE LOOP	Elmer Panasuk
2864 Wayside Loop	[illegible]
10 Seward Ave	[illegible] Moffitt

MARCH 11-14 2004

Duane V Knoll

THIS IS A PETITION TO OPEN THE BLOCKED OFF ROAD LOCATED ON SEWARD STREET. BETWEEN WAYSIDE LANE AND MANOR DRIVE.

2867 Wayside Loop	
2836 " Lane, Spfld	David A Wilson
2836 Wayside Ln, Spfld	Eldon Hudgins
2732 Wayside Ln. Spfld	G. M. Hudgins
2732 Wayside Ln. Spfld	Alice Huff
2686 Wayside Ln Spfld	[illegible]
2686 wayside Ln Spfd.	Lynette Huss
2686 wayside Ln	Eileen Stringer
2634 WAYSIDE LN	Cecil Stringer
2570 " "	Donald Bowden
" " "	[illegible]
2600 Wayside lane	[illegible] "
2555 Wayside	Jim Taylor
2555 Wayside Ln	[illegible]
25 & 27 Allen Ave	Curt Summers
25 & 27 Allen Ave.	Julie Ardana
36 Allen Av	[illegible]
2637 WAYSIDE LN	Larry [illegible]
3021 Wayside LN.	Michael [illegible]
37 Crosby Ave.	Maria [illegible]
41 Crosby Ave	Shari McChesney
30 Crosby ave	Greg C Elliakson
30 Crosby Ave	Michael T. McKay
3179 Wayside Loop	Gertrude D. McKay
2979 Wayside Lp.	Mark & Bonnie [illegible]
2931 WAYSIDE LP	James & Valene DeVall
3043 Wayside Lp	Tony Rasmussen
3097 wayside Lp	Dennis & Linda Abraham
3150 wayside LP	Larry & Valerie Hampton
3184 Wayside Lp	Gary & Joy Lapping
	[illegible]

MARCH 11 - 14 · 2004

[illegible]

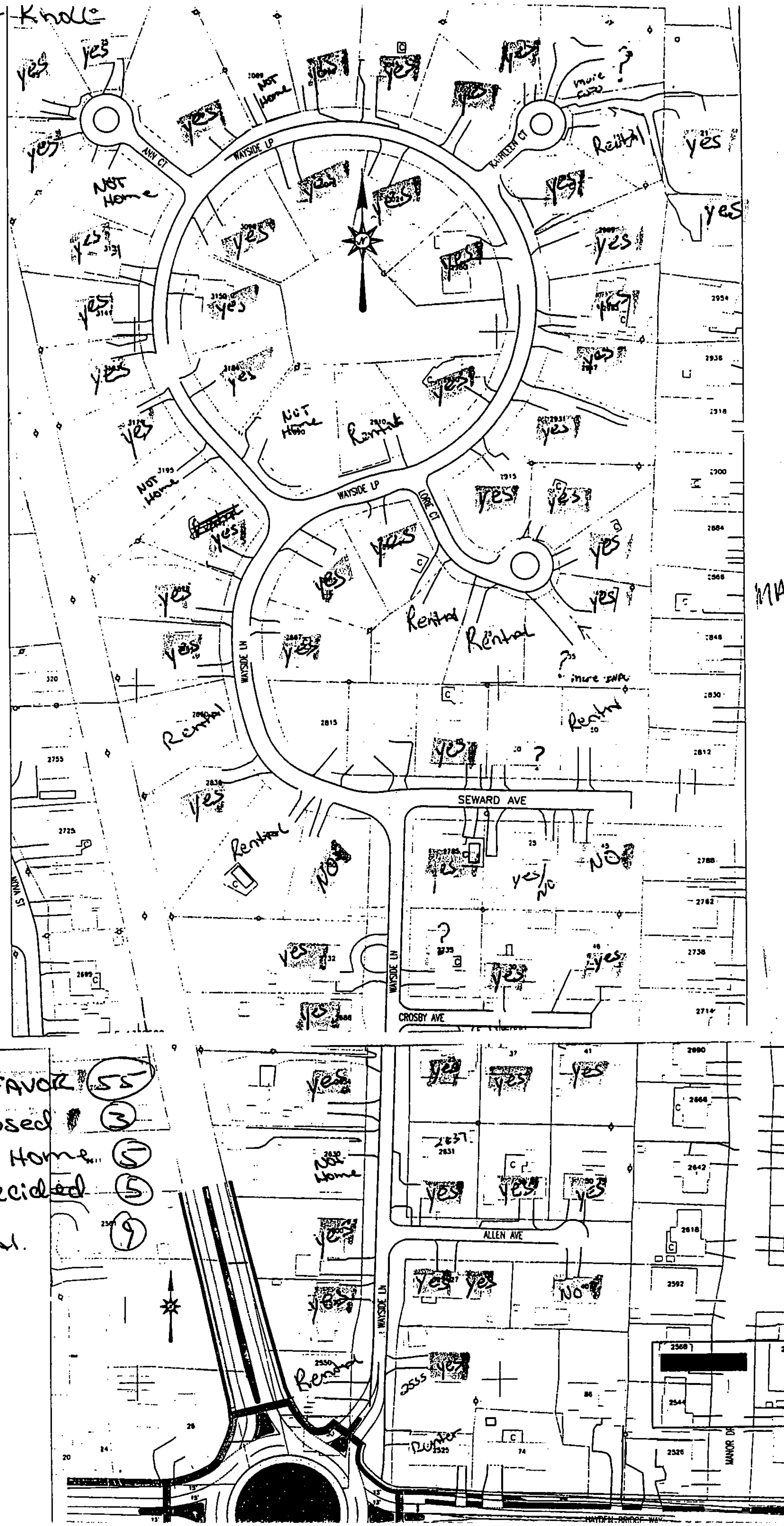
THIS IS A PETITION TO OPEN THE BLOCKED OFF ROAD LOCATED ON SEWARD STREET. BETWEEN WAYSIDE LANE AND MANOR DRIVE.

Shirley S. Simpson	25 Wayside Ln Spfd OR 97477
Carmen J. Olsen	50 Allen Ave.
Joy Desatoff	55 Lorie Ct.
Brenda Botz	25 Ann Ct. Spfd, OR
[illegible]	35 Ann Ct Spfd, OR
[illegible]	347 Wayside Loop
[illegible] Canaday	25 Crosby Ave
Lois M. Canaday	25 Crosby Ave. Spfd.
Charlotte Whirlpool	46 Crosby Ave Spfd.

MARCH 11-14 2004

[illegible signature]

Duane Knoll



MARCH 11, 04

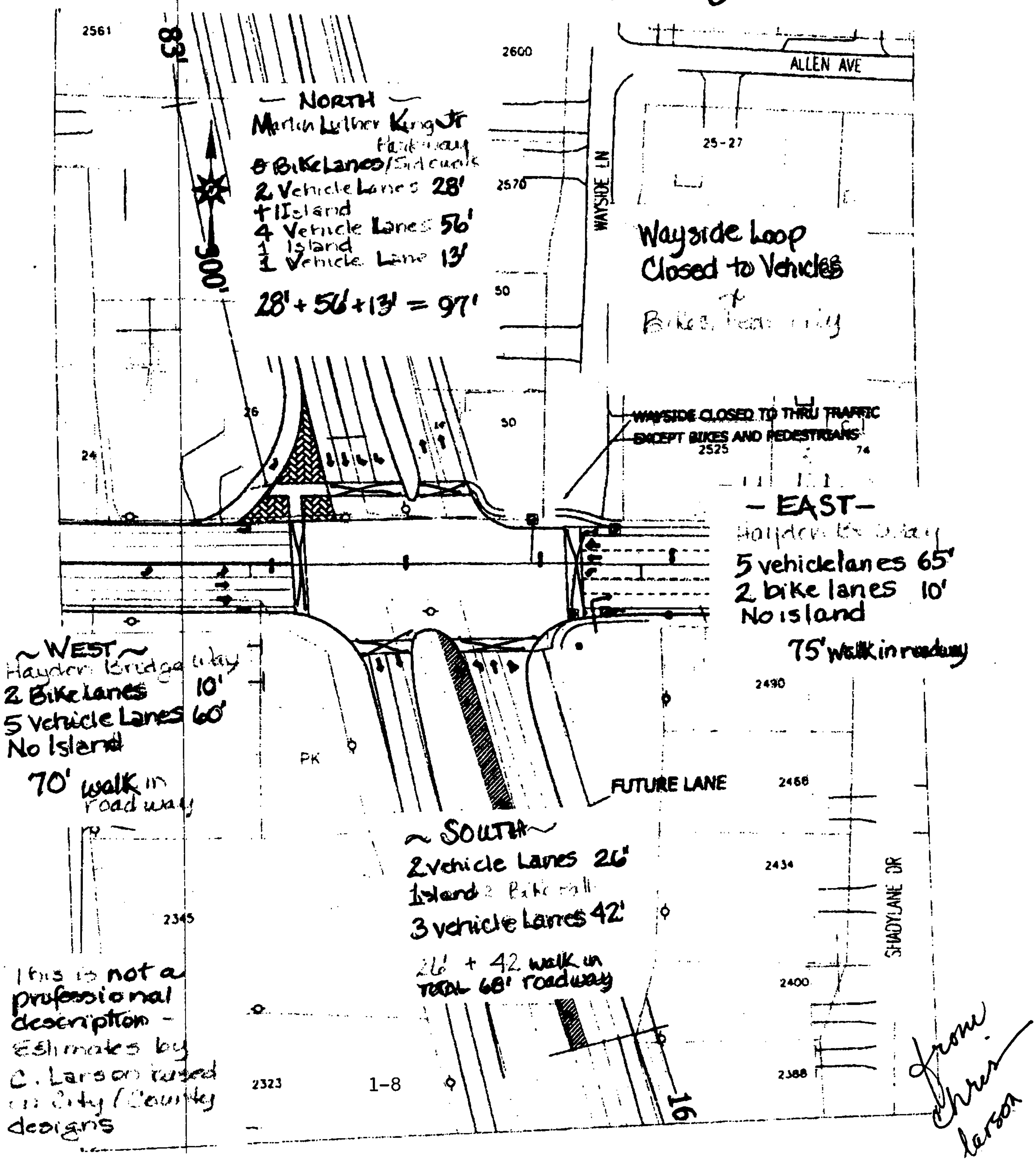
IN FAVOR 55
Opposed 3
NOT Home 5
undecided 5
Rental 9

— Estimated —

Pedestrian Roadway Distance @ Signalized Intersections

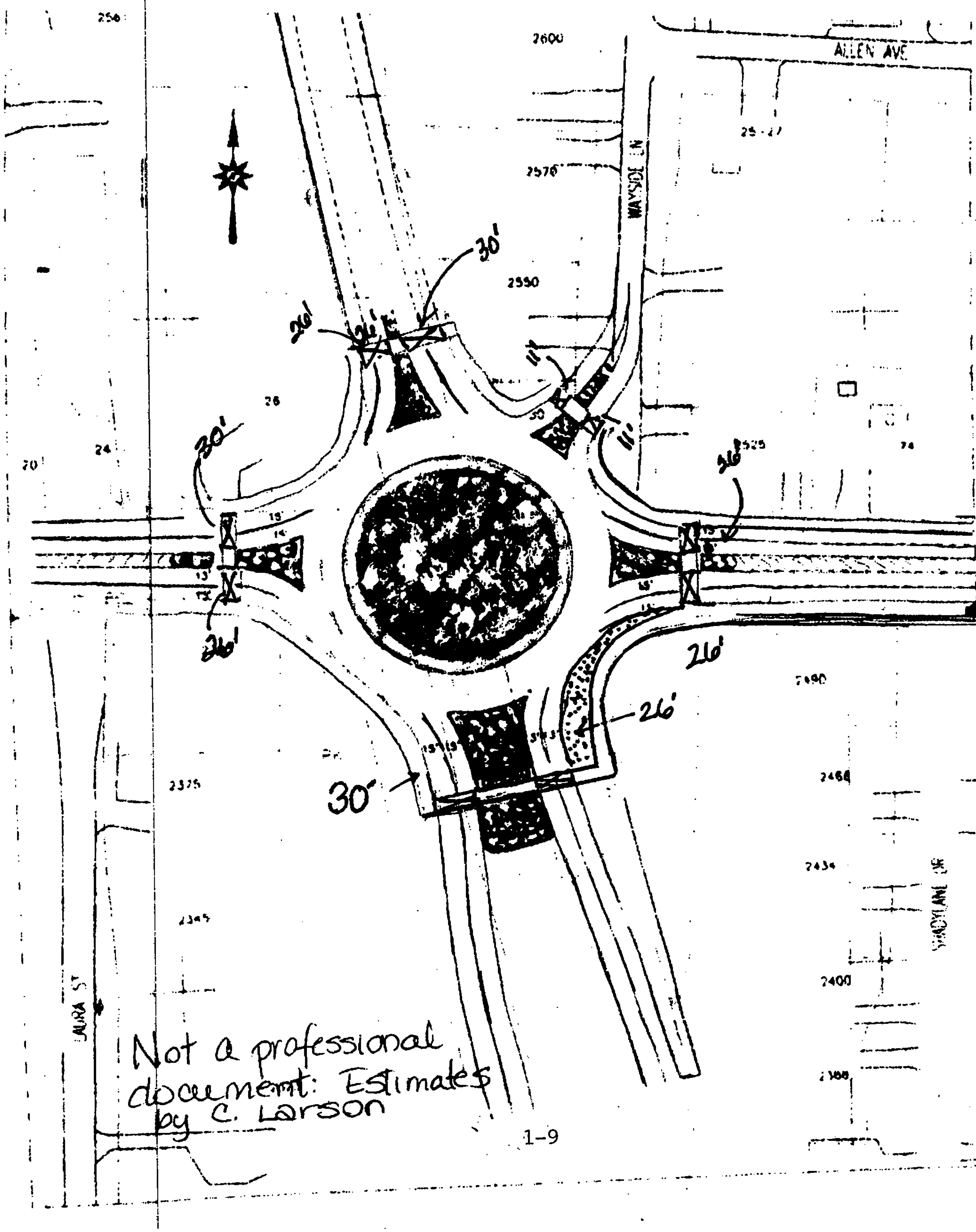
Maximum: 70-75' on HBW east + west leg

Total In-Road Pedestrian Walkways: 310'



Pedestrian In-Road Walk Distance with 5 islands Traffic Circle Design

Maximum In-Roadway: 30' Total: 240'



Not a professional document: Estimates by C. Larson

CITY OF SPRINGFIELD, OREGON
SPRINGFIELD

PUBLIC WORKS DEPARTMENT
ADMINISTRATION
ENGINEERING DIVISION
ENVIRONMENTAL SERVICES DIVISION
MAINTENANCE DIVISION
TRANSPORTATION DIVISION
TECHNICAL SERVICES DIVISION

225 FIFTH STREET
SPRINGFIELD, OR 97477

www.ci.springfield.or.us/dept_pw.htm
www.ci.springfield.or.us

April 14, 2004

Lane County Board of Commissioners
125 East 8th Avenue
Eugene, OR 97401

RE: Lane County Board of Commissioners Public Hearing for the Martin Luther King Jr. Parkway

Dear Commission Chair Green and Lane County Commissioners;

Thank you for the opportunity to testify concerning the Martin Luther King Jr. Parkway. Attached please find three memos from City of Springfield staff in support of the City Council recommendation for the Parkway project:

- Martin Luther King Jr. Parkway Project overview
- Sound walls
- Roundabout safety

As the lead agency for the Parkway project and the jurisdiction that will maintain and operate the roadway when it is completed, and the lead agency for conducting the public open houses, City staff welcomes the chance to work with the County Board of Commissioners and County staff on this approval process.

Sincerely,

Nick Arnis
Transportation Manager

ADMINISTRATION / TECHNICAL SERVICES / ENGINEERING: (541) 726-3753 • FAX (541) 736-1021
MAINTENANCE: (541) 726-3761 • FAX (541) 726-3621 TRANSPORTATION: (541) 726-3753 • FAX (541) 726-3781
ENVIRONMENTAL SERVICES: (541) 726-3694 • FAX (541) 726-2309

MEMORANDUM City of Springfield

DATE: April 14, 2004

TO: Lane County Board of Commissioners

FROM: Nick Arnis, Transportation Manager
City of Springfield

SUBJECT: Martin Luther King Jr. Parkway Project

The following will outline the purpose and need for the Parkway, the background of decisions over the years made concerning the Parkway, and important design elements regarding the Parkway.

Purpose and Need

The Martin Luther King Jr. Parkway (Parkway) is a minor City arterial road with a typical four lane cross section that will carry local and regional traffic. The Parkway will provide an alternative route for the regional through trips that currently use Game Farm Road South and this new road will access major employment, housing and commercial areas in Springfield. An estimated 30,000 trips a day will use the Parkway and redirect traffic to the I-5/Beltline interchange which is important for the success of the I-5/Beltline interchange project.

Given the volumes of traffic and the constraints of building a new arterial road in an urban setting, different design elements were considered such as sound walls and a two lane roundabout. The need for a two lane roundabout and sound walls are consistent with the desire of the City to lessen the impacts of very large volumes of traffic in a residential neighborhood.

The Parkway will cost $9.3 million and is targeted for construction in 2005.

Background of Decisions

The Parkway project is over ten years in the making. The first ideas for a road to alleviate the traffic on Game Farm Road South and provide access to large vacant parcels in the Gateway area were presented in the Gateway Refinement Plan which was adopted in 1992. The Gateway Refinement Plan contains polices about transportation specific to when the designs for the Parkway should begin in relation to traffic levels on Game Farm Road South, the need to evaluate and possibly mitigate noise due to roads, and if roads are built in urbanizable parcels the Lane County Board would review the design of the road.

In 1998, the City Council, after a lengthy public process, approved a resolution for the alignment of the Parkway. In order to locate the Parkway in the narrow southern segment (Hayden Bridge Way to the PeaceHealth site) the City agreed to construct sound walls and reduce the width of the Parkway in this segment by not providing bike lanes or sidewalks.

By 2001 the traffic levels on Game Farm Road South had reached a level that tripped into action the need to secure funding, approve the alignment with the County, and begin designs for the Parkway. The County Board generously approved $1.9 million for the Parkway in the 2002-06 Capital Improvement Program in May 2001 and in December of the same year approved $3.3 million for the Parkway under the Capital Project Program (CaPP).

In June of 2001, the City negotiated an agreement with Arlie & Co., owners of the parcels where the northern segment of the Parkway is located, for the dedication of right of way and a payment of $2.75 million for the Parkway. PeaceHealth assumed these obligations when the hospital bought land from Arlie & Co. In addition, PeaceHealth and the City signed another agreement obligating PeaceHealth to pay $2.25 million of any oversizing of the Parkway due to PeaceHealth traffic than what is estimated by the City.

The City and County signed an intergovernmental agreement in early 2003 that designates the City as the lead agency for the project and for the County to provide design and construction engineering and contract management services.

Important Design Elements

There are five substantial design elements for the Parkway:

- The "North Link" decisions
- Sound walls for the southern segment
- Two lane roundabout at Hayden Bridge Way
- Bus Rapid Transit
- Hayden Bridge Way parking

"North Link"

The "North Link" alignment issue concerns the intersection area where the Parkway ties into Beltline road at the north end of the project. The issue is about the amount and type of traffic that will use the existing Game Farm Road segment between Beltline and Deadmond Ferry Road. This issue came up when the City sought County approval of the Parkway alignment in 2001.

The City conducted a formal steering committee process between August and November of 2002. The Steering Committee began as a small group of property owners that included the Patrician Mobile Home park and grew to a larger group at the request of the local homeowners on Deadmond Ferry Road. The Committee voted on a charter about who were the voting members, the purpose and goal of the committee, and they elected a citizen to chair the Committee. The Patrician Mobile Home Park was represented by its owner and manager. After a great deal of discussion over an intensive few months of meetings about options, the Committee unanimously voted to approve an alignment for the Parkway that would improve the existing Game Farm Road between Beltline and Deadmond Ferry and the City would work directly with the owner of

Patrician about improvements to the Patrician driveway.

Sound Walls for the Southern Segment

The methodology and design concept for the sound walls is explained in greater detail in an attached memo from the City. The significant aspect of the sound wall is that there is very little local expertise about sound mitigation and design. Consequently, the City has hired a consultant to conduct a noise evaluation and sound wall types, and a consultant will be hired to assist the City and County concerning the design of the wall. The goal of the City is to mitigate the sound in the southern segment of the Parkway while not creating a wall that is so large that it is out of context with the road and surrounding neighborhood.

Two Lane Roundabout at the Hayden Bridge Way Intersection

The decision by the City to pursue a two lane roundabout at the Hayden Bridge Way intersection was not taken lightly by staff or the City Council; a roundabout was not an option presented to the public at open houses about the design of the intersection. City staff began looking at a roundabout after public comments at an open house in July of 2003 about the lack of access to the Hayden Bridge Way intersection with a signalized intersection and the concern by City staff about the size of a signalized intersection at Hayden Bridge Way. A consultant was hired to review all the intersection ideas at Hayden Bridge Way which also included those ideas submitted by the public at the open house. After four months of analysis, City staff conducted another open house about the intersection design comparing a signalized intersection with a two lane roundabout. Of the twenty nine households that attended the open house, twenty four of them supported the roundabout primarily because Wayside Lane can be connected to a roundabout.

When City staff conducted an evaluation and comparison between a signal and a two lane roundabout, the results were overwhelmingly in favor of a two lane roundabout for an intersection form at Hayden Bridge Way. A summary of the results are listed:

	Roundabout	Signal
Cost	$900,000	$1 million
Performance	Level of service B	Level of service D/E
Safety	Less severe crashes	Higher speed crashes occur
Access to Wayside	Provides access to Wayside Lane	Not feasible to connect Wayside
Right of way	Less right of way needed	More right of way needed
Maintenance	$3,000 to $5,000 savings	Signal electricity and maintenance cost
Pedestrian safety	Lower vehicle speeds and pedestrian islands	Higher vehicle speeds

Bus Rapid Transit

Lane Transit District (LTD) would like a dedicated Bus Rapid Transit (BRT) lane in the southern segment of the Parkway. It is likely that dedicated BRT lanes will exist for most of the Pioneer Parkway Corridor. Right of way in the southern segment of the Parkway is very limited. The City bought the old rail right of way that was sixty feet in width and in 1998 negotiated with property owners abutting the corridor about sound walls and as mentioned previously the City decided to remove bike lanes and sidewalks from this section to lessen the right of way impacts.

A dedicated lane in this section of the Parkway was factored with the further impacts to property owners and the need for the City to meet its standards for constructing an arterial roadway that includes some form of vegetation, outside shoulders, and a sound wall. In public meetings and in the public hearing before the City Council, there was not a great deal of support for a dedicated BRT lane in this section of the Parkway.

City staff would support a dedicated BRT lane if the transmission line is removed from the median in the southern segment which then allows for more room for BRT. At this time, City staff does not support the 83 foot proposal by LTD that would leave the transmission lines in the median and include a dedicated BRT lane because of safety issues with the transmission poles being too close to the roadway, City staff has already narrowed the right of way in this section for vehicles, and staff does not want to narrow the sound wall footprint at this preliminary stages of sound wall design.

Hayden Bridge Way Parking

The existing parking on Hayden Bridge Way east of the new Hayden Bridge Way /Martin Luther Jr. Parkway intersection will need to be removed for about 1000 feet to accommodate the added lanes at the intersection and keep within the existing right of way. City staff conducted two open houses to review the changes with residents along Hayden Bridge Way. The City Council recommends that the parking be removed but for staff to work with property owners and residents to possibly modify driveways with the owners consent in order to enter and exit the property.

MEMORANDUM **City of Springfield**

To: Lane County Board of Commissioners

From: Kristi Krueger, P.E. KK

Date: April 14, 2004

Subject: Martin Luther King Jr. Parkway Sound wall

Background:

The Gateway Refinement Plan was adopted by the City Council in November 1992, to address the land use issues and identify the public facilities needs in the Gateway area of Springfield. The Gateway Refinement Plan Transportation Element specifies that the City shall design and construct a north-south arterial corridor in order to accommodate increased traffic flows associated with future development of the north Gateway area in a manner that minimizes impacts on existing Gateway area residences. The Martin Luther King Jr. Parkway project was approved by the City Council in the 1992 Gateway Refinement Plan and later, in 1998, an alignment was approved by the City Council. As a transportation element in the November 1992 Gateway Refinement Plan, the design and construction of the Martin Luther King Jr. Parkway is to be in a manner that significantly reduces noise impacts.

Analysis and Evaluation:

As part of preparatory work for the roadway design of the Martin Luther King Jr. Parkway (MLK), the City hired Daly Standlee and Associates, a recognized expert in sound impacts. Standlee conducted a noise study to determine the impacts that might be expected at properties located along the Parkway between Hayden Bridge Way and 2300' to the North. Unmitigated noise levels at residences along this section were found to be excessive when compared to Federal Highway Administration (FHWA) and Housing Urban Development (HUD) noise criteria for highway noise.

The FHWA procedures for highway traffic noise analysis and abatement are contained in 23 CFR 772, "Procedures for Abatement of Highway Traffic Noise and Construction Noise." Since no federal funds are being used for the MLK, the new roadway is not bound to the FHWA procedures. Nevertheless, the FHWA documents provide valuable guidelines for assessing traffic noise levels and therefore were used in the study. The FHWA guidelines state that noise mitigation should be considered when the peak traffic noise hour levels predicted to occur with design-year traffic "approach" the noise abatement criterion (NAC) or "substantially exceed" existing noise levels. To ODOT "approach the NAC" means the predicted peak traffic noise hour level is within 2 decibels of the NAC; that is 65 decibels on ODOT projects. And, to "substantially exceed" existing noise levels means the predicted peak traffic noise hour level is 10 decibels or more above existing noise levels.

The sound levels expected during late night hours in the subject segment without mitigation are approximately 10 decibels louder than the highest existing ambient noise levels. An increase of 10 decibels in sound level is generally experienced as a doubling of sound by most people. A doubling of sound during the sleeping hours might be perceived as more of a change than during the day, especially if it is disturbing sleep.

Traffic noise can be effectively reduced by introducing a barrier between the traffic and the receiver. Walls or berms may be used as barriers to traffic noise. A berm reduces noise levels to the greatest extent, but unfortunately requires more right-of-way from the property owners and therefore was removed from the barrier options considered by the City.

The various wall types investigated were wood, pre-cast concrete, concrete masonry, foam/cement board and steel noise walls. The type of wall that reduces sound the most is a pre-cast concrete sound **absorptive** wall. The sound absorptive wall absorbs the sound instead of reflecting the sound from wall to wall and eventually over the wall. A reflective barrier would need to be 1.5 feet higher than an absorptive barrier system to achieve the same reduction of sound. Absorptive walls are more expensive than non-absorptive walls, but the additional cost will be somewhat offset by the lower required wall height. The **reflective** wall has an area cost of $12 a square foot where the **absorptive** wall has an area cost of $22 a square foot. The approximate cost for the pre-cast absorptive concrete wall is between $700,000 and $1,000,000 which falls within the budget of $1,000,000.

Daly Standlee and Associates recommends for the City select mitigation measures that at least achieve the late-night design standard, (noise level during the hours of 10:00p.m. to 6a.m. not exceed 55 decibels). If using barriers, the average height of **absorptive** barriers would need to be about 7 feet, and the average height of hard **reflective** barriers would need to be about 8.5 feet to address this criterion. If resources are plentiful, the City might consider mitigating to the peak hour Leq criterion, which will require the highest noise barrier. The peak hour Leq criterion requires that during the peak hour of travel noise levels not exceed 65 decibels. In this case the average height of **absorptive** barriers would need to be about 9.5 feet, and the average height of hard **reflecting** barriers would need to be 10.5 feet at an additional cost of $12 per square foot.

City Recommendation:

The City recommends using a combination of the late-night and 24-hour criterion noise measures and a sound **absorptive** pre-cast concrete wall that requires a 7-9 foot wall height. The 9 foot pre-cast concrete wall falls within the $1,000,000 budget. If a greater wall height is selected, additional funding will be needed.

Memorandum City of Springfield

Date:	April 14, 2004
To:	Lane County Board of Commissioners, Bobby Green, Board Chair
From:	Brian F. Barnett, P.E., Traffic Engineer
Subject:	Martin Luther King, Jr. Parkway: Roundabout Safety

American traffic engineers and planners are using roundabouts with enthusiasm for several reasons. Roundabouts increase traveler safety, reduce travel delay, are economical, are beneficial to the environment, and improve the appearance of streets and intersections.

Safety

Roundabouts are safer than any other at-grade intersection form because roundabouts have fewer conflict points, slower speeds, and easier decision making. Data from Europe, the United Kingdom, Australia, and the United States of America demonstrate improved safety over all other at-grade intersection forms in two distinct ways: 1) reductions in the total number of collisions, and 2) even greater reductions in injury producing collisions. Collision frequency and severity will decline for pedestrians, and motor vehicles.

The Insurance Institute for Highway Safety conducted a study published in the American Journal of Public Health (copy attached). The study analyzed actual and expected crashes at stop and signal controlled intersections in rural and urban environments. Findings applicable to multilane roundabouts vs. signals include a reduction in all crashes of 32% and injury causing crashes of 68%. Injury crash reduction is greater than all crash reduction due to the elimination of most head-on, left turning across oncoming traffic, and right angle crashes. Head-on, left turning, and right angle crashes generate the highest energy and thus the highest number of injuries compared to rear-end and sideswipe crashes. Data for single and multi-lane roundabouts from other countries confirms the USA experience. Reductions in overall crashes range from 36% to 61%, and injury crash reduction ranges from 25% to 87%. (Exhibit 5-10, Roundabouts: An Informational Guide. Federal Highway Administration)

Pedestrian safety is also improved at roundabouts over traffic signals. Pedestrians using roundabouts are able to cross a much smaller roadway, consider traffic traveling only one direction at a time, and are exposed to traffic that is traveling at much slower speeds. Pedestrian crashes at British intersections occurred at the following rates: 0.33 crashes per million trips at flared roundabouts, and 0.67 crashes per million trips at signalized intersections. (Exhibit 5-15, Roundabouts: An Informational Guide. Federal Highway Administration) Clearly, signals are inferior to roundabouts for pedestrian safety.

Capacity
Roundabouts typically carry about 30% more vehicles than similarly sized signalized intersections during peak flow conditions. At Hayden Bridge Way & Parkway peak traffic hour Level of Service (LOS) on opening day is predicted to be LOS B for the roundabout and LOS D/E for a traffic signal. During off peak conditions roundabouts cause almost no delay (LOS A), but traffic signals can cause delay to side streets and left turning traffic from the major street often LOS C. Increased capacity at roundabouts is due to the continuously flowing nature of "yield only until a gap is available" vs. stopping at a red light until my turn comes.

Pedestrian travel distances will increase by about 20% at a roundabout over a traffic signal. Pedestrian delay at either type of intersection is difficult to predict and will depend upon random factors. Assuming no driver stops for a waiting pedestrian, finding a gap in traffic that is large enough to cross at a roundabout may take some time. This situation will only exist during moderate traffic volumes. At high volume periods where drivers are moving slowly, pedestrians will be able to cross as autos yield while waiting to approach the yield line. At low volume periods, acceptable gaps will available frequently. At traffic signals, pedestrian wait time to receive a WALK signal may be up to 120 seconds depending upon at what point in the signal cycle the pedestrian pushes the pedestrian button. Pedestrians will be crossing traffic lanes for about 80 seconds.

Economy
Roundabouts save money. The City saves because operations and maintenance expense of roundabouts is less than that of traffic signals. Signal maintenance and electricity annual cost is $3,000 to $5,000. The driver saves time through reduced delay and lower fuel consumption. The community at large saves because collisions are less frequent and much less severe, reducing insurance cost, medical cost, and the human cost of injury and death. Roundabouts also reduce the need for added lanes along roadways because the capacity of a system is most often determined by the intersections. Roadways are widened from intersection to intersection to accommodate the queues generated by traffic signals. Construction cost for a roundabout at Hayden Bridge Way/Parkway will cost about $100,000 less than a traffic signal.

Environment
Roundabouts conserve land since road systems are narrower overall. A roundabout at Hayden Bridge Way/Parkway will need about 157,000 square feet of land and the traffic signal will need about 183,000 square feet of land, or about 17% more.

Fuel consumption and air pollution are reduced significantly due to lower travel delay, especially in the off peak travel periods. Some areas of the country within Air Quality Containment areas are using Federal funds from the Congestion Mitigation and Air Quality Mitigation account to remove traffic signals and replace them with roundabouts to reduce both congestion and improve air quality. Estimates could be made of air pollution for various intersection forms to provide site-specific data.

Beauty

Roundabouts central and splitter islands provide area for landscaping, sculpture, or other aesthetic features. They also avoid the clutter of traffic signal controller boxes, poles and wires, and pavement cuts for detector loops.

Crash Reductions Following Installation of Roundabouts in the United States

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March 2000

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ABSTRACT

Modern roundabouts are designed to control traffic flow at intersections without the use of stop signs or traffic signals. U.S. experience with modern roundabouts is rather limited to date, but in recent years there has been growing interest in their potential benefits and a relatively large increase in roundabout construction. The present study evaluated changes in motor vehicle crashes following conversion of 24 intersections from stop sign and traffic signal control to modern roundabouts. The settings, located in 8 states, were a mix of urban, suburban, and rural environments. A before-after study was conducted using the empirical Bayes approach, which accounts for regression to the mean. Overall, the empirical Bayes procedure estimated highly significant reductions of 39 percent for all crash severities combined and 76 percent for all injury crashes. Reductions in the numbers of fatal and incapacitating injury crashes were estimated to be about 90 percent. Overall, results are consistent with numerous international studies and suggest that roundabout installation should be strongly promoted as an effective safety treatment for intersections.

INTRODUCTION

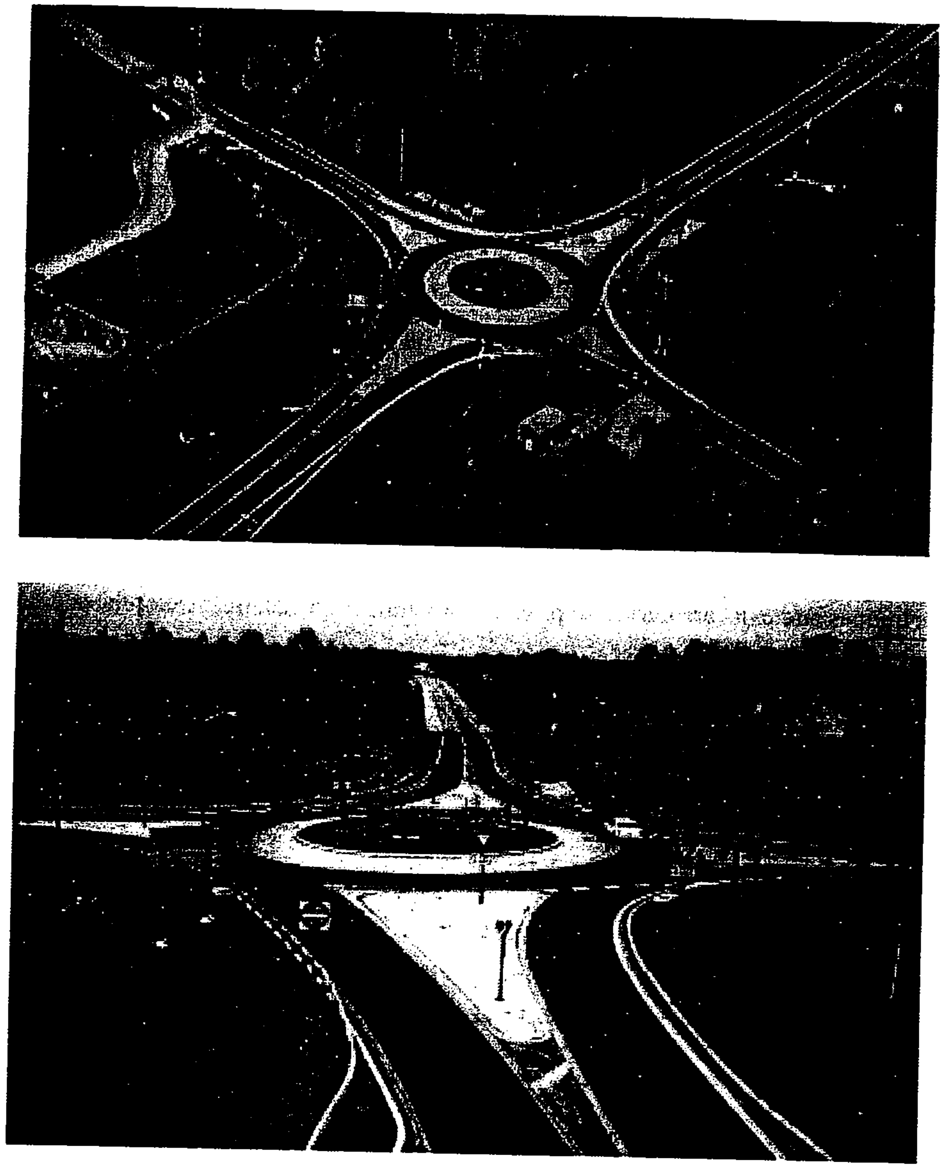
The modern roundabout is a form of intersection traffic control that has become increasingly common around the world but is seldom used in the United States. Circular intersections are not a new idea and, in fact, predate the advent of the automobile. The first one-way rotary system for motor vehicle traffic in the United States was put into operation in 1905 at Columbus Circle in New York City (Todd, 1988).

The main difference between modern roundabouts and older circles/rotaries is the design speed. Older rotaries typically were built according to 1940s-era design standards or even older guidelines, which generally were intended for vehicle speeds of 25 mph or more. Drivers typically enter older traffic circles at speeds of 35 mph or more. In contrast, modern roundabouts are designed for very low traffic speeds, about 15 mph. The low design speed is accomplished through two primary design features: drivers must enter the roundabout facing a central island rather than tangentially (this feature is known as deflection), and the approaches to the roundabout are curved to promote low entry speeds. Common characteristics that define a modern roundabout and provide safety features are: drivers entering a roundabout must yield to vehicles within the circulatory roadway, keeping weaving to a minimum; roundabout entrances and exits are curved to promote low traffic speeds; traffic circulates counterclockwise, passing to the right of a central island; raised "splitter" islands dividing the roadway at entrances and exits provide refuge for pedestrians, ensure drivers travel in the intended path, and separate opposing traffic (Figure 1). In addition, pedestrian activities are prohibited on the central island, pedestrians are not intended to cross the circulatory roadway, and when pedestrian crossings are provided for approach roads they are placed approximately one car length back from the entry point.

Numerous studies, mostly in the international literature, indicate that modern roundabouts are safer than other methods of intersection traffic control, and that converting intersections from stop signs or traffic signals to roundabouts is associated with substantial reductions in motor vehicle crashes and injuries. For example, Schoon and van Minnen (1994) studied 181 Dutch intersections converted from conventional controls (traffic signals or stop signs) to modern roundabouts and reported that crashes and injuries were reduced by 47 and 71 percent, respectively; the more severe injury crashes (resulting in hospital admissions) were reduced by 81 percent. Troutbeck (1993) reported a 74 percent reduction in the rate of injury crashes following conversion of 73 roundabouts in Victoria, Australia. These and similar studies may overestimate the magnitude of crash reductions associated with conversion of intersections to roundabouts by failing to control for regression-to-the-mean effects — a major problem affecting the validity of many road safety improvement studies. A thorough review of the literature was conducted by Elvik et al. (1997), who concluded that converting from yield, two-way stop, or traffic signal control to a roundabout reduces the total number of injury crashes by 30-40 percent. Reductions in the number of

This work was supported by the Insurance Institute for Highway Safety. The opinions, findings, and conclusions expressed in this publication are those of the author(s) and do not necessarily reflect the views of the Insurance Institute for Highway Safety.

Figure 1
Views of Roundabout in Cecil County, MD



pedestrian crashes were in the same range. Bicycle crashes were reduced by approximately 10-20 percent. It should be noted that the Elvik et al. study was a meta-analysis that included some circular intersections not meeting the typical definition of modern roundabouts. Regression to the mean was not controlled for.

U.S. experience with modern roundabouts is rather limited to date, but there has been growing interest in their potential benefits and, recently, a relatively large increase in roundabout construction. Garder (1997) conducted an extensive review of existing and planned U.S. installations and reported strong activity in several states including Colorado, Florida, Maine, Maryland, Michigan, Nevada, Vermont, and Washington. A recent, but limited, before-after crash study was conducted by Flannery and Elefteriadou (1999) based on 8 roundabouts, 3 in Florida and 5 in Maryland. Results were promising, suggesting consistent reductions in crashes and injuries, but the analyses were limited in scope.

The present before-after study was designed to better estimate the nature and magnitude of crash reductions following installation of modern roundabouts in the United States. It included a greater number of intersections and employed more powerful statistical analysis tools than the simple before-after comparisons used in prior studies.

METHOD

The empirical Bayes approach was employed to properly account for regression to the mean while normalizing for differences in traffic volume between the before and after periods. The change in safety at a converted intersection for a given crash type is given by:

$$B–A, \tag{1}$$

where B is the expected number of crashes that would have occurred in the after period without the conversion and A is the number of reported crashes in the after period.

To eliminate regression-to-the-mean effects and to reduce uncertainty in the results, B was, in general, estimated using an empirical Bayes procedure (Hauer, 1997) described more fully in the appendix. In essence, a regression model is used to first estimate the annual number of crashes (P) that would be expected at intersections with traffic volumes and other characteristics similar to the one being analyzed. The regression estimate is then combined with the count of crashes (x) in the n years before conversion to obtain an estimate of the expected *annual* number of crashes (m) at the intersection before conversion. This estimate of m is:

$$m = w_1(x) + w_2(P), \tag{2}$$

where the weights w_1 and w_2 are estimated from the mean and variance of the regression estimate as:

$$w_1 = P/(k + nP) \tag{3}$$

$$w_2 = k/(k + nP), \tag{4}$$

where

$$k = P^2/Var(P) \tag{5}$$

is a constant for a given model and is estimated from the regression calibration process.

Factors then are applied to account for the length of the after period and differences in traffic volumes between the before and after periods. The result is an estimate of B. The procedure also produces an estimate of the variance of B. The significance of the difference ($B–A$) is established from this estimate of the variance of B and assuming, based on a Poisson distribution of counts, that:

$$Var(A) = A. \tag{6}$$

Uncertainty in the estimates of safety effects also can be described with the use of likelihood functions, which have been presented in the full project report (Persaud et al., 1999).

ASSEMBLY OF DATA AND REGRESSION MODELS

Data for converted intersections: The analyses were confined to 8 states — California, Colorado, Florida, Kansas, Maine, Maryland, South Carolina, and Vermont — where a total of 24 intersections were converted to modern roundabouts between 1992 and 1997. There are a few modern roundabouts in the United States that are not included in the present analysis because data were not available or the roundabouts were too new.

Of the 24 intersections studied, 21 were previously controlled by stop signs, and 3 were controlled by traffic signals. Fifteen of the roundabouts were single-lane circulation designs, and 9, all in Colorado, were multilane. Summary data for the study intersections are given in Table 1. For each intersection, crash data were obtained for periods before and after conversion. The construction period, as well as the first month after completion, were excluded from analysis. The lengths of the before and after periods varied in accordance with available crash data. In no case was a period shorter than 15 months. Data were extracted from printed police crash reports and, where not available, from report summaries. Information regarding injuries also was derived from police crash reports. Police reports convey the detection and apparent severity of injuries, either through the so-called KABCO scale (Killed, A injury, B injury, C injury, Only property damage) or by separating injuries into three categories: possible injury, non-incapacitating injury, and the more severe incapacitating injuries. In this study, "possible" injuries were not counted as injuries. Injury data based on police reports have known limitations, especially in regard to injury severity. During the study period, there were no known changes in reporting practices that would cause a change in the number of reported crashes.

Table 1
Details of the Sample of Roundabout Conversions

Jurisdiction	Year Opened	Control Before*	Single or Multilane	AADT Before	AADT After	Months Before	Months After	Crash Count Before All	Crash Count Before Injury	Crash Count After All	Crash Count After Injury
Anne Arundel County, MD	1995	1	Single	15,345	17,220	56	38	34	9	14	2
Avon, CO	1997	2	Multilane	18,942	30,418	22	19	12	0	3	0
Avon, CO	1997	2	Multilane	13,272	26,691	22	19	11	0	17	1
Avon, CO	1997	6	Multilane	22,030	31,525	22	19	44	4	44	1
Avon, CO	1997	1	Multilane	18,475	27,525	22	19	25	2	13	0
Avon, CO	1997	6	Multilane	18,795	31,476	22	19	48	4	18	0
Bradenton Beach, FL	1992	1	Single	17,000	17,000	36	63	5	0	1	0
Carroll County, MD	1996	1	Single	12,627	15,990	56	28	30	8	4	1
Cecil County, MD	1995	1	Single	7,654	9,293	56	40	20	12	10	1
Fort Walton Beach, FL	1994	2	Single	15,153	17,825	21	24	14	2	4	0
Gainesville, FL	1993	6	Single	5,322	5,322	48	60	4	1	11	3
Gorham, ME	1997	1	Single	11,934	12,205	40	15	20	2	4	0
Hilton Head, SC	1996	1	Single	13,300	16,900	36	46	48	15	9	0
Howard County, MD	1993	1	Single	7,650	8,500	56	68	40	10	14	1
Manchester, VT	1997	1	Single	13,972	15,500	66	31	2	0	1	1
Manhattan, KS	1997	1	Single	4,600	4,600	36	26	9	4	0	0
Montpelier, VT	1995	2	Single	12,627	11,010	29	40	3	1	1	1
Santa Barbara, CA	1992	3	Single	15,600	18,450	55	79	11	0	17	2
Vail, CO	1995	1	Multilane	15,300	17,000	36	47	16	n/a	14	2
Vail, CO	1995	4	Multilane	27,000	30,000	36	47	42	n/a	61	0
Vail, CO	1997	4	Multilane	18,000	20,000	36	21	18	n/a	8	0
Vail, CO	1997	4	Multilane	15,300	17,000	36	21	23	n/a	15	0
Washington County, MD	1996	1	Single	7,185	9,840	56	35	18	6	2	0
West Boca Raton, FL	1994	1	Single	13,469	13,469	31	49	4	1	7	0

*1 = four-legged, one street stopped; 2 = three-legged, one street stopped; 3 = all-way stop; 4 = other unsignalized; 6 = signal

Regression models: From data about intersections not converted and a consideration of existing models, the regression models required for the empirical Bayes estimates of safety effect (Equations 2-5) were assembled. New models were calibrated for stop controlled urban intersections, whereas other models were adopted from Lord (2000) for signalized intersections and Bonneson and McCoy (1993) for rural stop controlled intersections. For urban stop controlled intersections, two levels of models were calibrated:

$$\text{level 1: } crashes/year = (\alpha)\ (total\ entering\ AADT)^{\beta} \quad (7)$$

$$\text{level 2: } crashes/year = (\alpha)\ (total\ entering\ AADT)^{\beta 1}\ (minor\ road\ proportion\ of\ AADT)^{\beta 2} \quad (8)$$

Two levels of models were required because in a few instances, estimates of annual average daily traffic (AADT) were available only for the intersection as a whole. In most cases, entering AADTs were available for each approach, and level 2 models, which produce better estimates, could be applied. The data set used for the calibration was from a sample of urban intersections in Florida, Maryland, and Toronto, Ontario. These data confirmed the stability of crash reporting over the time period of the conversion data in two states that accounted for 9 of the 24 intersections. The models adopted from previous research were of the same forms as Equations 7-8.

Following recent works by Persaud et al. (1997) and Bonneson and McCoy (1993), the Generalized Linear Interactive Modelling (GLIM) software package (Baker and Nelder 1978) was used for estimating the parameters α (actually $\ln(\alpha)$ since a linear model is fitted) and the βs for Equations 7-8 for all crashes combined and for injury crashes only. GLIM allows the specification of a negative binomial distribution, which now is regarded as being more appropriate to describe the count of crashes in a population of entities than the Poisson or normal distributions assumed in conventional regression modelling. In specifying a negative binomial error structure, the parameter k (Equation 5), which relates the mean and variance, had to be iteratively estimated from the model and the data as part of the calibration process.

Typical model calibration results are illustrated in Table 2, which shows the level 2 coefficient estimates for four-legged, one-street stopped intersections. Models were also estimated for three-legged stop controlled intersections. Full details of both the new and existing models are given in the project report (Persaud et al., 1999).

Table 2
Level 2 Reference Population Models for One Street Stopped, Four-Legged Urban Intersections Considering Distribution of AADT Between Major and Minor Road
crashes/year = (α) (*total entering AADT*)$^{\beta 1}$ (*minor road proportion of AADT*)$^{\beta 2}$

Crash Severity	Jurisdiction	ln(α) (Standard Error)	β1 (Standard Error)	β2 (Standard Error)	k
All combined	Maryland Florida	–9.900 (2.04) –9.868 (2.07)	1.198 (0.210)	0.370 (0.125)	3.10
	Combined	–9.886 (2.01)	1.202 (0.213)	0.376 (0.107)	3.10
Injury	Maryland Florida	–8.271 (2.33) –8.015 (2.37)	0.861 (0.249)	0.173 (0.127)	3.34
	Combined	–8.613 (2.31)	0.904 (0.245)	0.197 (0.122)	3.24

Because of major operational differences between various roundabout designs and settings, results were analyzed and reported for several groups of conversions for which there were sufficient crash data to provide meaningful results. These include 9 urban single-lane roundabouts that prior to construction were stop controlled, 5 rural single-lane roundabouts that prior to construction were stop controlled, 7 urban multilane roundabouts that prior to construction were stop controlled, and 3 urban intersections converted to roundabouts from traffic signal control.

RESULTS

Table 3 summarizes the estimated crash reductions and provides two measures of safety effects. The first is "index of safety effectiveness" (θ), which is approximately equal to the ratio of the number of crashes occurring after conversion to the number expected had conversion not taken place. The second is the more conventional percent reduction in crashes, which is equal to $100(1-\theta)$. Overall, the empirical Bayes procedure estimated a highly significant 39 percent reduction for all crash severities combined for the 24 converted intersections. Because injury data were not available for the period before construction of the 4 roundabouts in Vail, overall estimates for changes in injury crashes are based on the other 20 intersections. The empirical Bayes procedure estimated a highly significant 76 percent reduction for injury crashes for these 20 converted intersections.

Table 3 also summarizes estimated crash reductions for selected groups of conversions. For the group of 9 urban single-lane roundabouts converted from stop control, the empirical Bayes procedure estimated a highly significant 61 percent reduction for all crash severities combined and a 77 percent reduction for injury crashes. For the group of 5 rural single-lane roundabouts converted from stop control, similar effects were estimated — a 58 percent reduction for all crash severities combined and an 82 percent for injury crashes. For the group of 7 urban multilane roundabouts, however, the estimated effect on all crash severities combined was smaller — a 15 percent reduction. Because injury data were not available for the period before construction of 4 of these roundabouts, overall estimates for changes in injury crashes were not computed for this group of intersections. For the 3 roundabouts converted from traffic signal control, estimated reductions were 32 percent for all crash severities combined and 68 percent for injury crashes. Two of these roundabouts had multilane circulation designs.

For completeness, partial results also are given for individual conversions in a group. Readers are cautioned about drawing conclusions from these results because there is a significant likelihood that the change in safety for individual conversions is due to chance. In some cases, however, there may be logical explanations for an apparent deterioration in safety following roundabout conversion. At the Gainesville site, for example, transportation officials were unable to secure adequate right of way to construct a roundabout to design specifications that would accomplish the desired deflection and speed reduction. This may explain the apparent absence of crash reduction at this site.

Table 3
Estimates of Safety Effect for Groups of Conversions

Group Characteristic Before Conversion/Jurisdiction	Count of Crashes During Period After Conversion		Crashes Expected During After Period Without Conversion (Standard Deviation)		Index of Effectiveness (Standard Deviation)		Percent Reduction in Crashes	
	All	Injury	All	Injury	All	Injury	All	Injury
Single Lane, Urban, Stop Controlled								
Bradenton Beach, FL	1	0	9.9 (3.6)	0 (0)				
Fort Walton Beach, FL	4	0	16.9 (3.9)	2.7 (1.1)				
Gorham, ME	4	0	6.8 (1.4)	0.9 (0.4)				
Hilton Head, SC	9	0	42.8 (6.0)	8.2 (1.9)				
Manchester, VT	1	1	1.7 (0.7)	0 (0)				
Manhattan, KS	0	0	4.2 (1.2)	1.2 (0.5)				
Montpelier, VT	1	1	4.3 (1.8)	1.1 (0.6)				
Santa Barbara, CA	17	2	17.97 (4.9)	0 (0)				
West Boca Raton, FL	7	0	8.1 (3.0)	2.6 (1.3)				
Entire group (9)	44	4	112.6 (10.2)	16.6 (2.6)	0.39 (0.07)	0.23 (0.12)	61	77
Single Lane, Rural, Stop Controlled								
Anne Arundel County, MD	14	2	24.6 (4.0)	6.2 (1.7)				
Carroll County, MD	4	1	15.2 (2.6)	3.2 (0.9)				
Cecil County, MD	10	1	14.3 (2.9)	5.6 (1.4)				
Howard County, MD	14	1	36.7 (5.5)	7.7 (2.1)				
Washington County, MD	2	0	14.4 (3.1)	4.2 (1.3)				
Entire group (5)	44	5	105.2 (8.4)	26.9 (3.4)	0.42 (0.07)	0.18 (0.09)	58	82
Multilane, Urban, Stop Controlled								
Avon, CO	3	0	19.9 (4.9)	0 (0)				
Avon, CO	17	1	12.2 (3.1)	0 (0)				
Avon, CO	13	0	30.1 (5.7)	2.3 (1.0)				
Vail, CO	14	—	19.1 (4.4)	—				
Vail, CO	61	—	50.9 (7.6)	—				
Vail, CO	8	—	9.8 (2.1)	—				
Vail, CO	15	—	11.8 (2.3)	—				
Entire group (7)	131		153.8 (12.4)	n/a	0.85 (0.10)	n/a	15	n/a
Urban, Signalized								
Avon, CO	44	1	49.8 (7.0)	5.4 (1.7)				
Avon, CO	18	0	52.1 (7.0)	5.3 (1.7)				
Gainesville, FL	11	3	4.8 (1.5)	1.3 (0.5)				
Entire group (3)	73	4	106.7 (10.0)	12.0 (2.5)	0.68 (0.10)	0.32 (0.17)	32	68
All conversions	292	14	478.2 (20.7)	57.8 (5.1)	0.61 (0.04)	0.24 (0.07)	39	76

— Data not available

Effects on fatal crashes and those causing incapacitating injuries are more difficult to measure due to the small samples, but indications are that such crashes were substantially reduced. For the 20 converted intersections with injury data, there were 3 fatal crashes during the before period and none during the after period. The fatal crashes may have contributed to the fact that the roundabouts were constructed and may therefore contribute to the regression-to-the-mean phenomenon. There were 27 incapacitating injury crashes during the before period and only 3 during the after period. Taking into account the durations of the before and after periods and increases in traffic volume, and adjusting for regression to the mean (estimated to be roughly 22 percent), the observed value of 3 incapacitating or fatal injury crashes during the after period is substantially and significantly less than the 26.6 expected. The estimated reduction in fatal and incapacitating injury crashes is 89 percent ($p<0.001$).

There were 3 reported pedestrian crashes during the before period and 1 (with minimal injuries) during the after period. Four bicyclists were injured during the before period and 3 during the after period. However, these samples are too small to be meaningful.

DISCUSSION

Results of this study indicate that converting conventional intersections from stop sign or traffic signal control to modern roundabouts can produce substantial reductions in motor vehicle crashes. Of particular note are the large reductions found in the number of injury crashes, especially those involving incapacitating and fatal injuries. These findings generally are consistent with results of numerous international studies. The accumulated knowledge suggests that roundabout construction should be strongly promoted as an effective safety treatment for intersections. Given the large numbers of injury (700,000) and property damage (1.3 million) crashes that occur each year at traffic signals and stop signs in the United States (National Highway Traffic Safety Administration, 1999), widespread construction of roundabouts can produce substantial reductions in crash losses associated with motor vehicle use on public roads.

It is possible that the smaller safety effect observed for the group of urban intersections that previously were multilane and stop controlled may be due to differences in safety performance of single- versus multilane roundabout designs. However, a firm conclusion cannot be made because of other important differences between conversions in Colorado and those in other states. For example, 3 of the 4 roundabouts in Colorado are part of freeway interchanges that also include nearby intersections that were previously four-way stop controlled. The multilane roundabouts do seem to be effective in eliminating most incapacitating injury crashes.

Crash reductions resulting from conversion of conventional intersections to modern roundabouts can be attributed primarily to two factors: reduced traffic speeds and elimination of specific types of motor vehicle conflicts that frequently occur at angular intersections. These conflicts include left turns against opposing/oncoming traffic, front-to-rear conflicts (often involving the lead vehicle stopping or preparing to stop for a traffic signal or stop sign), and right-angle conflicts at traffic signals and stop signs. Retting et al. (2000) reported that crashes associated with these three intersection traffic conflicts account for two-thirds of police-reported crashes on urban arterials. Red light running crashes, which involve side impacts at relatively high speeds, are especially injury producing (Retting et al., 1995) and can be eliminated through roundabouts conversion.

Although the sample was too small to estimate effects on pedestrian crashes, Scandinavian evaluations of roundabouts conclude that single-lane roundabouts are very safe for pedestrians (Ulf and Jörgen, 1999). Data from this study give no reason to doubt that those experiences can be translated to North America. And none of the multilane roundabouts have had a single pedestrian crash so far, even though there were two crashes during the before period at these sites. Likewise, Scandinavian experience shows that single-lane roundabouts with one-lane entries are very safe for bicyclists.

Some have expressed concern that older drivers may have difficulties adjusting to roundabouts. However, in this study, the average age of crash-involved drivers did not increase following the installation of roundabouts, suggesting that roundabouts do not pose a problem for older drivers.

In addition to reducing the risk of motor vehicle crashes and injuries, conversion to roundabouts can produce other important societal benefits including reductions in vehicle emissions, noise, fuel consumption, and traffic delays (Hyden and Varhelyi, 1999; Jacquemart, 1998). Roundabouts also can improve the aesthetic appearance of intersections by providing opportunities for landscaping and architectural treatments. Roundabouts in place of traffic signals can provide cost savings for local governments by avoiding the expense of new traffic signal construction and maintenance.

Roundabouts are not feasible, nor appropriate, at all intersections. Sufficient right of way must be available for construction of the circular intersection. Typically, a modern roundabout has an outer diameter of approximately 100 feet (30 m). This allows for large enough deflections to reduce speeds to an appropriate level. However, land can be saved compared with signalization because approach roads can be kept narrower. Capacity constraints and limited rights of way eliminate from consideration many busy urban intersections, especially those located in central business districts. Also, intersections with high volumes of both bicycle and motor vehicle traffic may not be good candidates for roundabouts. There remains a need to develop a procedure for estimating the likely safety consequences of a contemplated installation. In the meantime, it is suggested that future installations be patterned after the ones found in this study to have had a very positive safety experience.

ACKNOWLEDGEMENTS

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APPENDIX
Empirical Bayes Estimation

The theory is covered in detail elsewhere (Hauer, 1997), so what is presented here is merely an illustration. Consider the Anne Arundel County, Maryland, intersection converted in 1994 for which the crash counts and AADTs on the approaches were as follows.

	Before Conversion	After Conversion
Months (years) of crash data	56 (4.67)	38 (3.17)
Count of total crashes	34	14
Major approaches AADT	10,654	11,956
Minor approaches AADT	4,691	5,264

Estimating B: The Crashes That Would Have Occurred in the After Period without the Conversion

First, using the model from Bonneson and McCoy (1993), the regression estimate (Y) of the number of *total* crashes/year during the before period is:

$$P\ (crashes/year) = 0.000379 \times (major\ road\ AADT)^{0.256} \times (minor\ road\ AADT)^{0.831}$$
$$= 0.000379 \times (10{,}654)^{0.256} \times (4{,}691)^{0.831} = 4.58.$$

Then, the expected annual number of crashes during the before period is estimated as:

$$m_b = (k + x_b) / (k/P + y_b),$$

where x_b is the count of crashes during the before period of length y_b years and $k = 4.0$ is a parameter estimated in the regression model. Thus, the expected annual number of crashes during the before period is:

$$m_b = (4.0 + 34) / [(4/4.58) + 4.67] = 6.860.$$

To estimate *B*, the length of the after period and differences in the AADTs between the before and after period must be considered. This is accomplished by first multiplying the expected annual number of crashes in the before period by *R*, the ratio of the annual regression predictions for the after and before periods. In the after period:

$$crashes/year = 0.000379 \times (11{,}956)^{0.256} \times (5{,}264)^{0.831} = 5.19.$$

The ratio *R* of the after period to the before period regression predictions is:

$$R = 5.19/4.58 = 1.133,$$

which gives:

$$m_a = R \times m_b = 1.133 \times 6.860 = 7.772 \text{ crashes/year}.$$

Finally, to the estimate of B, the number of crashes that would have occurred in the after period had the conversion not taken place, m_a is multiplied by y_a, the length of the after period in years. Thus:

$$B = 7.772 \times 3.17 = 24.61.$$

Recall that 14 crashes actually occurred. The variance of B is given by:

$$Var(B) = B \times R \times y_a/(p + y_b) = 24.61 \times 1.133 \times 3.17 / (0.873 + 4.333) = 16.93$$

Estimation of Safety Effect

In the estimation of changes in crashes, the estimate of B is summed over all intersections in the converted group and compared with the count of crashes during the after period in that group (Hauer 1997). For the 5 conversions in Maryland, the table below gives the estimates of B, variance of these estimates, and the count of crashes in the after period.

After Period Count (A)	Empirical Bayes Estimate (B)	$Var(B)$
14	36.71	30.63
14	24.62	15.95
2	14.38	9.40
10	14.33	8.55
4	15.16	6.76
Sum = λ = 44	Sum = π =105.19	Sum = 71.29

The variance of B is summed over all conversions. The variance of the after period counts, A, assuming that these are Poisson distributed, is equal to the sum of the counts. There are two ways to estimate safety effect as shown below. For each, the estimation of the variance is illustrated.

Method 1: Reduction in Expected Number of Crashes (δ)

This is the difference between the sums of the Bs and As over all sites in a conversion group. Let:

$$\pi = \Sigma B$$
$$\lambda = \Sigma A;$$

thus:

$$\delta = \pi - \lambda.$$

For the Maryland conversion data in the table above:

$$\delta = 105.19 - 44 = 61.19.$$

The variance of δ is given by:

$$Var(\delta) = \Sigma\ Var(B) + \Sigma\ Var(A).$$

For the Maryland conversion data in the table above:

$$Var(\delta) = 71.29 + 44 = 115.29.$$

Method 2: Index of Effectiveness (θ)

A biased estimate of θ is given by:

$$\theta = \lambda / \pi.$$

The percent change in crashes is in fact 100(1–θ); thus a value of θ = 0.7 indicates a 30 percent reduction in crashes. From Hauer (1997), an approximate unbiased estimate of θ is given by:

$$\theta = (\lambda/\pi) / \{1 + [Var(\pi)/\pi^2]\}.$$

For the Maryland conversion data in the table above:

$$\theta = (44/105.19)/[1 + (71.29/105.19^2)] = 0.416.$$

The variance of θ is given by:

$$Var(\theta) = \theta^2\{[Var(\lambda) / \lambda^2] + [Var(\pi)/\pi^2]\} / [1+Var(\pi)/\pi^2]^2.$$

For the Maryland conversion data in the table above:

$$Var(\theta) = 0.416^2\ [(44/44^2) + (71.29/105.19^2)] / [1 + (71.29/105.19^2)]^2 = 0.0050.$$

ATTACHMENT 2

Written Testimony
Submitted between
April 14 and April 28, 2004

Memorandum City of Springfield

Date: April 28, 2004

To: Sonny Chickering, P.E., County Engineer

From: Brian F. Barnett, P.E., Traffic Engineer

Subject: Air Quality Predictions for Roundabout and Signal Intersection Forms

This memorandum presents the air quality results of analysis of traffic volumes for years 2007 and 2018, as predicted in the RiverBend Master Plan traffic study prepared by Peace Health. Year 2007 analysis represents the opening day of the hospital and MLK Jr. Parkway. Year 2018 analysis represents the horizon year for the master planned area.

The software called "aaTraffic SIDRA" is a capacity and analysis tool, and was used to predict the total pollutant load and fuel consumption of traffic signal and roundabout intersection forms at Hayden Bridge Way and MLK Jr. Parkway/Pioneer Parkway intersection. SIDRA is capable of analyzing intersections using signs, signals, and roundabouts forms of traffic right of way control. SIDRA was used to provide the most consistent comparison between intersection forms.

The analysis was done on volumes expected in the PM peak hour for the two analysis years. In both analysis years, 2007 and 2018 vehicles using a roundabout vs. a traffic signal are expected to consume about 12% to 16% less fuel and produce about 6% to 24% less total air pollution. These results are limited to PM peak hour conditions. The performance advantage of a roundabout vs. a signal during low to moderate flow conditions is bigger than during peak flows. Thus, during off peak times the percentage reduction of fuel consumed and air pollutants produced, are even larger than those shown in the tables below. Results for the PM peak hour are in the tables that follow.

Please enter this information into the Martin Luther King, Jr. Parkway project record. If you need additional information, please contact me.

Air Quality for PM Peak Hour in Analysis Year 2007			
Measure	**Traffic Signal**	**Roundabout**	**Reduction (%)**
Fuel Consumption (gallons/hour)	92.4	81.4	11.9
Carbon Dioxide (kg/hr)	875.6	771.5	11.9
Hydrocarbons (kg/hr)	1.414	1.153	18.5
Carbon Monoxide (kg/hr)	39.57	35.68	9.8
NOX (kg/hr)	1.659	1.560	6.0

Air Quality for PM Peak Hour in Analysis Year 2018			
Measure	**Traffic Signal**	**Roundabout**	**Reduction (%)**
Fuel Consumption (gallons/hour)	129.5	108.5	16.2
Carbon Dioxide (kg/hr)	1227.3	1027.9	16.2
Hydrocarbons (kg/hr)	2.075	1.582	23.8
Carbon Monoxide (kg/hr)	55.09	47.09	14.5
NOX (kg/hr)	2.208	2.012	8.9

To: Lane County Public Works

Attn: Sonny Chickering

Re: Martin Luther King, Jr. Memorial Parkway Project

April 27, 2004

Sir:

Please enter into the public record my views concerning the construction of roundabouts as a traffic control solution for the new Martin Luther King Parkway in Springfield. I have long advocated the increased use of modern, British-style roundabouts, and feel that this project offers an excellent opportunity to demonstrate their benefits and to enhance the safety, efficiency and aesthetic beauty of this new parkway.

The primary benefit of roundabouts is safety. Where they have been constructed recently in the United States, while often met with initial skepticism, they have reduced injuries and fatalities statistically by 50% to 86%, according to records from Colorado, Maryland and other states. Not only do they reduce vehicular accidents, but they also provide a safer crossing for pedestrians and bicyclists, who cross behind, rather than in front of, the first car in line to enter the roundabout.

While safety alone is reason enough to seriously consider the widespread use of roundabouts, it has also been shown that they are often the most efficient way to move traffic through an intersection. In Long Beach, CA, a refurbished roundabout now processes traffic at the rate of 5,000 vehicles an hour, with an average delay of only about five seconds. A new roundabout configuration at a freeway exit in Vail, CO, has been met with cheers from the public as it has eliminated traffic backups that often stretched all the way back onto Interstate 80. There are many such examples as these intersections have gained acceptance throughout the country.

From the standpoint of fuel efficiency and air quality, when one considers the vast numbers of cars idling at red-light intersections at any given moment, the benefit of moving cars more quickly through an intersection becomes obvious. Modern, multi-lane intersections with traffic lights are designed to "store" traffic, while typically moving only one or two lanes of traffic at a time. Roundabouts have the benefit of continuously moving traffic, reducing fuel consumption and pollution at the same time.

Roundabouts are less expensive to construct and maintain than conventional intersections, with the added advantage of creating space for beautiful flower plantings or other landscaping in their centers. The only real issue is education, but from my experience the process of negotiating a roundabout is simple. One merely yields, looks left for the next opening in traffic, and merges. Cars in the circle have right-of-way, and simply choose where they leave the circle, only ever making a right turn, never a left.

I am confident that placing roundabouts along the new parkway is not only the best answer to the traffic flow question, but that the public will find them efficient, easy to negotiate and aesthetically pleasing. Thank you for taking my views into consideration.

Sincerely,

Norman C. Waddell
155 Coachman Dr.
Eugene, OR 97405

(541)302-2846

4/28/2004

To: Lane County Commissioners

From: John and Kathy Vogt, 2795 Castle Drive, Springfield, OR (the corner of Seward and Castle Drive).

Subject: MLK Parkway/Hayden Bridge Way intersection and related topics

Regrettably we were out of town for the public meeting on this topic. Please consider the following thoughts and questions in making your decision on the roundabout on MLK/Hayden Bridge Way. I will be addressing some of the comments made at that meeting as reported in the Springfield News.

Our underlying concern is that Wayside Loop would be closed to Hayden Bridge Way if a roundabout is not approved. This would dump an additional 900 cars/day into our quiet neighborhood. I am attaching a copy of my written comments from March 17 in case you do not have them readily available. Please refer to my concerns mentioned there.

I often use the roundabout by Symantec and have always sailed through with only a slight reduction of speed. I sense that many people are uncomfortable with the concept but it certainly handles the traffic flow well.

Do the people on Wayside, who oppose the roundabout, realize that they may lose direct access to Hayden Bridge Way if the roundabout is not approved?

It seems to me that using a roundabout is simply making a right turn at a yield sign and changing lanes to the inside if you want to go around a ways. I think drivers could be educated to that.

The larger two lane roundabout would be much more efficient with traffic than the single lane small radius one located near Symantec. A five way roundabout is simple, effective solution. A five-way traffic light would not be simple or effective.

Hopefully your final decision on this matter will keep Wayside open to Hayden Bridge Way and be based on objective study and analysis by experts in the transportation and traffic field.

We urge you to approve the roundabout on Hayden Bridge Way as recommended by the Springfield City Council. Springfield's transportation staff and the council did an excellent and thorough job of studying this issue and getting public input.

Sincerely,

John H. Vogt

747-9614

Kathryn V. Vogt

Previously submitted 3/17/2004

To: Lane County Commissioners

From: John and Kathy Vogt, 2795 Castle Drive, Springfield, OR

Subject: MLK Parkway/Hayden Bridge Way intersection and related topics

We strongly support the resolutions passed by the Springfield Council on March 15 and urge you take action that supports their decision.

Because our neighborhood could be greatly impacted with a large influx of traffic we offer the following thoughts for your consideration.

John and Kathy Vogt

The following are our thoughts and opinions on roundabouts, Wayside Lane and Opening Seward

Keep Wayside Loop open to Hayden Bridge Rd!!

We live at the corner of Seward and Castle Drive. We would be greatly impacted if Wayside is closed to Hayden Bridge Way. Since Manor is already congested and slow, I believe that at least 500 of the 900 cars that presently move in and out of Wayside would come past our home either to go up Castle or on up Seward to Third. Presently, I doubt if we have more that 100 cars a day past our corner. Opening Seward would provide a straight shot from Wayside to 3rd thus encouraging a speeding problem.

Access to Hayden Bridge Road is difficult from Manor, Castle Dr. and Third. To make a left turn onto Hayden Bridge we currently wind our way through the neighborhood to 5th and Hayden Bridge to take advantage of the light. Adding an additional 900 cars a day to the mix would certainly pose a traffic problem and detract from our quiet neighborhood, especially along Seward.

Wayside loop traffic will not use Manor to access Hayden Bridge because Manor is narrow and residence must park on the street because many of these homes are single car driveways and garages. This will put the bulk of the traffic down Seward to Castle and Third. However, as this traffic realizes that they have difficulty turning left onto Hayden Br, they will learn that the winding trip through the neighborhood to the light at 5th the quickest way out.

Again, cars parked along both sides of Manor, Castle, and Third St. already interrupt the smooth flow of traffic. We feel that putting and extra 900 cars a day past our corner is a lousy deal for us and totally unnecessary!

Put in a roundabout at the intersection of Pioneer Parkway, Wayside Loop, and Hayden Bridge Rd!!

Short of building an overpass, a roundabout would provide the smoothest traffic flow at this intersection. I also feel that it would encourage southbound traffic to move on down Pioneer Parkway to I-105 instead of turning onto Hayden Bridge Way (already a crowded street that goes through schools zones and past homes). A five way light at this intersection that would facilitate Wayside traffic does not seem efficient. The 900 cars you figure that use Wayside would be an insignificant addition of traffic in a roundabout. I have often used the roundabout at 39th and Glison in Portland - it works very well at this busy intersection. It is my understanding that Bend and Coeur d'Alene have used roundabouts to solve difficult traffic situations. I feel that people will initially complain but will adjust quickly.

Leave Seward closed between Wayside and Manor.

This would be desirable because it would preserve the quiet nature of both neighborhoods. That is why we moved here in the first place.

John and Kathy Vogt
2795 Castle Drive
747-9614

Springfield, Oregon, United States