City of Sherwood Oregon

Home of the Tualatin River National Wildlife Refuge

City of Sherwood
PLANNING COMMISSION
Sherwood City Hall
22560 SW Pine Street
Sherwood, OR 97140
November 13, 2007 – 7PM

1. **Call to Order/Roll Call**

2. **Agenda Review**

3. **Consent Agenda** – Draft Minutes from September 25, 2007

4. **Staff Announcements**

5. **Council Announcements (**Council President Dave Grant, Planning Commission Liaison**)**

6. **Community Comments** (*The public may provide comments on any non-agenda item)*

7. **Old Business:**

8. **New Business:**

   a. **Public Hearing – Former Driftwood Mobile Home Park Plan Amendment (PA 07-01)** – The applicant has requested to change the zone of the former driftwood mobile home park located at 21305 SW Pacific Highway (assessor map 2S130D, tax lot 1200) from Medium Density Residential Low to Retail Commercial.

   b.) **Public Hearing – Oregon Street Industrial Park (SP 07-08)** – the applicant has requested that the hearing be continued until November 27, 2007 to allow time to respond to issues raised by staff during the review phase.

9. **Comments from Commission**

10. **Next Meeting:** November 27, 2007 – Oregon Street Industrial Park

11. **Adjournment**

City of Sherwood, Oregon
Planning Commission DRAFT Minutes
September 25, 2007

Commission Members Present:
Chair Patrick Allen
Jean Lafayette
Dan Balza
Adrian Emery
Lisa Walker

Staff:
Julia Hajduk, Planning Manager
Michelle Miller, Associate Planner
Cynthia Butler, Recording Secretary
Gene Thomas, P.E.
Jonathan Ingram, Engineering Associate
Lance Gilgan, Recreation Coordinator

Commission Members Absent:
Matt Nolan
Todd Skelton

Council Liaison – Dave Grant

City Attorney – Matthew Michel

1. **Call to Order/Roll Call** – Cynthia Butler called roll. Matt Nolan and Todd Skelton were noted as absent.

2. **Agenda Review** - Chair Allen welcomed new Commissioner, Lisa Walker to the Planning Commission. Patrick also stated that nominations and voting for a Vice Chair originally planned to add to the agenda this evening, would be postponed when all members of the Commission were present. There were no changes to the agenda.

3. **Consent Agenda –** Minutes from the July 10th & July 24, 2007 sessions were approved by vote:

Yes – 5 No – 0 Abstain - 0

4. **Announcements –** Julia Hajduk announced that this was Cynthia Butler's last Planning Commission session as Recording Secretary for the City of Sherwood, as she was taking a new position with the City of Portland. Julia introduced Stephanie Guediri who will be stepping in as Recording Secretary on an interim basis until a permanent replacement is determined. Julia said that an application for a PUD Modification for the Langer PUD development is under review and will be heard by the City Council on October 16th, concurrently with a development agreement that is under consideration on this project. The Brookman Rd. Concept Plan Open House is October 10th, followed by the Steering Committee meeting on October 24th. Brookman Rd. Concept Plan postcard mailers and email notification about the open house has been sent to property owners and interested parties to get the word out. The Comfort Suites Hotel & Conference Center appeal was heard by the City Council on September 18th, which was approved with a modified condition that the access is temporary and will be relocated to the property line when an existing structure causing the temporary location is removed.

Chair Allen asked Council liaison and Council President Dave Grant, if he had any comments to share from the Council. Councilor Grant acknowledged a full agenda this evening and had no announcements from Council at this time.

5. **Community Comments –** Chair Allen asked if there were any community comments on topics not on the agenda. There were none.

6. New Business – Public Hearing – SP 07-09; CUP 07-03 Snyder Park Lighting Appeal: Chair Allen recapped the state mandated rules for the appeal hearing process, particularly in regard to testimony and evidence, and how that differed from rules governing the original hearing. Only those parties who submitted verbal or written testimony in the initial hearing are allowed to give testimony in the appeal hearing, and only evidence submitted during the initial hearing is permitted for review and deliberation. Chair Allen asked the public to consider that the shared goal to create a community in Sherwood that all residents can enjoy, which will assist the public meeting process by allowing mutual respect for differing viewpoints expressed.

Adrian Emery read the Public Appeal Hearing Disclosure Statement.

Chair Allen asked Commissioners if there was any exparté contact, conflicts of interest or bias to declare. Patrick added that he received an email as part of a large distribution list notifying people of the hearing and suggesting attendance, with nothing substantive regarding the materials, which would not impair his ability to make an impartial decision on this application.

Dan Balza recused himself from the hearing on this matter and took a seat in the audience.

Jean Lafayette stated that she had a conversation with Harry Lance who lives across the street from Snyder Park. Jean added that she visited the site and that she served on the Planning Commission in 2003 for the original application on the baseball field, and has re-read the record from that time period. Jean stated that these would not impair her ability to make an impartial decision on this application.

Lisa Walker stated that she also received the email notifying people of the hearing and suggesting attendance, which would not impair her ability to make an impartial decision on this application.

Adrian Emery stated that he had conversations with several people in passing, but these would not affect his ability to make an impartial decision on this application.

Chair Allen reviewed the time limits and process for participants in an appeal hearing. Chair Allen opened the hearing at 7:15 PM.

Michelle Miller recapped the appeal received and the initial hearing held on August 6, 2007, and the subsequent Notice of Decision by the Hearings Officer dated August 13, 2007. The Hearings Officer approved with conditions the installation of 70 foot light fixtures at Snyder Park Soccer Field to light soccer fields for soccer and lacrosse team practices and games, finding that the applicable criteria had been met with several conditions of approval, primarily that the lights would comply with Section 16.154 of the Code regarding Heat and Glare standards. Michelle stated that at the initial hearing proponents of the application cited benefits to the community by allowing an additional 1300-1800 soccer and lacrosse players to use the field during the fall & winter months. Opponents cited the Heat & Glare standards were not met, and that property values and enjoyment of property would be damaged by the installation of the lights. Michelle added that some of the opponent testimony asserted that verbal promises were made by the former Mayor for the City of Sherwood at the initiation of the park that lighting would never be installed.

Michelle cited and responded to the 4 primary issues raised by the appellant in the appeal: 1) Light fixtures did not demonstrate that they would reduce glare into adjacent properties; 2) Setbacks for the light fixtures did not satisfy the Code criteria; 3) Neighboring property would be adversely affected; and 4) Mitigation measures such as the shut-off time was not sufficient to protect the owners use and enjoyment of their property. Michelle said that the appellant also asserted that the Hearings Officer incorrectly interpreted the requirements for towers and wireless communication facilities.

Michelle responded: 1) The half-foot candle of illumination at the property line of the neighboring property owners was found to meet the standards with the condition that the City would hold accountable and guarantee that Musco Lighting, designer of the light fixtures, complies with the claimed illumination levels that are approved; 2) The park abuts a residential zone the setback requirements apply. Fixtures will be further than 20 feet from the front and rear property lines, and further than 5 feet from the side, meeting the setback standards; 3) The applicant is required to show that the proposal meets all the overall needs of the community. The Sherwood Parks Board made the recommendations to support the light of the soccer field to provide for necessary recreational facilities for Sherwood citizens. The City Council placed lighting sports fields as a goal for 2007, and were the policy decisions that initiated this land use application process. The applicant presented testimony that showed the increased number of users and the amount of added playing time; 4) No evidence was presented at the initial hearing to support the claim that property values would be adversely affected.

Michelle discussed the public notice issue raised by the appellant and referred to a letter submitted by the appellant's attorney, Kenneth Helm, dated September 14, 2007, Exhibit 1 of the packet. Michelle added that the Code is clear in respect to providing public notice and recapped the process followed by the City, concluding that the City met all requirements including providing a signed affidavit shown in Exhibit 4 of the packet showing that public notice standards were completed. Michelle addressed the petition submitted by the appellant with signatures in opposition to the soccer field lighting, and reiterated that the law restricts testimony and evidence received at an appeal hearing to that which was presented at the initial hearing, disallowing the petition submittal to be considered by the Planning Commission.

Michelle concluded that staff recommends the Planning Commission uphold the decision of the Hearings Officer approving the proposed lighting at Snyder Park.

Chair Allen asked Commissioners if there were any questions of staff at this time prior to receiving the applicant testimony. There were none.

Gene Thomas, P.E. – Project Engineer and Applicant/City of Sherwood; Gene recapped reasons for the application that included extending practice and play time on the soccer field for an increased population of participants, and meeting Parks Board needs and City Council goals to provide lighted sports fields for Sherwood citizens. Gene cited the artificial turf at the Snyder Park soccer field as providing an ideal location during the fall and winter months for soccer teams. Gene said that teams will not have control over the timing of the lights, which would be pre-set. The technical aspects of the lights were discussed, including the half-foot candle illumination and design to project lighting downward onto the field instead of across the field. Gene said that the City can measure the lighting to assure that it meets the criteria.

Jonathan Ingram, Engineering Associate and Applicant/City of Sherwood; Jonathan discussed Exhibit G, a map of Snyder Park previously presented to the Hearings Officer at the hearing on August 6, 2007. Jonathan said that the illumination along the property line will not be above a half-foot candle measurement, and will meet or exceed all setback requirements. Jonathan clarified that lights S-1 & S-2 will be 70 feet, but lights S-3 & S-4 will be 60 feet, as revised prior to the August 6th Hearings Officer session.

Lance Gilgan, Recreation Coordinator and Applicant/City of Sherwood; Lance revisited issues he presented at the initial hearing regarding the 9PM shut-off time for lights. An administrative rule was passed last year to extend the park hours to 9PM with the temporary lighting currently in place, which is the reason why the 9PM time was proposed in this application. Lance says at this time the temporary lights are not required beyond 8:15 and are extinguished at that hour. Control of the lighting would remain under his responsibility by pre-programming. Lance confirmed that the estimated 1300-1800 additional soccer and lacrosse players described by Michelle is accurate.

Lisa Walker referenced Exhibit C, a projected time table Lance prepared for the Parks Board showing lights coverage over a period of various months until 8PM in the evening, and asked Lance what changed the proposed time for lights out from 8PM to 9PM. Lisa also asked about the middle school lighting hours and operation policy.

Lance responded that the extra hour helps reduce the number of teams playing at the same time. Currently, Lance said that there are times when there are 4 teams practicing at once on one field and there are 80 soccer teams in the City this year. The Parks Board recommended the 9PM time. Lance confirmed that lights at the middle school can be on until 10PM and operated by key.

Tim Butts, Musco Lighting, 11710 SE Brockenhurst Circle, Happy Valley OR; Tim displayed the light fixture to be installed as presented at the initial hearing on August 6th, and discussed technical aspects of the light. Tim said that the sports lighting fixture keeps light on the field with very little off-site light, and is planned to have 20 mounted on 4 poles, 5 on each pole. The 20 foot candle it a class 4 level, which is practice level lighting. Musco Lighting guarantees the illumination claimed on lights.

Chair Allen asked if the applicant had further testimony. Gene confirmed any remaining for testimony would be reserved for rebuttal. Chair Allen opened testimony for the appellant.

Ken Helm, Attorney for Appellant, 16289 NW Mission Oaks Dr., Beaverton OR; Mr. Helm referred to his letter provided in the packet, Exhibit 1, dated September 14, 2007 and expressed that support of sports fields is an important component in the community, but that a balance needs to be maintained between the community's use of the park and its neighbors. Ken discussed the history of the park as related to him by his client and many of his client's neighbors, and reiterated that verbal promises were made by a former Mayor that the soccer field would never be lighted. Mr. Helm referred to the petition signed by neighbors and wanted the Commission to understand how many people were in opposition to the application, and would like the Commission to take this under consideration. Mr. Helm stated that he believed that although this may not be a legal standard, it could have a bearing on how the Commission evaluates other legal standards discussed later.

Chair Allen asked Mr. Helm to confirm if his practice was land use law, and how the Commission could consider non-legal evidence in the context of an appeal under Oregon law.

Mr. Helm confirmed 12 years practice in land use law, and added that although evidence may not be legally binding on their own merit they may have an impact on how additional arguments are evaluated. Ken discussed the Hearings Officer findings for the Heat & Glare standards and said that the condition in the Notice of Decision does not require performance testing to confirm lighting meets these standards prior to installation. Mr. Helm stated that a condition should be entered to require the City to conduct performance testing on the illumination and performed on a periodic basis. Regarding Exhibit G referred to in Jonathan Ingram's presentation, Mr. Helm stated that the foot candle measurements are only two-four hundredths away from violating the standard, and that it would take very little for the illumination measurement to vary. Regarding the 9PM shut-off time on Page 3 of his letter, he said that noise continues even after lights go out. An earlier shut-off time would reduce noise and activity in the park and wanted the Commission to consider 8PM.

Concluding, Mr. Helm discussed the public notice and said that many property owners indicate they did not receive notice and that this standard may have not been met. Additionally, Mr. Helm made 5 recommendations: 1) First choice, reverse the Hearings Officer decision and deny the application because the lighting is not a good fit for the neighborhood; 2) If approving the application, prior to approval provide greater outreach to neighbors recapping protections that will assure illumination standards are met and timing for lighting shut-off; 3) Confirm that data claimed by the lighting vendor is accurate prior to installation; 4) Add a condition that if lights do not perform that there is a bond and performance guarantee in place; 5) Affirm an 8PM shut-off time with no amendments.

Patrick Allen addressed the issue of public notice and said that an affidavit exists that the public notice process was done according to Code. Patrick added that the City has an obligation to follow the Code for public notice, but does not have an obligation under the Code to assure that notice reaches recipients. Regarding the performance bond issue, Patrick said that a bond is a financial aspect in protecting the City's interests that the City Council would evaluate, and asked Mr. Helm what basis under the Code requires the Planning Commission to consider this. Mr. Helm said that it would assure that the light spillage criteria is met. Patrick said that rather than a bond, this aspect could be addressed by the Planning Commission by making a condition that if illumination standards are not met the lights would not be permitted to be used. Patrick reiterated that the Commission's role must consider the Code. Mr. Helm stated that he did not disagree that the Planning Commission has the authority to impose conditions to ensure that standards in the Code are met.

Chair Allen reiterated that only those people who provided verbal or written testimony at the initial public hearing on August 6th may provide testimony this evening, and opened the hearing to public testimony, beginning proponents of the application. Chair Allen read the names of those already on the record.

Darrel McSmith, 23697 SW Stonehaven St., Sherwood OR; Darrel is a board member of the Sherwood Youth Soccer Club and schedules teams for fields in Sherwood. Darrel said finding space for teams during daylight hours is a challenge, and has asked the City during the past 3 years to help find additional space.

Thad Overturf, 22830 SW Forest Creek Dr. #100, Sherwood OR; Thad is on the Sherwood Parks Board and said that he is in favor of the lighting to accommodate the growth in the City, and said that progress often requires change.

Bill Butterfield, 23614 SW Heron Lakes Dr., Sherwood OR; Bill has installed 2 lighting projects in Sherwood and that Musco Lighting met all the requirements and guarantees. Bill stated that in order to install this equipment a pre-engineered package is required, which the City has.

Chair Allen asked if there were any other proponents on the record that wished to testify this evening. There were none. Chair Allen opened testimony to opponents on the record who wanted to testify. Chair Allen read the names of those already on the record.

Anthony Passadore, 23445 SW Sherk Pl, Sherwood OR; Anthony discussed the public notice process and said that the City could have done more to inform all the property owners around the park, and said that he and his neighbors used their own funds to get notice out to their neighbors to attend the meeting tonight. Mr. Passadore added that he gathered the signatures on the petition. Anthony said that he does not read the Tigard-Tualatin Times where the notice appeared and that it is likely not read by many who live in Sherwood. Mr. Passadore said that some of the proponents tonight who have testified work for a contractor who has won a bid to install lighting for the City, and that this should be disclosed as a conflict of interest. Anthony expressed concerns over lighting spillage and noise with the field being lighted longer into the evening, and added that a neighbor said another rendering of the map shown earlier (Exhibit G) had different light spillage measurements than was shown this evening. Mr. Passadore encouraged the use of grass fields for later practice instead of relying heavily on the Astroturf which he felt was not necessary. Mr. Passadore said that he & his neighbors are not against athletics, but that lights attract people and believes that people will be invited to remain in the park for longer periods with the lighting. Anthony concluded by saying the issue is about livability and not just the Code.

Jean Lafayette asked Mr. Passadore to clarify where he saw the additional rendering of lighting levels as mentioned in his testimony.

Julia Hajduk clarified that the applicant's original submittal had another design, but that this was revised before the August 6th Hearings Officer session.

Jean Lafayette asked for clarification that the information on Muscoe Lighting as mentioned previously in testimony from Bill Butterfield was in the packet.

Michelle Miller clarified that the Muscoe Lighting information was provided in Exhibit A of the packet.

Sarah Bullfinch, 23465 SW Sherk Pl., Sherwood OR; Sarah said that she agreed with everything that Anthony Passadore said, and added that her concern was that promises were made in the past when they moved into their home that no lighting would be installed in the park, and that lights are not wanted.

Paul Grob, Appellant, 23417 SW Sherk Pl., Sherwood OR; Paul stated that the appeal is not adversarial and that the appeal is done in the spirit of community. Paul said that mitigation for adverse effects is required and that he believes the application does not provide this.
Robin Krieger, 23221 SW Sherk Pl, Sherwood OR; Robin agreed that they were verbally promised several years ago that there would be no lights at the park. Robin expressed that the School District should have considered placing turf at the schools to accommodate night practice and games that require lighting. Robin said that she is a coach and is aware of the need to share field space, but feels in the long term it would benefit the community to delay any lighting at Snyder Park as long as possible. Robin stated that she is concerned about the light spread configuration of the lights at the middle school and if this configuration was used at Snyder Park how these will illuminate. Robin was also concerned about the 9PM turn-off time, which she expressed was too late. Robin concluded by saying that is does not seem appropriate that the Parks Board can determine the timing of the lights and that the height of the towers also ruins the view of the park.

Virginia Maffit, 15329 SW Sunset Blvd., Sherwood OR; Virginia said that she was at the original meeting when former Mayor Mark Cottle verbally promised that there would never be lighting at the park. Virginia added that at the meeting people also expressed concerns about having sound at the park, and wanted to know what could be done to assure that sound does not get installed as well.

Chair Allen reiterated the public hearing process for Planning Commission and the City Council, and added that citizens can ask to be on interested parties list to receive updates when projects are under hearing review.

Julia Hajduk concurred that the Planning Commission cannot randomly make changes to the Code and encouraged public involvement at public hearings when changes to the Code are being presented.

Virginia concluded by saying she also felt there was not ample notice provided, and that the large light poles would detract from the value of their homes, as prospective buyers would prefer homes without the view of the poles.

Allison Bassich, 15081 SW Smock St. Sherwood OR; Allison said that her street is a dead-end along one side of the park, which already attracts vehicle parking issues and activity. Allison said that extending the hours of the park impacts the livability of her home. Allison added that the view of the spectacular park will be damaged by the large lighting poles.

Judy Roberts, 15076 SW Smock St., Sherwood OR; Judy said that she used to live near Tualatin High School and public notice for any changes at the school was well covered, and does not understand why Sherwood did not provide better notice. Judy concluded that the money needs to be spent buying more space for parks.

Chair Allen asked if the applicant wanted to use any of the remaining time allotted for rebuttal.

Gene Thomas, P.E. said that in regard to performance guarantee and warranty, the manufacturer does warrant their product and there is a performance guarantee with the product. The contractor does not get paid if these are not provided. Gene clarified that the computer-generated light values shown in the exhibits mentioned are developed from actual situations, and are tested in the lab within facilities under the appropriate conditions to provide as much accuracy as possible. Gene added that the City does not have a contract with any contractor, supplier, or designer at this point in time. There is nothing under contract that would be an obligation to anyone. Regarding the spread of the lights at the middle school mentioned in testimony earlier, these are designed as a 30 foot candle and the lights at Snyder Park would be a 20 foot candle. The light intensity would not be the same. Gene concluded by saying that replacing the temporary lights is one of the reasons that the City is working on this project.

Chair Allen asked if there was any further testimony from opponents. There was none. Chair Allen closed the public hearing at 8:50 PM.

Chair Allen recommended a 5-minute break at 8:55 PM.

< 5-minute break >

Chair Allen reconvened the session at 9PM, and stated that the appellant had 5 remaining minutes for testimony if desired.

Ken Helm said that if the decision is not remanded back to the Hearings Officer, conditions need to be in place directing the City to fix the problems inherent in the application. Additionally, there may be a public notice issue.

Chair Allen asked Commissioners if there were any questions for Mr. Helm. There were none.

Chair Allen asked if the applicant had any further rebuttal. They did not. Chair Allen opened the session to final staff comments.

Julia Hajduk said that public notice was done according to Code, and said that possibly more notice could have been done by the Parks Board, City Council or the applicant, but that the Code requirements were met. Julia said that as with any other applicant the public notice procedures are done according to Code.

Michelle Miller reiterated that public notice was provided for property owners within 100 feet of the site, posted on the site, posted around town at City Hall, Library, YMCA, Senior Center, and Albertson's on Tualatin-Sherwood Rd. Notice was also published twice in the Tualatin-Tigard Times, all according to Code time lines.

Patrick Allen asked staff to confirm that an affidavit of mailing and posting was done, but that the Code does not require the City to confirm receipt of mailings such as certified mail. Michelle confirmed that the City did provide the affidavit and does not send notice by certified mail.

Jean Lafayette asked about the boundaries for public notice. Michelle stated that the boundary is the tax lot for the soccer field, and that public notice is sent to property owners within 100 feet of the tax lot in an application, and summarized that although there may be disagreement on some of the standards in the current Code, they have to be followed in the review of criteria on applications.

Matthew Michel spoke to the notice issue and confirmed that staff followed the legal standard outlined in the Code for providing public notice. Regarding the allowance of new information into the record in an appeal hearing, Matthew reiterated that the Planning Commission is not allowed to consider any new testimony not presented at the original land use hearing. Matthew said that the Planning Commission may remand back to the Hearings Officers, but reminded that the Hearings Officer's decision would be the final authority.

Patrick Allen asked Mr. Michel to confirm that the appellant could still appeal to LUBA regardless of whether it is the Planning Commission or the Hearings Officer that makes the decision on the appeal. Mr. Michel confirmed.

Patrick asked staff why the Hearings Officer did not consider an 8PM shut-off time for the lights. Julia stated that the Hearings Officer heard all of the testimony from opponents at the initial hearing and did consider earlier times, but determined that the proposed 9PM shut-off time was sufficient. Matthew Michel reaffirmed that the Planning Commission can change the time if that is their determination.

Adrian Emery asked staff to confirm if the Parks Board recommended the 9PM shut-off time. Michelle referred to testimony by Lance Gilgan and confirmed.

Patrick Allen asked Matthew if the Commission can consider financial issues such as bonds. Mr. Michel stated that these are usually associated with contracts through the finance process and that the Planning Commission is not charged with evaluating financial issues, which are considered risk management.

Lisa Walker asked Mr. Michel if the Commission could place a condition that there be periodic testing for illumination spillage measurements and that they be made available to the public. Mr. Michel confirmed.

Jean Lafayette referred to the standards for Low Density Residential (LDR) zoning in the Code that specifies height limitation for similar descriptive devices much shorter than those allowed by the Chimney, Spires and Structure standards used to evaluate the light poles for the park. Jean asked staff why the LDR standards would not apply. Discussion ensued regarding the differences, resulting in agreement that the LDR standard applies to devices attached to the residence or structure – which would not apply to the light pole structures at the park.

Patrick Allen asked Matthew Michel if the Hearings Officer has the authority to allow new testimony or evidence into another hearing if the appeal was remanded back. Matthew stated that the Hearings Office might have the authority to decide upon new testimony if he feels it may benefit his ability to make a decision.

Chair Allen asked Commissioners if there were any further questions for staff before deliberating on the appeal. There were none.

Adrian stated that there were many logical reasons given in testimony tonight to consider changes that the Commission is not allowed to do. Adrian said that in the future some of the Code issues could be looked at for amending, but they must go by the current Code.

Patrick Allen stated that the question before the Commission is whether or not the City is legally entitled to install lights at Snyder Park Soccer Field, and if so what conditions or changes are recommended. Patrick said that staff appears to meet notice requirements, and the half-foot candle standard has been met. The remaining issue under discussion appears to be the 9PM shut-off time.

Julia reiterated for the Commission that if the time for shut-off is recommended to change, the Commission would need to make modified findings or direct staff to modify findings.

Discussion ensued among Commissioners on remanding the appeal back to the Hearings Officer or to add conditions prior to approval. The shut-off time and possible phasing of the shut-off process was also discussed.

Patrick mentioned that the record did not contain some of the information brought up regarding the phasing out of lighting or how long that takes, and that total darkness language needs to be in the final recommendation.

Jean added that testing of light spillage could also be conditioned. Lisa expressed concern about who would monitor the light spillage and assure code compliance. Julia stated that code compliance is not a basis for making a decision. Patrick agreed that it is the City's burden to confirm that the lights meet standards.

Lisa Walker referred back to the testing and monitoring of light spillage and suggested that remanding back to the Hearings Officer may allow time for a study between the foot candle strength of the current temporary lighting and the proposed lights, since this is not known.

Julia reiterated that the remand process is unclear in the Code and that there has not been a remand in her experience at the City of Sherwood to compare to, and deferred to the City Attorney, Matthew Michel for guidance.

Matthew Michel stated that if the appeal is remanded, the Commission must phrase the remand so that the Hearings Officer is clear on what specific aspect of his decision the Commission found to be incorrect and needs re-evaluation. Matthew reminded Commissioners also that the Hearings Officer heard the same testimony that they have heard this evening.

Julia recapped that the Commission can condition the issues under deliberation without remanding to the Hearings Officer.

Patrick asked staff where in the record the applicant's needs are discussed in terms of the impact on sports teams for possible alternative shut-off times, such as 8PM or 8:30PM. Julia asked if Patrick to detail any specific questions and give staff a brief time to review the record in response. Patrick added that any information on the staging of the lighting for the shut-off process would also be helpful, and the actual pattern of usage presently.

Commissioners agreed.

Mr. Michel stated that the role of the Commission is to direct policy for the City rather than the specifics of the management of the light system and how it will operate.

Chair Allen confirmed the information was worth noting and added that an environment of mis-trust appears to exist between citizens and the City, the Commission has been leaning toward wanting to manage the operation process of the lights.

Chair Allen recommended a 5-minuted break at 10:06 PM.

< 5-minute break >

Chair Allen reconvened the session at 10:14 PM.

Julia stated that the information Patrick requested prior to the break was not specifically in the packet, but was discussed at the initial hearing and would be available on the taped recording of that session. If the Commission wanted to continue the hearing prior to final deliberation and a motion, Julia said that copies of the tapes or transcripts of the taped recording from the initial Hearings Officer session could be provided. Julia added that the Commission could make conditions to limit the lighting time, if desired.

Consensus among the Commission after further discussion recommended total darkness by 8:15 and semi-annual compliance testing to be completed with results made available to the public. Commissioners recapped the conditions to be amended and took a few minutes to draft a motion.

Patrick Allen moved that the Planning Commission affirm the report of the Hearings Officer based on the staff report, findings of fact, public testimony, staff recommendations, agency comments, applicant comments, and conditions with the following amendments: That the Hearings Officer findings be revised to find the Hearings Officer erred in balancing neighbors use and enjoyment of their property with the applicant's need for a later cut-off time for lighting. Further, that the ongoing condition B-1 be amended to add the following sentence; Applicant will conduct semi-annual light spillage measurements to assure continued compliance with this condition and make those results publicly available. Finally, that an additional ongoing condition B-2 be added that reads; Lights will automatically be extinguished no later than 8:15 PM.

Jean Lafayette seconded.

Chair Allen asked if there was any further discussion on the motion. There was none. Vote was taken:

Yes- 4 No – 0 Abstain – 0

Motion carried.

7. Comments by Commission – Adrian talked about the current Work Program and would like to get back to discussion on a portable vendor code. Patrick agreed that more information was needed to discuss portable vendors.

Julia said that the issue of signs is also on the Work Program and that she is considering having an intern come in to do some preliminary study.

Chair Allen asked if there were any further comments by the Commission. There were none.

8. Next Meeting - October 23, 2007: PA 07-01; Former Driftwood Mobile Home Park Plan Amendment. Vice Chair nominations and election.

Julia reminded everyone that the Brookman Road Concept Plan Open House is on Wednesday, October 10, 2007 from 6-8:30 PM in the Community Room at City Hall.

9. Adjournment – Chair Allen adjourned the session at 10:43 PM.

End of Minutes.

PLANNING DEPARTMENT

Julia Hajduk, Planning Supervisor

Pre App. Meeting:	November 2, 2005
App. Submitted:	July 20, 2006
App. Complete:	October 9, 2006
120-Day Deadline:	February 6, 2007

Proposal:
The applicant has requested a comprehensive plan and zone map amendment to change the zone from Medium Density Residential Low (MDRL) to Retail Commercial (RC). The property was a former mobile home park which has since been vacated. The applicant submittal is included as Exhibit A.

I. BACKGROUND

A. Applicant/Owner:
Donald and Virginia Pfeifer
2011 NE 164th Place
Portland, OR 97230

Representatives:
Todd Mobley
Lancaster Engineering
321 SW 5th Avenue, Suite 400
Portland, OR 97204

Ed Sullivan, Esq.
Garvey, Schubery Barer
121 SW Morrison, Suite 1100
Portland, OR 97204

Leslie Ann Hauer, AICP
6100 Collins Road
West Richland, WA 99353

B. Location: The site is located at 21305 SW Pacific Highway; tax lot 1200 on Washington County Tax Assessor's map 2S130D0.

C. Parcel Size: The parcel is 5.74 acres.

D. Existing Development and Site Characteristics: The site was originally developed in 1964 as a mobile home park with 41 single-wide spaces. Currently there are no mobile homes on site; a single family home exists on the site that was used as a residence and office for the park manager, which remains vacant.

E. Zoning Classification and Comprehensive Plan Designation: The existing zone is Medium Density Residential Low (MDRL). Section 16.16 of the Sherwood Zoning and Community Development Code (SZCDC) lists the permitted uses in this zone. The proposed zone is Retail Commercial (RC). Compliance with the permitted uses in the RC zone is identified in Section 16.28 of the SZCDC.

F. Adjacent Zoning and Land Use: Properties to the northeast along Pacific highway are zoned predominantly Retail Commercial (RC) to the intersection of Tualatin-Sherwood Road/Edy Road. The adjacent property to the southwest is General Commercial (GC) for another ¾ mile, with a sizeable High Density Residential (HDR) parcel further down Pacific Highway and to the northwest. Across Pacific Highway, properties are a mix of GC, RC, and HDR.

Property Immediately adjacent to the northeast is zoned RC, currently used as a retail and storage. The abutting property to the southwest is zoned GC and is approved to be built with a hotel. The property to the northwest is zoned HDR and is currently developed with attached housing units.

G. Review Type: The proposed Plan Amendment requires a Type V review, which involves public hearings before the Planning Commission and City Council. The Planning Commission will make a recommendation to the City Council who will make the final decision. Any appeal of the City Council decision would go directly to the Land Use Board of Appeals.

H. Public Notice and Hearing: Notice of the November 13, 2007 Planning Commission hearing on the proposed application was published in the *Tigard-Tualatin Times* on November 1st and 8th and posted on-site and mailed to property owners within 100 feet of the site on October 17th in accordance with Section 16.72.020 and 16.72.030 of the SZCDC. The notice was a revised notice from a previously scheduled hearing, therefore notice was provided more than 20 days in advance of the November 13th hearing to ensure the revised notice was received before the first originally scheduled meeting date.

I. Review Criteria:
The required findings for the Plan Amendment are identified in Section 4.203.02 of the Sherwood Zoning and Community Development Code (SZCDC); Applicable standards are: Comprehensive Plan, Part II, Chapter 4, Section E (residential), Section H (Economic Development Policies and Strategies), and Section I (Commercial); Metro Functional Plan Title 1; and Statewide Planning Goal 9, 10 and Goal 12.

II. PUBLIC COMMENTS

No public comments were received as of the date of this report.

III. AGENCY COMMENTS

Staff e-mailed notice to affected agencies on September 6, 2007. The following is a summary of comments received.

The Sherwood City Manager has provided comments included as Exhibit B which recommends denial because he believes a more appropriate use would be for office commercial as opposed to retail commercial.

Kinder Morgan Energy indicated that they have no concerns with the proposed zone change.

Pride Disposal Co. has reviewed the requested zone change and has no comment at this time.

Washington County Department of Land Use and Transportation Planning has reviewed the request and offered the following comment:

> For all of the major intersections which will have potential traffic impacts from this request, ODOT has jurisdiction. The county therefore will rely on ODOT's review of the traffic impacts on these intersections, some of which involve county facilities.

For the other intersections that are considered in the report which involve county/county roadways, these are stop-controlled rather than signalized intersections and do not have associated performance criteria in the county's Transportation Plan. The county therefore does not have any specific comments regarding the proposal.

Metro has reviewed the request and offered the following comments:

Title 1 of the Urban Growth Management Functional Plan (Metro Code 3.07.140) allows a local jurisdiction to rezone an area as long as the jurisdiction continues to provide at least the overall capacity for housing specified in Table 3.07-1. In reviewing the application, it appears that the City of Sherwood can maintain its current dwelling unit capacity even with the reduction of 41-63 dwelling units.

The analysis provided by the applicant indicates that previous subdivisions approved by the City are developing at close to maximum density, which is higher than the capacity assumed in Table 3.07-1. If the City agrees with the applicant's analysis, the City has capacity available to rezone the former Driftwood Mobile Home Park without reducing its overall dwelling unit capacity. In addition, residential development is permitted in the RC zone, giving the City another way to meet required dwelling unit capacity.

Portland General Electric has no objection to this zone change. They have indicated that they do have both distribution line (12,500V) and sub-transmission line (115,00V) on the same side of the HWY 99W as the proposed zone change to Retail Commercial. PGE can underground the distribution, but under grounding the sub- Transmission is not economical or physically feasible to underground.

Tualatin Valley Fire and Rescue does not endorse or disapprove of this proposed zone change.

ODOT Outdoor Advertising Sign Program reviewed the proposal and has indicated that zone changes from residential to commercial, for the sake of qualifying for an outdoor advertising sign, are not recognized as legitimate commercial zoning. No plan for an outdoor advertising sign is indicated. Otherwise, no comment.

ODOT Rail Division indicated that they have no concerns with the proposed zone change.

ODOT Region 1 provided comments which are attached as Exhibit C. In summary, they have concerns with the applicant's transportation analysis in relation to Transportation Planning Rule (TPR) compliance and recommend either denial the zone change be limited in a way that caps the number of trips on site to the maximum trips under the current zoning at "worst-case" build-out.

DLCD was notified of the requested zone change on August 10, 2007 and provided no comments or objections.

IV. PLAN AMENDMENT REQUIRED FINDINGS

16.80.030 - Map Amendment

This section states that an amendment to the City Zoning Map may be granted, provided that the proposal satisfies all applicable requirements of the adopted Sherwood Comprehensive Plan, the Transportation System Plan and this Code, and A-D below.

The applicable Comprehensive Plan policies are discussed under Section V. below. Section 16.02.080 requires that all development adhere to all applicable regional, State and Federal regulations. Applicable Regional regulations are discussed under Section VI. and applicable State regulations are discussed under Section VII.

FINDING: This is discussed in detail below.

A. The proposed amendment is consistent with the goals and policies of the Comprehensive Plan and the Transportation System Plan.

FINDING: This is discussed in detail below under Section V.

B. There is an existing and demonstrable need for the particular uses and zoning proposed, taking into account the importance of such uses to the economy of the City, the existing market demand for any goods or services which such uses will provide, the presence or absence and location of other such uses or similar uses in the area, and the general public good.

The applicant has not submitted a market analysis, but refers to the City of Sherwood's Economic Opportunities Analyses (EOA) which was completed in early 2007. According to the EOA the City of Sherwood has only 13 acres of vacant commercial land left, including just 6 lots zoned for RC. The EOA concluded that Sherwood would need to add 27 additional acres to its UGB for new commercial development, under the preferred "medium growth scenario." (see pages 41-43 0f the EOA, attached as Exhibit D.) The applicant expands on the EOA by addressing the Commercial Polices as follows:

- **Policy 1. Commercial activities will be located so as to most conveniently service customers.**

Applicant finding: *The subject site is associated with the large, established: Six Corners commercial area, making it very convenient to the customers who already use the area, as well as the large volume of traffic that passes through this area.*

- **Policy 2. Commercial uses will be developed so as to complement rather than detract from adjoining uses.**

Applicant finding: *Development of a commercial use on this site would better complement the adjacent commercial land and uses than a mobile home park or the single-family / duplex uses allowed under the current MDRL zoning.*

- **Policy 3. Highway 99W is an appropriate location for commercial development at the highway's intersections with City arterial and major collector roadways.**

Applicant finding: *The site is located along Highway 99W, near several major intersections.*

- **Policy 4. The 1983 "Sherwood Old Town Revitalization Plan" and its guidelines and strategies are adopted as a part of the Sherwood Comprehensive Plan.**

Applicant finding: *The site is not part of Old Town, and the Revitalization Plan is not applicable.*

FINDING: Based on the analysis above, the applicant has shown that the City's EOA in itself has provided a demonstrable need for the requested zone change in order to accomplish the City's goal of providing "Economic Opportunities". By addressing the policies of the EOA, the applicant further solidifies compliance of the above standard. In addition, the rezoning of property within the City potentially lessens the need for UGB expansions. This standard has been satisfied.

C. The proposed amendment is timely, considering the pattern of development in the area, surrounding land uses, any changes which may have occurred in the neighborhood or community to warrant the proposed amendment, and the availability of utilities and services to serve all potential uses in the proposed zoning district.

The applicant states that the mobile home park use was originally developed before Sherwood's Comprehensive Plan was adopted, at a time when there was comparatively very little commercial development in the Six Corners area, and no development on adjacent properties. Now, the site is an unused former mobile home park zoned for medium density residential, between two commercial parcels. Because the mobile home park has been closed, it is timely to consider a re-zone before the property develops inconsistent with locational criteria in the comprehensive plan (discussed further in this report). The proposed amendment is both timely and consistent with the area's land use pattern.

FINDING: Based on the information provided and considering the pattern of development along SW Pacific Highway, Retail Commercial is a more suitable use for the area. Therefore, this standard has been satisfied.

D. Other lands in the City already zoned for the proposed uses are either unavailable or unsuitable for immediate development due to location, size or other factors.

The applicant refers back to the City of Sherwood's EOA which indicates a demonstrated need for additional commercial land. The subject site is the only property zoned MDRL along Pacific Highway between Tualatin-Sherwood Road and Meineke Parkway. Staff questioned why the applicant chose to request a zone change to retail commercial as opposed to another commercial zone that was also supported by the EOA. The applicant responded that the RC zone was requested after considering the existing zoning surrounding the subject site. RC was chosen because it was less "permissive" than the general commercial zone.

FINDING: Based on the applicant's analysis and City's EOA, staff finds that this standard is satisfied.

16.80.030 - Transportation Planning Rule (TPR) Consistency

A. **Review of plan and text amendment applications for effect on transportation facilities. Proposals shall be reviewed to determine whether it significantly affects a transportation facility, in accordance with OAR 660-12-0060 (the TPR). Review is required when a development application includes a proposed amendment to the Comprehensive Plan or changes to land use regulations.**

B. **"Significant" means that the transportation facility would change the functional classification of an existing or planned transportation facility, change the standards implementing a functional classification, allow types of land use, allow types or levels of land use that would result in levels of travel or access that are inconsistent with the functional classification of a transportation facility, or would reduce the level of service of the facility below the minimum level identified on the Transportation System Plan**

C. **Per OAR 660-12-0060, Amendments to the Comprehensive Plan or changes to land use regulations which significantly affect a transportation facility shall assure that allowed land uses are consistent with the function, capacity, and level of service of the facility identified in the Transportation System Plan.**

Chris Maciejewski of DKS has reviewed the traffic impact study material submitted for the proposed zone change. The reviewed materials included the original submission from July 2007 as well as addendums dated September 28, 2007 and October 19, 2007 that were in response to comments and request for additional information dated September 13, 2007. This review focused on determining if the City of Sherwood and OAR 660-012-0060 requirements were met.

The memo from Mr. Maciejewski, submitted to the City on October 29, 2007, is included as Exhibit E. The memo identifies that "The traffic impact study concludes that the proposed mitigation measures are adequate to mitigate the impacts of the proposed rezone. The mitigation measures listed in the October 19, 2007 addendum to the report include:

- Add a left turn lane to the Sunset Boulevard approach at Highway 99W/Elwert Road
- Add a left turn lane to the Sherwood Boulevard approach at Highway 99W/Edy Road and implement protected phasing.
- Add a southbound right turn lane on Highway 99W at Highway 99W/Tualatin Sherwood Road
- Add an eastbound right turn lane on Roy Rogers Road at Roy Rogers Road/Borchers Drive.

The following mitigation measures were not listed in the report but may be needed:

- A southbound right turn lane on Highway 99W at the site access was assumed in the capacity analysis but was not indicated in the list of improvements. This improvement may not be feasible due to the lane drop on Highway 99W in the access vicinity.
- Additional or revised mitigation may be required based on updating the analysis to address the items mentioned in the Capacity Analysis and Queuing Analysis section."

At the time of writing the memo, DKS indicated that the, proposed rezone was not recommended for approval. However they concurred with the ODOT recommendation that if a condition were imposed capping the trips to the current zones "worst-case" trips, findings of TPR compliance could be made.

FINDING: Based on the traffic analysis of a professional traffic engineer the City consulted, the proposed zone change is not consistent with the Transportation Planning Rule. However, Staff met with the applicant to discuss the findings of the traffic engineer, considered ODOT recommendations and concludes that it is possible to place conditions on the property to ensure compliance with the TPR. Therefore, if the applicant satisfies the following condition of approval, this section will be met.

CONDITION: Prior to this zone change becoming final, the applicant shall provide a written agreement, recorded with the property and binding on all future owners that all development on this parcel shall be subject to the City's site plan approval process and that requires the site plan approval shall not be granted for uses that, taken cumulatively, exceed the trip generation equivalent for the existing Medium Density Residential (MDRL) designation (approximately 480 trips per day) unless and until:

1) Transportation improvements to allow for the additional trips have been installed, funded, or included in the City's Capital Improvement Plan; or
2) The City's Plan is amended consistent with the Statewide Planning Goals to provide otherwise.

V. APPLICABLE COMPREHENSIVE PLAN POLICIES

The applicable portions of the Comprehensive Plan include Chapter 4, Land Use, Section E – Residential; and Section H - Economic Development, Section I - Commercial.

Chapter 4, Section E - Residential Land Use

Policy 1 Residential areas will be developed in a manner which will insure that the integrity of the community is preserved and strengthened.

Policy 2 The City will insure that an adequate distribution of housing styles and tenures are available.

Policy 3 The City will insure the availability of affordable housing and locational choice for all income groups.

Policy 4 The City shall provide housing and special care opportunities for the elderly, disadvantaged and children.

Policy 5 The City shall encourage government assisted housing for low to moderate income families.

Policy 6 The City will create, designate and administer five residential zones specifying the purpose and standards of each consistent with the need for a balance in housing densities, styles, prices and tenures.

The proposed Comprehensive Plan amendment and associated Zone Change is from Medium Density Residential (MDRL) to Retail Commercial (RC). There is no residential component associated with this request. However, the RC zone does allow for mixed use projects, which could include a residential element.

FINDING: Based on the analysis above, residential is a potential component of an RC development, however, the proposed change does not include a residential element.

Chapter 4, Section H – applicable Economic Development Policies and Strategies

Policy 2 The City will encourage economic growth that is consistent with the management and use of its environmental resources.

Policy 5 The City will seek to diversify and expand commercial and industrial development in order to provide nearby job opportunities, and expand the tax base.

The subject site was developed in 1964 as a mobile home park and has never been identified with environmental resources. Changing the zoning designation to Retail Commercial, the site will be able to provide job opportunities to the community while increasing the tax base of the City.

FINDING: The proposed zone change is consistent with the above policies and supports economic development within the City.

Chapter 4, Section I – applicable Commercial Policies

FINDING: The commercial policies have been addressed earlier in this report under section 16.80.030 of the Map Amendment criteria.

VI. APPLICABLE REGIONAL (METRO) STANDARDS

The only applicable Urban Growth Management Functional Plan criteria are found in Title 1 – Housing. The City of Sherwood is currently in compliance with the Functional Plan and any amendment to the Sherwood Plan & Zone Map must show that the community continues to comply. Table 3.01-7 of this Title indicates that Sherwood's dwelling unit capacity is 5,216 and the job capacity is 9,518. The proposed amendment will provide greater job opportunity while allowing mixed use projects which would allow residential and will not result in the loss of jobs. The applicant has provided adequate documentation that enabled Metro to provide comments confirming that "The City of Sherwood can maintain its current dwelling unit capacity even with the reduction of 41-63 dwelling units."

FINDING: Based on staff's analysis, the proposed zone change is consistent with the Metro Functional Plan criteria and the City would continue to be in compliance if the zone change were approved.

VII. APPLICABLE STATE STANDARDS

The applicable Statewide Planning Goals include: Goal 9, 10 and Goal 12.

Goal 9 – ECONOMIC DEVELOPMENT
To provide adequate opportunities throughout the state for a variety of economic activities vital to the health, welfare, and prosperity of Oregon's citizens.

Oregon Administrative Rule 660-009 (Economic Development) implements Goal 9. OAR 660-009 requires that Cities and Counties prepare Economic Opportunities Analysis in accordance with the directions in the Rule. It also requires that Cities provide an adequate supply of land to meet identified employment needs.

As discussed above, Sherwood adopted an EOA earlier this year which was implemented through amendments to the goals and policies of the comprehensive plan. The proposed plan amendment helps meet some of the commercial land needs identified in the EOA. The proposed plan amendment meets economic goals and policies found in the EOA, the City's Comprehensive Plan, and the City's Economic Development Strategy.

FINDING: The proposed plan amendment is consistent with the requirements of Goal 9 and its Administrative Rule.

Goal 10 - HOUSING
This goal specifies that each city must plan for and accommodate needed housing types, such as multifamily and manufactured housing. It requires each city to inventory its buildable residential lands, project future needs for such lands, and plan and zone enough buildable land to meet those needs. It also prohibits local plans from discriminating against needed housing types.

Statewide Planning Goal 10 is implemented by the comprehensive plan and in the Metro region by OAR 660-007 (Metropolitan Housing). OAR 660-007 provides density standards and methodology for land need and supply comparisons. Metro Title 1 responds to the requirements of the Metropolitan Housing Rule. By complying with Metro Title 1, Sherwood complies with OAR 660-007 as well as Statewide Planning Goal 10.

FINDING: Based on the analysis above, this Goal has been satisfied.

Goal 12 - TRANSPORTATION
The goal aims to provide "a safe, convenient and economic transportation system." It asks for communities to address the needs of the "transportation disadvantaged."

Goal 12 is implemented by OAR 660-012-0000. Compliance with this Goal and the OAR was discussed above.

FINDING: The proposed zone change is generally consistent with State standards, which have been met as conditioned previously.

Staff assessment and recommendation on Plan Amendment:
Based on the analysis above, the applicant has provided adequate information to make findings in support of the proposed amendment, provided a condition is imposed to ensure compliance with the Transportation Planning Rule. Therefore, staff recommends APPROVAL of the proposed plan amendment with conditions.

VIII. RECOMMENDED CONDITIONS OF APPROVAL

1. Prior to this zone change becoming final, the applicant shall provide a written agreement, recorded with the property and binding on all future owners that all development on this parcel shall be subject to the City's site plan approval process and that requires the site plan approval shall not be granted for uses that, taken cumulatively, exceed the trip generation equivalent for the existing Medium Density Residential (MDRL) designation (approximately 480 trips per day) unless and until:
    1) Transportation improvements to allow for the additional trips have been installed, funded, or included in the City's Capital Improvement Plan; or
    2) The City's Plan is amended consistent with the Statewide Planning Goals to provide otherwise.

IX. ATTACHMENTS

A. Applicant submittal packet
B. City Manager comments dates 9-13-07
C. ODOT comments dates November 1, 2007
D. Excerpts (pages 41-31) of the Economic Opportunities Analysis
E. DKS memo dated October 29, 2007

Study Roadways

Roadway Names	Functional Classification	# of Lanes	Posted Speed (mph)	Sidewalk	Bike Lane
Highway 99W	Statewide Highway[1] Arterial[2] Principal Arterial[3]	5-6	45	With Development	With Development
Edy Road	Collector[2] Collector[3]	2-3	40	With Development	With Development
Elwert Road	Arterial[2] Collector[3]	2	Not Posted	No	No
Meinecke Road	Collector[2] Collector[3]	2	Not Posted	Yes	No
Tualatin-Sherwood Road	Arterial[2] Arterial[3]	5-6	45	Yes	Yes
Borchers Drive	Collector[2] Collector[3]	2-3	25	Yes	Yes
Langer Drive	Collector[2] Collector[3]	2-3	Not Posted	Yes	No
Century Drive	Arterial[2] Collector[3]	2	25	Yes	No
12th Street	Collector[2] Collector[3]	2	Not Posted	Yes	No
Sherwood Boulevard	Arterial[2] Arterial[3]	2	25	Yes	Yes
Roy Rogers Road	Arterial[2] Arterial[3]	3-4	35	Yes	Yes

[1] Oregon Department of Transportation (ODOT)
[2] Washington County
[3] City of Sherwood

Shading indicates revisions to the table.

TRIP GENERATION SUMMARY
Pfeifer/List Development

Scenario	Land Use	Size	AM Peak Hour			PM Peak Hour			Weekday		
			In	Out	Total	In	Out	Total	In	Out	Total
Scheme 1	General Office Building	30,000	41	6	47	8	37	45	0	0	0
	Shopping Center	35,000	96	61	157	150	163	313	1,716	1,716	3,432
	Pass-by (34%)		*-27*	*-27*	*-54*	*-53*	*-53*	*-106*	*-583*	*-583*	*-1,166*
	High-Turnover (Sit-Down) Restaurant	5,000	30	28	58	34	21	55	318	318	636
	Pass-by (43%)		*-12*	*-12*	*-24*	*-12*	*-12*	*-24*	*-137*	*-137*	*-274*
Total Trips			**128**	**56**	**184**	**127**	**156**	**283**	**1,314**	**1,314**	**2,628**

Scenario	AM Peak Hour			PM Peak Hour			Weekday		
	In	Out	Total	In	Out	Total	In	Out	Total
Current Zoning	9	26	35	29	17	46	220	220	440
Proposed Zoning	128	56	184	127	156	283	1,314	1,314	2,628
Net Increase in Site Trips	**119**	**30**	**149**	**98**	**139**	**237**	**1,094**	**1,094**	**2,188**

TRIP GENERATION CALCULATIONS

Land Use: Single-Family Detached Housing
Land Use Code: 210
Variable: Dwelling Units
Variable Value: 46

AM PEAK HOUR

Trip Rate: 0.75

	Enter	Exit	Total
Directional Distribution	25%	75%	
Trip Ends	9	26	35

PM PEAK HOUR

Trip Rate: 1.01

	Enter	Exit	Total
Directional Distribution	63%	37%	
Trip Ends	29	17	46

WEEKDAY

Trip Rate: 9.57

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	220	220	440

SATURDAY

Trip Rate: 10.10

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	232	232	464

Source: TRIP GENERATION, Seventh Edition

TRIP GENERATION CALCULATIONS

Land Use: General Office Building
Land Use Code: 710
Variable: 1000 Sq Ft Gross Floor Area
Variable Value: 30.0

AM PEAK HOUR

Trip Rate: 1.55

	Enter	Exit	Total
Directional Distribution	88%	12%	
Trip Ends	41	6	47

PM PEAK HOUR

Trip Rate: 1.49

	Enter	Exit	Total
Directional Distribution	17%	83%	
Trip Ends	8	37	45

WEEKDAY

Trip Rate: 11.01

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	165	165	330

SUNDAY

Trip Rate: 0.98

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	15	15	30

Source: TRIP GENERATION, Seventh Edition

TRIP GENERATION CALCULATIONS

Land Use: Shopping Center
Land Use Code: 820
Variable: 1,000 Sq Ft Gross Leasable Area
Variable Value: 35.0

AM PEAK HOUR

Trip Rate: Ln(T)=0.60Ln(X)+2.29

	Enter	Exit	Total
Directional Distribution	61%	39%	
Trip Ends	96	61	157

PM PEAK HOUR

Trip Rate: Ln(T)=.66Ln(X)+3.40

	Enter	Exit	Total
Directional Distribution	48%	52%	
Trip Ends	150	163	313

WEEKDAY

Trip Rate: Ln(T)=.65Ln(X)+5.83

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	1,716	1,716	3,432

SATURDAY

Trip Rate: Ln(T)=.63Ln(X)+6.23

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	2,384	2,384	4,768

Source: TRIP GENERATION, Seventh Edition

TRIP GENERATION CALCULATIONS

Land Use: High-Turnover (Sit-Down) Restaurant
Land Use Code: 932
Variable: 1,000 Sq. Feet Gross Floor Area
Variable Value: 5.00

AM PEAK HOUR

Trip Rate: 11.52

	Enter	Exit	Total
Directional Distribution	52%	48%	
Trip Ends	30	28	58

PM PEAK HOUR

Trip Rate: 10.92

	Enter	Exit	Total
Directional Distribution	61%	39%	
Trip Ends	34	21	55

WEEKDAY

Trip Rate: 127.15

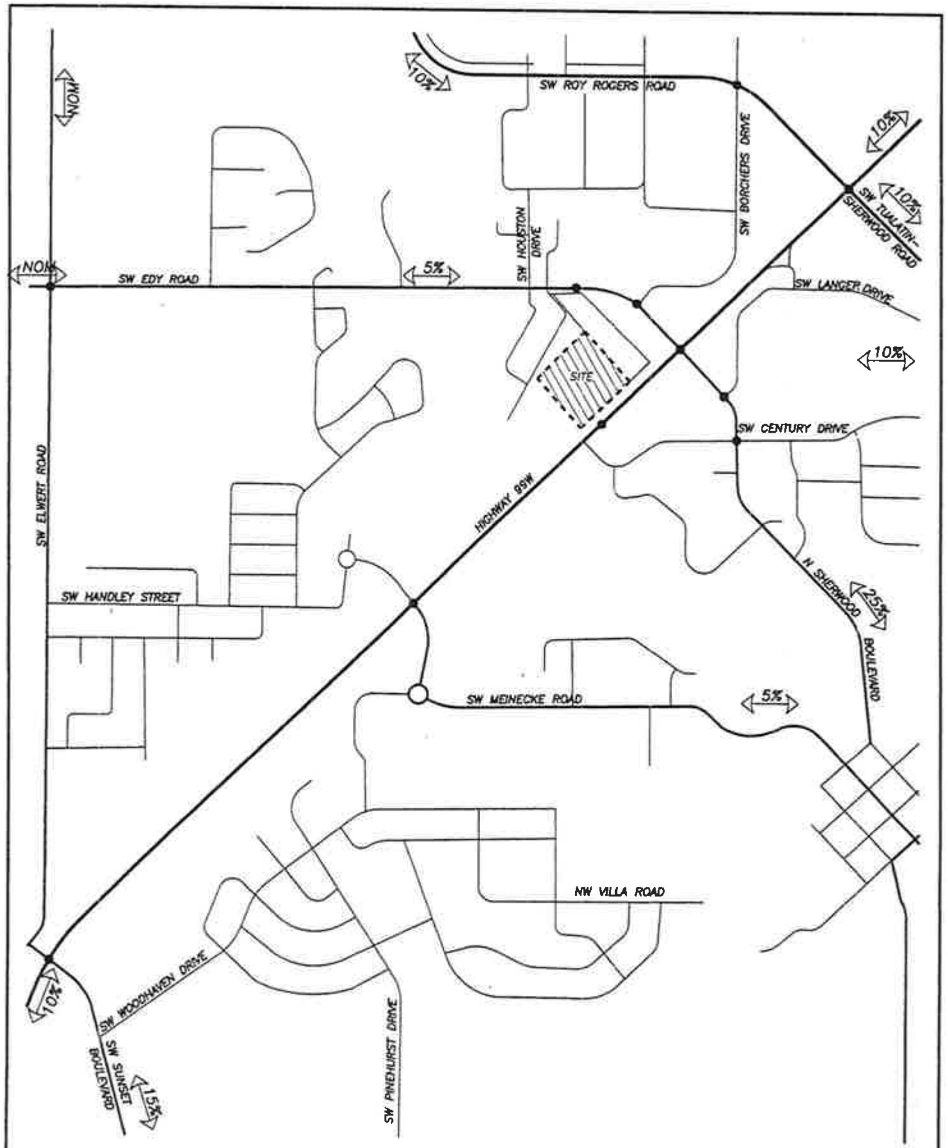
	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	318	318	636

SATURDAY

Trip Rate: 158.37

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	396	396	792

Source: TRIP GENERATION, Seventh Edition

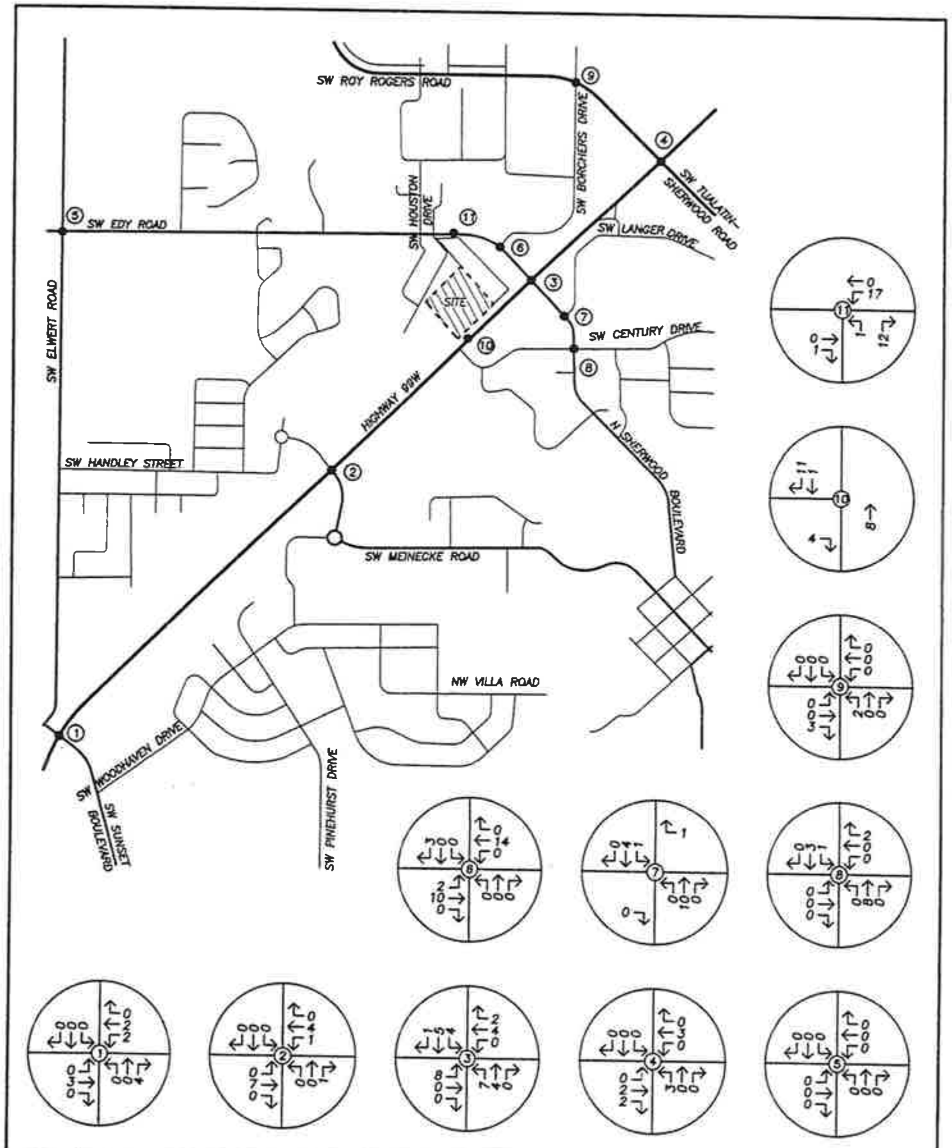


SITE TRIP DISTRIBUTION
Inbound & Outbound Percentages
PM Peak Hour

no scale

FIGURE 3

PAGE 14

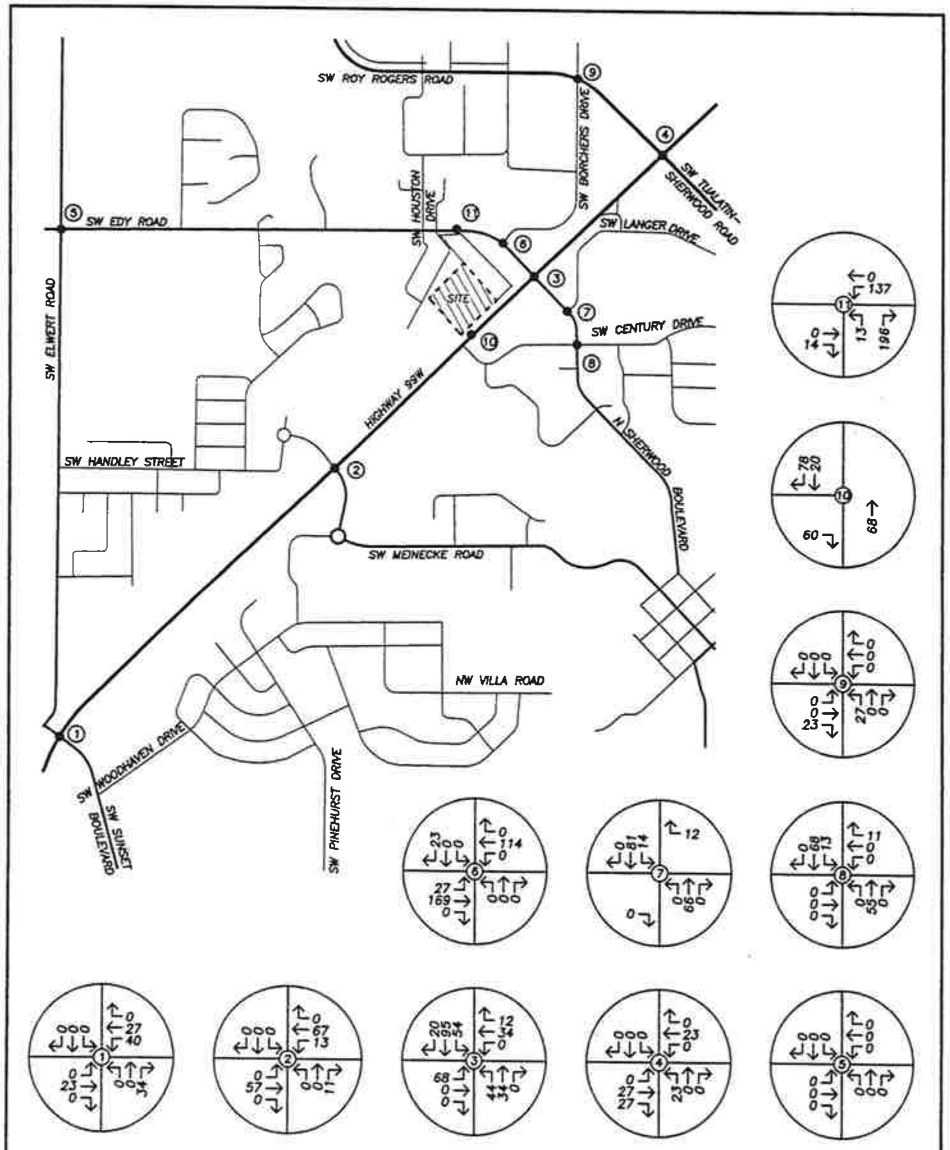


SITE-GENERATED TRAFFIC
Site Trips under Current Zoning
PM Peak Hour

no scale

FIGURE A-1

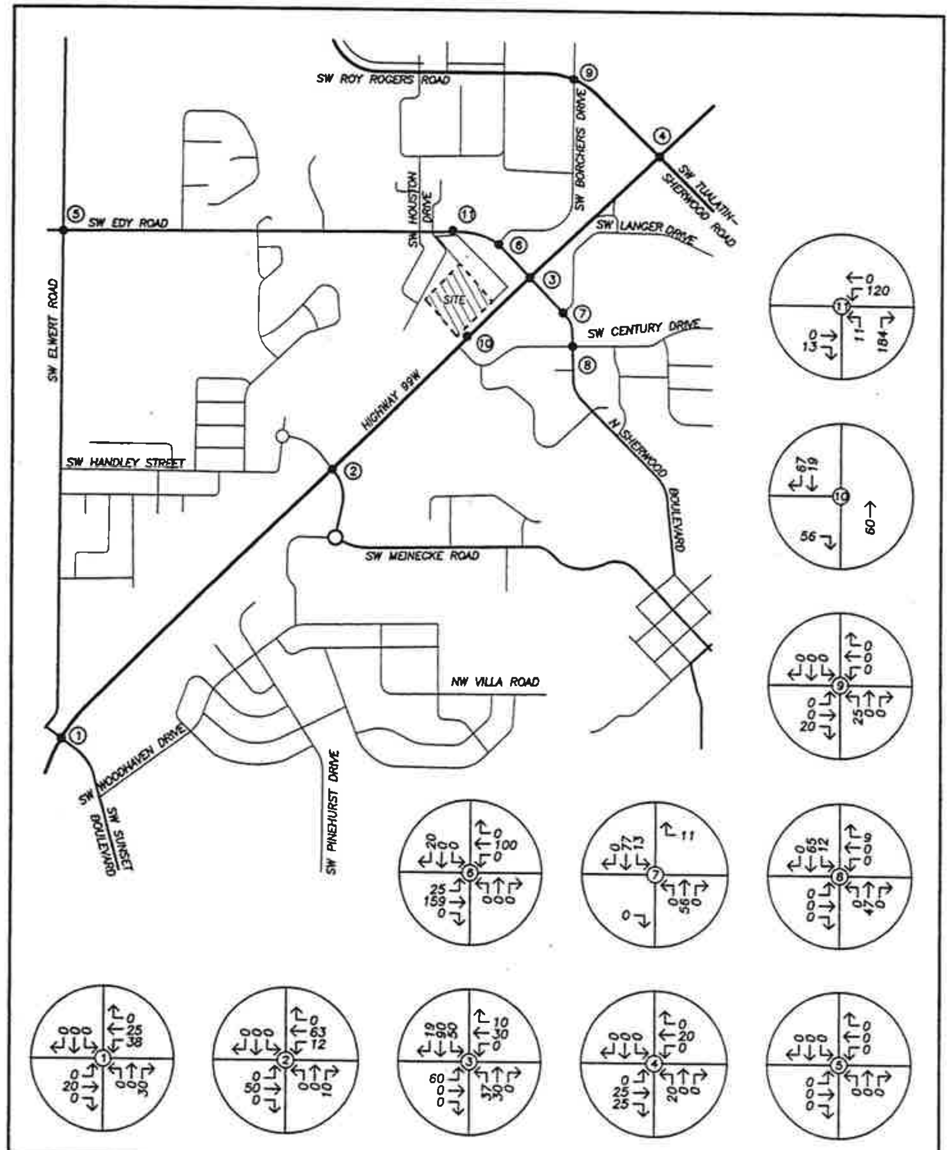
APPENDIX



SITE-GENERATED TRAFFIC
Site Trips under Proposed Zoning
PM Peak Hour

FIGURE A-2

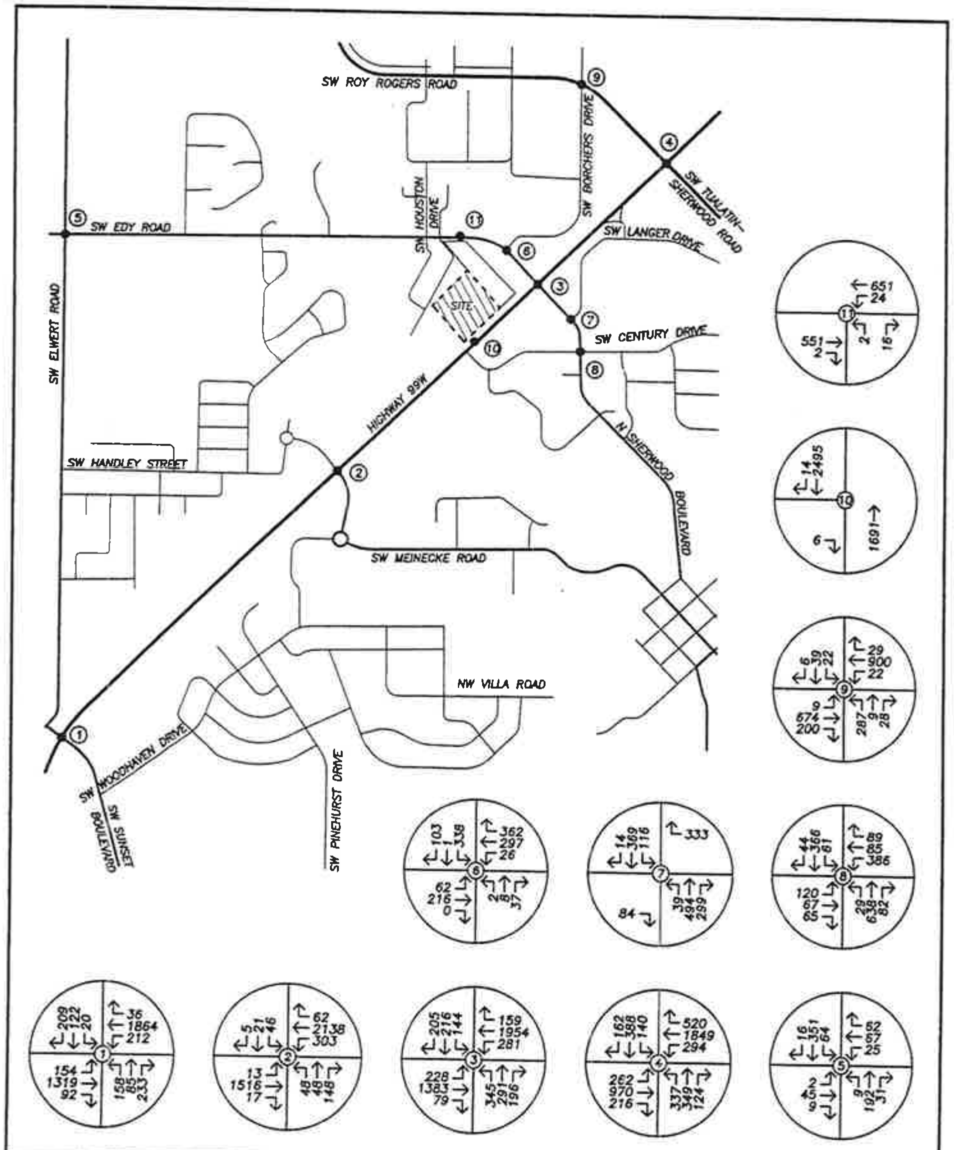
APPENDIX



SITE-GENERATED TRAFFIC
Net Increase in Site Trips
PM Peak Hour

FIGURE 4

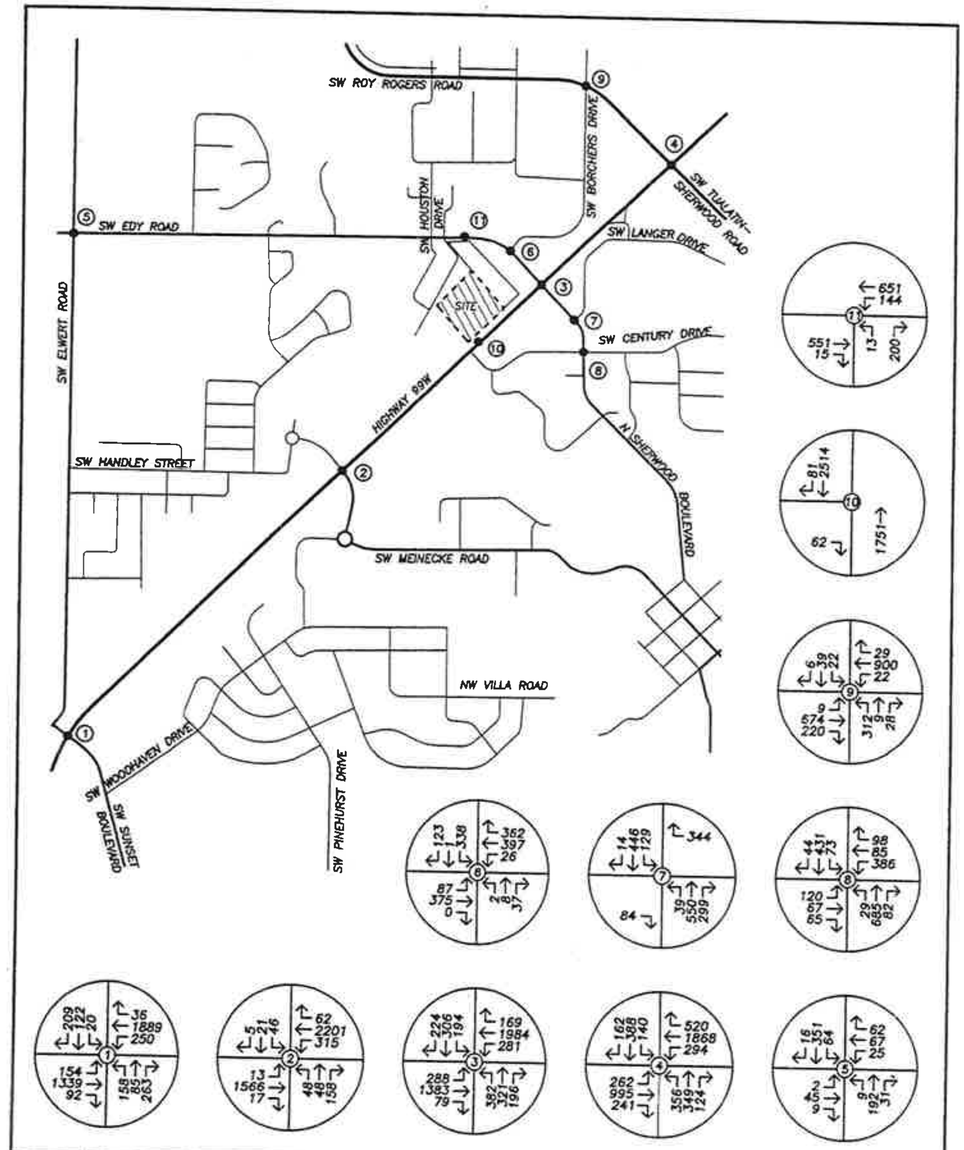
PAGE 15



TRAFFIC VOLUMES
15-year Background Traffic Conditions
PM Peak Hour

FIGURE 5

PAGE 17



TRAFFIC VOLUMES
15-year Background plus Site Trips Conditions
PM Peak Hour

FIGURE 7

PAGE 18

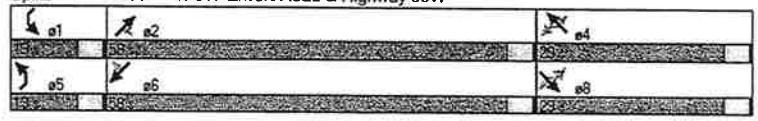
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.993			0.969		0.950			0.950		
Satd. Flow (prot)	0	1871	1583	0	1811	1583	1736	3406	1599	3467	3505	1509
Flt Permitted		0.937			0.639		0.950			0.950		
Satd. Flow (perm)	0	1765	1583	0	1194	1583	1736	3406	1599	3467	3505	1509
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			162			184			96			32
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		3096			2452			1095			4015	
Travel Time (s)		70.4			55.7			24.9			91.3	
Volume (vph)	20	122	209	158	85	263	154	1339	92	250	1889	36
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	1%	2%	2%	1%	2%	4%	6%	1%	1%	3%	7%
Adj. Flow (vph)	21	127	218	165	89	274	160	1395	96	260	1968	38
Lane Group Flow (vph)	0	148	218	0	254	274	160	1395	96	260	1968	38
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		8			4		5	2		1	6	
Permitted Phases	8		8	4		4			2			6
Detector Phases	8	8	8	4	4	4	5	2	2	1	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	13.0	58.0	58.0	13.0	58.0	58.0
Total Split (%)	29.0%	29.0%	29.0%	29.0%	29.0%	29.0%	13.0%	58.0%	58.0%	13.0%	58.0%	58.0%
Maximum Green (s)	25.0	25.0	25.0	25.0	25.0	25.0	9.0	54.0	54.0	9.0	54.0	54.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	Max	Max	Max	Max	Max	Max	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0	0		0	0
Act Effct Green (s)		25.0	25.0		25.0	25.0	9.0	54.0	54.0	9.0	54.0	54.0
Actuated g/C Ratio		0.25	0.25		0.25	0.25	0.09	0.54	0.54	0.09	0.54	0.54
v/c Ratio		0.34	0.42		0.85	0.51	1.03	0.76	0.11	0.83	1.04	0.05
Control Delay		33.3	12.1		62.3	14.8	125.6	21.3	2.7	58.8	57.7	6.0
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		33.3	12.1		62.3	14.8	125.6	21.3	2.7	58.8	57.7	6.0
LOS		C	B		E	B	F	C	A	E	E	A
Approach Delay		20.7			37.6			30.3			57.0	

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS		C			D			C			E	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NET and 6:SWT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.04
Intersection Signal Delay: 43.0 Intersection LOS: D
Intersection Capacity Utilization 94.8% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 1: SW Elwert Road & Highway 99W



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↰↑	↱		↰↑	↱	↰	↑↑	↱	↰↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.99	1.00		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1871	1583		1810	1583	1736	3406	1599	3467	3505	1509
Flt Permitted		0.94	1.00		0.64	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1766	1583		1194	1583	1736	3406	1599	3467	3505	1509
Volume (vph)	20	122	209	158	85	263	154	1339	92	250	1889	36
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	21	127	218	165	89	274	160	1395	96	260	1968	38
RTOR Reduction (vph)	0	0	122	0	0	138	0	0	44	0	0	15
Lane Group Flow (vph)	0	148	97	0	254	136	160	1395	52	260	1968	23
Heavy Vehicles (%)	0%	1%	2%	2%	1%	2%	4%	6%	1%	1%	3%	7%
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		8			4		5	2		1	6	
Permitted Phases	8		8	4		4			2			6
Actuated Green, G (s)		25.0	25.0		25.0	25.0	9.0	54.0	54.0	9.0	54.0	54.0
Effective Green, g (s)		25.0	25.0		25.0	25.0	9.0	54.0	54.0	9.0	54.0	54.0
Actuated g/C Ratio		0.25	0.25		0.25	0.25	0.09	0.54	0.54	0.09	0.54	0.54
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		442	396		299	396	156	1839	863	312	1893	815
v/s Ratio Prot							c0.09	0.41		0.07	c0.56	
v/s Ratio Perm		0.08	0.06		c0.21	0.09			0.03			0.02
v/c Ratio		0.33	0.24		0.85	0.34	1.03	0.76	0.06	0.83	1.04	0.03
Uniform Delay, d1		30.7	29.9		35.7	30.8	45.5	17.9	10.9	44.8	23.0	10.7
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.99	1.34	1.30
Incremental Delay, d2		2.0	1.5		24.9	2.4	79.0	3.0	0.1	10.2	26.9	0.0
Delay (s)		32.7	31.4		60.6	33.1	124.5	20.9	11.1	54.6	57.8	14.0
Level of Service		C	C		E	C	F	C	B	D	E	B
Approach Delay (s)		31.9			46.3			30.4			56.7	
Approach LOS		C			D			C			E	

Intersection Summary			
HCM Average Control Delay	44.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	94.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	1792	1615	1752	1900	1615	1805	3471	1615	1787	3505	1615
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1805	1792	1615	1752	1900	1615	1805	3471	1615	1787	3505	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			5			168			8			21
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1448			2553			4015			1905	
Travel Time (s)		32.9			58.0			91.3			43.3	
Volume (vph)	46	21	5	48	48	158	13	1566	17	315	2201	62
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	6%	0%	3%	0%	0%	0%	4%	0%	1%	3%	0%
Adj. Flow (vph)	49	22	5	51	51	168	14	1666	18	335	2341	66
Lane Group Flow (vph)	49	22	5	51	51	168	14	1666	18	335	2341	66
Turn Type	Prot		Free	Prot		Free	Prot		Free	Prot		Free
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases			Free		4	Free			Free			Free
Detector Phases	3	8		7	4		5	2		1	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	8.0	20.0		8.0	20.0		8.0	20.0		8.0	20.0	
Total Split (s)	8.0	20.0	0.0	8.0	20.0	0.0	8.0	52.0	0.0	20.0	64.0	0.0
Total Split (%)	8.0%	20.0%	0.0%	8.0%	20.0%	0.0%	8.0%	52.0%	0.0%	20.0%	64.0%	0.0%
Maximum Green (s)	4.0	16.0		4.0	16.0		4.0	48.0		16.0	60.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Walk Time (s)		5.0			5.0			5.0			5.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	4.0	7.4	100.0	6.4	7.9	100.0	4.0	49.8	100.0	27.8	80.9	100.0
Actuated g/C Ratio	0.04	0.07	1.00	0.06	0.08	1.00	0.04	0.50	1.00	0.28	0.81	1.00
v/c Ratio	0.68	0.17	0.00	0.46	0.34	0.10	0.19	0.96	0.01	0.67	0.83	0.04
Control Delay	90.6	44.9	0.0	60.2	48.9	0.1	37.8	24.9	0.0	41.0	9.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	90.6	44.9	0.0	60.2	48.9	0.1	37.8	24.9	0.0	41.0	9.0	0.0
LOS	F	D	A	E	D	A	D	C	A	D	A	A
Approach Delay		71.4			20.7			24.8			12.7	

Lanes, Volumes, Timings
2: SW Meinecke Road & Highway 99W 9/24/2007

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS		E			C			C			B	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 96 (96%), Referenced to phase 2:NET and 6:SWT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 18.4 Intersection LOS: B
Intersection Capacity Utilization 83.5% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 2: SW Meinecke Road & Highway 99W

ø1	ø2	ø3	ø4
20 s	52 s	8 s	20 s
ø6	ø5	ø7	ø8
64 s	8 s	8 s	20 s

HCM Signalized Intersection Capacity Analysis
2: SW Meinecke Road & Highway 99W 9/24/2007

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1792	1615	1752	1900	1615	1805	3471	1615	1787	3505	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	1792	1615	1752	1900	1615	1805	3471	1615	1787	3505	1615
Volume (vph)	46	21	5	48	48	158	13	1566	17	315	2201	62
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	49	22	5	51	51	168	14	1666	18	335	2341	66
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	49	22	5	51	51	168	14	1666	18	335	2341	66
Heavy Vehicles (%)	0%	6%	0%	3%	0%	0%	0%	4%	0%	1%	3%	0%
Turn Type	Prot		Free	Prot		Free	Prot		Free	Prot		Free
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases			Free		4	Free			Free			Free
Actuated Green, G (s)	3.2	4.0	100.0	5.6	6.4	100.0	0.8	46.6	100.0	27.8	73.6	100.0
Effective Green, g (s)	3.2	4.0	100.0	5.6	6.4	100.0	0.8	46.6	100.0	27.8	73.6	100.0
Actuated g/C Ratio	0.03	0.04	1.00	0.06	0.06	1.00	0.01	0.47	1.00	0.28	0.74	1.00
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	58	72	1615	98	122	1615	14	1617	1615	497	2580	1615
v/s Ratio Prot	c0.03	0.01		0.03	c0.03		0.01	c0.48		0.19	c0.67	
v/s Ratio Perm			0.00			c0.10			0.01			0.04
v/c Ratio	0.84	0.31	0.00	0.52	0.42	0.10	1.00	1.03	0.01	0.67	0.91	0.04
Uniform Delay, d1	48.2	46.7	0.0	45.9	45.0	0.0	49.6	26.7	0.0	32.1	10.5	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.72	0.47	1.00	1.16	0.85	1.00
Incremental Delay, d2	65.1	2.4	0.0	4.9	2.3	0.1	199.7	26.9	0.0	0.3	0.6	0.0
Delay (s)	113.2	49.1	0.0	50.8	47.3	0.1	235.4	39.4	0.0	37.5	9.5	0.0
Level of Service	F	D	A	D	D	A	F	D	A	D	A	A
Approach Delay (s)		87.2			18.6			40.6			12.7	
Approach LOS		F			B			D			B	

Intersection Summary

HCM Average Control Delay	24.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	83.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

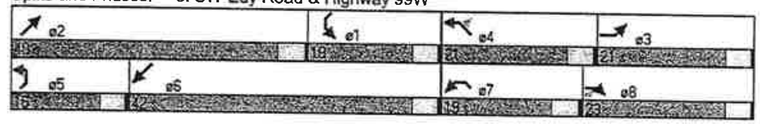
Lane Group	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	
Turning Speed (mph)	15	9	9	15	15	9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Frt		0.850	0.850			0.850		0.992			0.988	
Flt Protected	0.950			0.950	0.950		0.950			0.950		
Satd. Flow (prot)	1787	1599	1615	1698	1713	1553	1752	4908	0	1787	4987	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1787	1599	1615	1698	1803	1553	1752	4908	0	1787	4987	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			222			204		10			16	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)	30				30			30			30	
Link Distance (ft)	445				539			1905			1840	
Travel Time (s)	10.1				12.3			43.3			41.8	
Volume (vph)	194	306	224	382	321	196	288	1383	79	281	1984	169
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	1%	1%	0%	1%	0%	4%	3%	5%	2%	1%	3%	0%
Adj. Flow (vph)	202	319	233	398	334	204	300	1441	82	293	2067	176
Lane Group Flow (vph)	202	319	233	365	367	204	300	1523	0	293	2243	0
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases			8			4						
Detector Phases	3	8	8	7	4	4	5	2		1	6	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0		8.0	20.0	
Total Split (s)	21.0	23.0	23.0	19.0	21.0	21.0	16.0	40.0	0.0	18.0	42.0	0.0
Total Split (%)	21.0%	23.0%	23.0%	19.0%	21.0%	21.0%	16.0%	40.0%	0.0%	18.0%	42.0%	0.0%
Maximum Green (s)	17.0	19.0	19.0	15.0	17.0	17.0	12.0	36.0		14.0	38.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lead		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Walk Time (s)	5.0	5.0	5.0		5.0	5.0		5.0			5.0	
Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.0		11.0			11.0	
Pedestrian Calls (#/hr)	0	0	0		0	0		0			0	
Act Effct Green (s)	17.0	19.0	19.0	15.0	15.0	17.0	12.0	36.0		14.0	38.0	
Actuated g/C Ratio	0.17	0.19	0.19	0.15	0.15	0.17	0.12	0.36		0.14	0.38	
v/c Ratio	0.66	1.05	0.48	1.43	1.43	0.47	1.43	0.86		1.17	1.18	
Control Delay	55.5	106.6	17.5	246.8	245.3	10.0	245.4	43.6		113.3	101.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0		0.0	142.7	
Total Delay	55.5	106.6	17.5	246.8	245.3	10.0	248.4	43.6		113.3	244.6	
LOS	E	F	B	F	F	B	F	D		F	F	
Approach Delay	65.4				194.6			77.3			229.4	

Lane Group	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS	E				F			E			F	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 30 (30%), Referenced to phase 2:NET and 6:SWT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.43
Intersection Signal Delay: 157.7 Intersection LOS: F
Intersection Capacity Utilization 101.6% ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 3: SW Edy Road & Highway 99W



Movement	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	0.85	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	1599	1615	1698	1713	1553	1752	4908		1787	4988	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1787	1599	1615	1698	1803	1553	1752	4908		1787	4988	
Volume (vph)	194	306	224	382	321	196	288	1383	79	281	1984	169
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	202	319	233	398	334	204	300	1441	82	293	2067	176
RTOR Reduction (vph)	0	0	180	0	0	169	0	6	0	0	10	0
Lane Group Flow (vph)	202	319	53	365	367	35	300	1517	0	293	2233	0
Heavy Vehicles (%)	1%	1%	0%	1%	0%	4%	3%	5%	2%	1%	3%	0%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases			8			4						
Actuated Green, G (s)	17.0	19.0	19.0	15.0	17.0	17.0	12.0	36.0		14.0	38.0	
Effective Green, g (s)	17.0	19.0	19.0	15.0	17.0	17.0	12.0	36.0		14.0	38.0	
Actuated g/C Ratio	0.17	0.19	0.19	0.15	0.17	0.17	0.12	0.36		0.14	0.38	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	304	304	307	255	307	264	210	1767		250	1895	
v/s Ratio Prot	0.11	c0.20		c0.21	0.18		c0.17	0.31		0.16	c0.45	
v/s Ratio Perm			0.03		0.03	0.02						
v/c Ratio	0.66	1.05	0.17	1.43	1.20	0.13	1.43	0.86		1.17	1.18	
Uniform Delay, d1	38.8	40.5	33.9	42.5	44.0	35.2	44.0	29.6		43.0	31.0	
Progression Factor	1.15	1.12	2.41	0.97	0.97	1.18	1.30	1.38		0.72	0.62	
Incremental Delay, d2	4.8	62.0	0.2	214.0	113.8	0.2	204.9	2.7		81.6	80.8	
Delay (s)	49.6	107.3	82.1	255.0	156.4	41.8	262.0	43.4		112.7	100.0	
Level of Service	D	F	F	F	F	D	F	D		F	F	
Approach Delay (s)	84.1				169.9			79.4			101.5	
Approach LOS	F				F			E			F	

Intersection Summary			
HCM Average Control Delay	103.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	101.6%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCS+™ DETAILED REPORT

General Information		Site Information	
Analyst	GAJ	Intersection	Hwy 99W/Edy Rd
Agency or Co.	Lancaster Engineering	Area Type	All other areas
Date Performed	6/22/2007	Jurisdiction	ODOT
Time Period	PM Peak Hour	Analysis Year	BK Cond
		Project ID	07038 - Pfeifer Zone Change

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N_1	1	3	0	1	3	0	1	1	1	1	1	1
Lane Group	L	TR		L	TR		L	LT	R	L	T	R
Volume, V (vph)	288	1383	79	281	1984	169	382	321	196	194	306	224
% Heavy Vehicles, %HV	3	5	2	1	3	0	1	1	4	1	1	0
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, l_1	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green, e	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Arrival Type, AT	3	3		3	3		3	3	3	3	3	3
Unit Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Filtering/Metering, I	1.000	1.000		1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Initial Unmet Demand, Q_b	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N_m												
Buses Stopping, N_B	0	0		0	0		0	0	0	0	0	0
Min. Time for Pedestrians, G_p	3.2			3.2			3.2			3.2		

Phasing	Excl. Left	WB Only	Thru & RT	04	NB Only	SB Only	07	08
Timing	G = 7.0	G = 6.0	G = 42.0	G =	G = 14.0	G = 9.0	G =	G =
	Y = 4	Y = 4	Y = 6	Y =	Y = 4	Y = 4	Y =	Y =
Duration of Analysis, T = 0.25					Cycle Length, C = 100.0			

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	300	1523		293	2243		398	334	204	202	319	233
Lane Group Capacity, c	123	2057		304	2588		250	263	217	161	169	145
v/c Ratio, X	2.44	0.74		0.96	0.87		1.59	1.27	0.94	1.25	1.89	1.61
Total Green Ratio, g/C	0.07	0.42		0.17	0.52		0.14	0.14	0.14	0.09	0.09	0.09
Uniform Delay, d_1	46.5	24.4		41.2	21.0		43.0	43.0	42.6	45.5	45.5	45.5
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Delay Calibration, k	0.50	0.30		0.47	0.40		0.50	0.50	0.45	0.50	0.50	0.50
Incremental Delay, d_2	671.5	1.5		41.8	3.4		284.5	147.9	44.5	155.3	420.9	302.8
Initial Queue Delay, d_3	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay	718.0	25.9		82.9	24.4		327.5	190.9	87.1	200.8	466.4	348.3
Lane Group LOS	F	C		F	C		F	F	F	F	F	F
Approach Delay	139.8			31.1			226.4			358.7		
Approach LOS	F			C			F			F		
Intersection Delay	134.9			X_c = 1.24			Intersection LOS			F		

 HCS+™ Version 5.21 Generated: 9/24/2007 2:36 PM

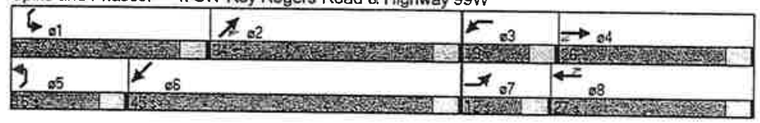
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑	↱	↰↰	↑	↱	↰	↑↑↑	↱	↰	↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.91	1.00	1.00	0.91	0.91
Frt			0.850			0.850			0.850		0.967	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	4917	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	4917	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			176			135			262		85	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1110			2115			1840			1741	
Travel Time (s)		25.2			48.1			41.8			39.6	
Volume (vph)	140	388	162	356	349	124	262	995	241	294	1868	520
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	17%	6%	5%	4%	4%	5%	3%	6%	9%	6%	2%	2%
Adj. Flow (vph)	152	422	176	387	379	135	285	1082	262	320	2030	565
Lane Group Flow (vph)	152	422	176	387	379	135	285	1082	262	320	2595	0
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases		4	4			8			2			
Detector Phases	7	4	4	3	8	8	5	2	2	1	6	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	8.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	
Total Split (s)	12.0	26.0	26.0	13.0	27.0	27.0	16.0	34.0	34.0	27.0	45.0	0.0
Total Split (%)	12.0%	26.0%	26.0%	13.0%	27.0%	27.0%	16.0%	34.0%	34.0%	27.0%	45.0%	0.0%
Maximum Green (s)	8.0	22.0	22.0	9.0	23.0	23.0	12.0	30.0	30.0	23.0	41.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	
Walk Time (s)		5.0	5.0		5.0	5.0		5.0	5.0		5.0	
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0		11.0	
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	
Act Effct Green (s)	8.0	22.0	22.0	9.0	23.0	23.0	12.0	31.7	31.7	21.3	41.0	
Actuated g/C Ratio	0.08	0.22	0.22	0.09	0.23	0.23	0.12	0.32	0.32	0.21	0.41	
v/c Ratio	1.24	1.07	0.37	1.28	0.90	0.29	1.36	0.70	0.40	0.88	1.26	
Control Delay	193.4	81.6	8.8	186.2	63.9	7.5	204.7	41.0	15.4	63.5	147.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	193.4	81.6	8.8	186.2	63.9	7.5	204.7	41.0	15.4	63.5	147.0	
LOS	F	F	A	F	E	A	F	D	B	E	F	
Approach Delay		87.2			108.0			65.5			137.8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS		F			F			E			F	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NET and 6:SWT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.36
Intersection Signal Delay: 108.3 Intersection LOS: F
Intersection Capacity Utilization 106.1% ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 4: SW Roy Rogers Road & Highway 99W



4: SW Roy Rogers Road & Highway 99W

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑	↱	↰↰	↑	↱	↰	↑↑↑	↱	↰	↑↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.91	1.00	1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	4919	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	4919	
Volume (vph)	140	388	162	356	349	124	262	995	241	294	1868	520
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	422	176	387	379	135	285	1082	262	320	2030	565
RTOR Reduction (vph)	0	0	137	0	0	104	0	0	179	0	50	0
Lane Group Flow (vph)	152	422	39	387	379	31	285	1082	83	320	2545	0
Heavy Vehicles (%)	17%	6%	5%	4%	4%	5%	3%	6%	9%	6%	2%	2%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases		4	4			8			2			
Actuated Green, G (s)	8.0	22.0	22.0	9.0	23.0	23.0	12.0	31.7	31.7	21.3	41.0	
Effective Green, g (s)	8.0	22.0	22.0	9.0	23.0	23.0	12.0	31.7	31.7	21.3	41.0	
Actuated g/C Ratio	0.08	0.22	0.22	0.09	0.23	0.23	0.12	0.32	0.32	0.21	0.41	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	123	394	338	303	420	354	210	1551	470	363	2017	
v/s Ratio Prot	0.10	c0.24		c0.11	0.21		c0.16	0.22		0.19	c0.52	
v/s Ratio Perm			0.03			0.02			0.06			
v/c Ratio	1.24	1.07	0.11	1.28	0.90	0.09	1.36	0.70	0.18	0.88	1.26	
Uniform Delay, d1	46.0	39.0	31.2	45.5	37.4	30.3	44.0	29.9	24.7	38.1	29.5	
Progression Factor	1.56	0.63	1.43	1.00	1.00	1.00	0.60	1.29	3.99	1.00	1.00	
Incremental Delay, d2	138.4	54.3	0.1	147.8	22.1	0.1	177.8	1.5	0.5	21.3	121.9	
Delay (s)	210.3	78.8	44.6	193.3	59.5	30.4	204.2	40.1	99.0	59.4	151.4	
Level of Service	F	E	D	F	E	C	F	D	F	E	F	
Approach Delay (s)		97.4			112.6			78.3			141.3	
Approach LOS		F			E			E			F	

Intersection Summary			
HCM Average Control Delay	115.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	106.1%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

5: SW Edy Road & SW Elwert Road

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.979			0.946			0.982			0.995	
Flt Protected		0.998			0.992			0.998			0.993	
Satd. Flow (prot)	0	1748	0	0	1769	0	0	1817	0	0	1847	0
Flt Permitted		0.998			0.992			0.998			0.993	
Satd. Flow (perm)	0	1748	0	0	1769	0	0	1817	0	0	1847	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1754			4157			1233			1513	
Travel Time (s)		39.9			94.5			28.0			34.4	
Volume (vph)	2	45	9	25	67	62	9	192	31	64	351	16
Confl. Peds. (#/hr)			1	1								
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	50%	3%	13%	0%	0%	2%	0%	3%	0%	0%	2%	0%
Adj. Flow (vph)	2	46	9	26	69	64	9	198	32	66	362	16
Lane Group Flow (vph)	0	57	0	0	159	0	0	239	0	0	444	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 60.8%	ICU Level of Service B
Analysis Period (min) 15	

ALL-WAY STOP CONTROL ANALYSIS

General Information		Site Information	
Analyst	GAJ	Intersection	Edy Rd/Elwert Rd
Agency/Co	Lancaster Engineering	Jurisdiction	Sherwood
Date Performed	6/13/2007	Analysis Year	BK + ST Cond
Analysis Time Period	PM Peak Hour		

Project ID 07038 - Pfeifer Zone Change

East/West Street: SW Edy Road | North/South Street: SW Elwert Road

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	2	45	9	25	67	62
%Thrus Left Lane						
Approach	**Northbound**			**Southbound**		
Movement	L	T	R	L	T	R
Volume (veh/h)	9	192	31	64	351	16
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.97		0.97		0.97		0.97	
Flow Rate (veh/h)	57		157		237		442	
% Heavy Vehicles	6		1		2		1	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

	Eastbound L1	Eastbound L2	Westbound L1	Westbound L2	Northbound L1	Northbound L2	Southbound L1	Southbound L2
Prop. Left-Turns	0.0		0.2		0.0		0.1	
Prop. Right-Turns	0.2		0.4		0.1		0.0	
Prop. Heavy Vehicle	0.1		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.0		-0.2		-0.0		0.0	

Departure Headway and Service Time

	Eastbound L1	Eastbound L2	Westbound L1	Westbound L2	Northbound L1	Northbound L2	Southbound L1	Southbound L2
hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.05		0.14		0.21		0.39	
hd, final value (s)	5.94		5.52		5.10		4.89	
x, final value	0.09		0.24		0.34		0.60	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	3.9		3.5		3.1		2.9	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	307		407		487		692	
Delay (s/veh)	9.56		10.26		10.65		14.98	
LOS	A		B		B		B	
Approach: Delay (s/veh)	9.56		10.26		10.65		14.98	
LOS	A		B		B		B	
Intersection Delay (s/veh)	12.65							
Intersection LOS	B							

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6: SW Edy Road & SW Borchers Drive

9/24/2007

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.928			0.876			0.851	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1881	0	1805	1746	0	1805	1664	0	1787	1585	0
Flt Permitted	0.179			0.458			0.651			0.726		
Satd. Flow (perm)	333	1881	0	870	1746	0	1237	1664	0	1366	1585	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					78			39			129	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		552			445			486			1271	
Travel Time (s)		12.5			10.1			11.0			28.9	
Volume (vph)	87	375	0	26	397	362	2	8	37	338	1	123
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	2%	1%	0%	0%	1%	1%	0%	0%	0%	1%	0%	2%
Adj. Flow (vph)	92	395	0	27	418	381	2	8	39	356	1	129
Lane Group Flow (vph)	92	395	0	27	799	0	2	47	0	356	130	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	62.0	62.0	0.0	62.0	62.0	0.0	38.0	38.0	0.0	38.0	38.0	0.0
Total Split (%)	62.0%	62.0%	0.0%	62.0%	62.0%	0.0%	38.0%	38.0%	0.0%	38.0%	38.0%	0.0%
Maximum Green (s)	58.0	58.0		58.0	58.0		34.0	34.0		34.0	34.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Min	C-Min		C-Min	C-Min	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	49.5	49.5		49.5	49.5		42.5	42.5		42.5	42.5	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.42	0.42		0.42	0.42	
v/c Ratio	0.56	0.42		0.06	0.88		0.00	0.06		0.61	0.17	
Control Delay	29.6	16.6		7.7	24.6		21.5	9.2		35.2	10.7	
Queue Delay	0.0	0.0		0.0	29.1		0.0	0.0		0.0	0.0	
Total Delay	29.6	16.6		7.7	53.7		21.5	9.2		35.2	10.7	
LOS	C	B		A	D		C	A		D	B	
Approach Delay		19.1			52.2			9.7			28.7	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		B			D			A			C	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 36.2 Intersection LOS: D
Intersection Capacity Utilization 83.2% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 6: SW Edy Road & SW Borchers Drive

ø2	ø4
38 s	62 s
ø6	ø8
38 s	62 s

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.93		1.00	0.88		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1881		1805	1747		1805	1664		1787	1586	
Flt Permitted	0.10	1.00		0.42	1.00		0.67	1.00		0.73	1.00	
Satd. Flow (perm)	181	1881		798	1747		1266	1664		1366	1586	
Volume (vph)	87	375	0	26	397	362	2	8	37	338	1	123
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	92	395	0	27	418	381	2	8	39	356	1	129
RTOR Reduction (vph)	0	0	0	0	39	0	0	22	0	0	74	0
Lane Group Flow (vph)	92	395	0	27	760	0	2	25	0	356	56	0
Heavy Vehicles (%)	2%	1%	0%	0%	1%	1%	0%	0%	0%	1%	0%	2%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	49.5	49.5		49.5	49.5		42.5	42.5		42.5	42.5	
Effective Green, g (s)	49.5	49.5		49.5	49.5		42.5	42.5		42.5	42.5	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.42	0.42		0.42	0.42	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	90	931		395	865		538	707		581	674	
v/s Ratio Prot		0.21			0.43			0.01			0.04	
v/s Ratio Perm	c0.51			0.03			0.00			c0.26		
v/c Ratio	1.02	0.42		0.07	0.88		0.00	0.03		0.61	0.08	
Uniform Delay, d1	25.2	16.1		13.2	22.6		16.6	16.8		22.4	17.1	
Progression Factor	1.00	1.00		0.73	1.19		1.00	1.00		1.19	2.30	
Incremental Delay, d2	101.0	0.3		0.0	1.0		0.0	0.1		4.3	0.2	
Delay (s)	126.3	16.5		9.7	27.8		16.6	16.9		30.9	39.6	
Level of Service	F	B		A	C		B	B		C	D	
Approach Delay (s)		37.2			27.2			16.9			33.2	
Approach LOS		D			C			B			C	

Intersection Summary

HCM Average Control Delay	31.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	83.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.865			0.865		0.995			0.947	
Flt Protected							0.950			0.950		
Satd. Flow (prot)	0	0	1644	0	0	1611	1805	1890	0	1736	1700	0
Flt Permitted							0.950			0.950		
Satd. Flow (perm)	0	0	1644	0	0	1611	1805	1890	0	1736	1700	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		414			1023			539			367	
Travel Time (s)		9.4			23.3			12.3			8.3	
Volume (vph)	0	0	84	0	0	344	129	446	14	39	550	299
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	2%	0%	3%	2%	2%	0%	0%	0%	4%	9%	0%
Adj. Flow (vph)	0	0	89	0	0	366	137	474	15	41	585	318
Lane Group Flow (vph)	0	0	89	0	0	366	137	489	0	41	903	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 75.1% ICU Level of Service D
Analysis Period (min) 15

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	GAJ	Intersection	Langer Dr/Sherwood Blvd
Agency/Co.	Lancaster Engineering	Jurisdiction	Sherwood
Date Performed	6/13/2007	Analysis Year	BK + ST Cond
Analysis Time Period	PM Peak Hour		

Project Description 07038 - Pfeifer Zone Change
East/West Street: SW Langer Drive | North/South Street: SW Sherwood Boulevard
Intersection Orientation: North-South | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	39	550	299	129	446	14
Peak-Hour Factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Hourly Flow Rate, HFR (veh/h)	40	567	308	132	459	14
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal		1			1	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			84			344
Peak-Hour Factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Hourly Flow Rate, HFR (veh/h)	0	0	86	0	0	354
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	1	0	0	1
Configuration			R			R

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L			R			R
v (veh/h)	40	132			354			86
C (m) (veh/h)	796	701			439			529
v/c	0.05	0.19			0.81			0.16
95% queue length	0.16	0.69			7.38			0.58
Control Delay (s/veh)	9.8	11.3			39.4			13.1
LOS	A	B			E			B
Approach Delay (s/veh)	--	--	39.4			13.1		
Approach LOS	--	--	E			B		

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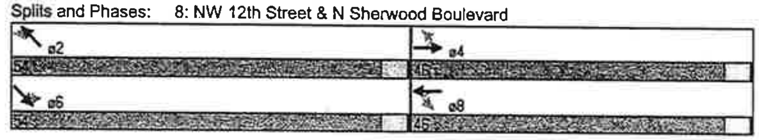
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.926			0.920			0.986			0.984	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	1742	0	1805	1739	0	1805	1840	0	1805	1837	0
Flt Permitted	0.594			0.656			0.103			0.338		
Satd. Flow (perm)	1129	1742	0	1246	1739	0	196	1840	0	642	1837	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		60			71			7			9	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		947			1090			367			1964	
Travel Time (s)		21.5			24.8			8.3			44.6	
Volume (vph)	120	67	65	386	85	98	73	431	44	29	685	82
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	2%	0%	0%	1%	0%	2%	0%	0%	2%	0%
Adj. Flow (vph)	125	70	68	402	89	102	76	449	46	30	714	85
Lane Group Flow (vph)	125	138	0	402	191	0	76	495	0	30	799	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Detector Phases	4	4		8	8		6	6		2	2	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	46.0	46.0	0.0	46.0	46.0	0.0	54.0	54.0	0.0	54.0	54.0	0.0
Total Split (%)	46.0%	46.0%	0.0%	46.0%	46.0%	0.0%	54.0%	54.0%	0.0%	54.0%	54.0%	0.0%
Maximum Green (s)	42.0	42.0		42.0	42.0		50.0	50.0		50.0	50.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Min	C-Min		C-Min	C-Min	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	35.2	35.2		35.2	35.2		56.8	56.8		56.8	56.8	
Actuated g/C Ratio	0.35	0.35		0.35	0.35		0.57	0.57		0.57	0.57	
v/c Ratio	0.31	0.21		0.92	0.29		0.68	0.47		0.08	0.76	
Control Delay	24.1	12.1		56.8	14.0		37.2	12.3		13.2	24.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	24.1	12.1		56.8	14.0		37.2	12.3		13.2	24.5	
LOS	C	B		E	B		D	B		B	C	
Approach Delay		17.8			43.0			15.6			24.1	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Approach LOS		B			D			B			C	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 26.2 Intersection LOS: C
Intersection Capacity Utilization 87.3% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 8: NW 12th Street & N Sherwood Boulevard



HCM Signalized Intersection Capacity Analysis
8: NW 12th Street & N Sherwood Boulevard
9/24/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	0.92		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1742		1805	1739		1805	1840		1805	1837	
Flt Permitted	0.57	1.00		0.64	1.00		0.17	1.00		0.38	1.00	
Satd. Flow (perm)	1084	1742		1221	1739		320	1840		717	1837	
Volume (vph)	120	67	65	386	85	98	73	431	44	29	685	82
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	125	70	68	402	89	102	76	449	46	30	714	85
RTOR Reduction (vph)	0	39	0	0	46	0	0	3	0	0	4	0
Lane Group Flow (vph)	125	99	0	402	145	0	76	492	0	30	795	0
Heavy Vehicles (%)	0%	0%	2%	0%	0%	1%	0%	2%	0%	0%	2%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	35.2	35.2		35.2	35.2		56.8	56.8		56.8	56.8	
Effective Green, g (s)	35.2	35.2		35.2	35.2		56.8	56.8		56.8	56.8	
Actuated g/C Ratio	0.35	0.35		0.35	0.35		0.57	0.57		0.57	0.57	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	382	613		430	612		182	1045		407	1043	
v/s Ratio Prot		0.06			0.08			0.27			c0.43	
v/s Ratio Perm	0.12			c0.33			0.24			0.04		
v/c Ratio	0.33	0.16		0.93	0.24		0.42	0.47		0.07	0.76	
Uniform Delay, d1	23.7	22.3		31.3	22.9		12.2	12.7		9.7	16.5	
Progression Factor	1.00	1.00		1.00	1.00		0.90	0.81		1.00	1.00	
Incremental Delay, d2	0.5	0.1		27.5	0.2		3.0	0.6		0.4	5.3	
Delay (s)	24.2	22.4		58.8	23.1		14.0	10.9		10.1	21.7	
Level of Service	C	C		E	C		B	B		B	C	
Approach Delay (s)		23.3			47.3			11.3			21.3	
Approach LOS		C			D			B			C	

Intersection Summary			
HCM Average Control Delay	25.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	87.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
9: SW Roy Rogers Road & SW Borchers Drive
9/24/2007

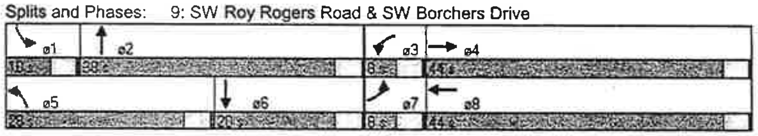
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↱		↰	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.963			0.995			0.887			0.979	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1597	3188	0	1703	3491	0	1770	1685	0	1703	1860	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1597	3188	0	1703	3491	0	1770	1685	0	1703	1860	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		53			4			31			7	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2043			1110			1271			856	
Travel Time (s)		46.4			25.2			28.9			19.5	
Volume (vph)	9	674	220	22	900	29	312	9	28	22	39	6
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	13%	11%	3%	6%	3%	0%	2%	0%	0%	6%	0%	0%
Adj. Flow (vph)	10	741	242	24	989	32	343	10	31	24	43	7
Lane Group Flow (vph)	10	983	0	24	1021	0	343	41	0	24	50	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Detector Phases	7	4		3	8		5	2		1	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	8.0	20.0		8.0	20.0		8.0	20.0		8.0	20.0	
Total Split (s)	8.0	44.0	0.0	8.0	44.0	0.0	28.0	38.0	0.0	10.0	20.0	0.0
Total Split (%)	8.0%	44.0%	0.0%	8.0%	44.0%	0.0%	28.0%	38.0%	0.0%	10.0%	20.0%	0.0%
Maximum Green (s)	4.0	40.0		4.0	40.0		24.0	34.0		6.0	16.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Walk Time (s)		5.0			5.0			5.0			5.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	4.0	34.4		4.0	36.0		22.5	50.2		6.1	27.9	
Actuated g/C Ratio	0.04	0.34		0.04	0.36		0.22	0.50		0.06	0.28	
v/c Ratio	0.16	0.87		0.35	0.81		0.86	0.05		0.23	0.10	
Control Delay	52.0	37.6		46.0	28.2		49.3	3.8		50.1	30.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	52.0	37.6		46.0	28.2		49.3	3.8		50.1	30.4	
LOS	D	D		D	C		D	A		D	C	
Approach Delay		37.7			28.6			44.5			36.8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		D			C			D			D	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 98 (98%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 34.9 Intersection LOS: C
Intersection Capacity Utilization 56.4% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 9: SW Roy Rogers Road & SW Borchers Drive



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	1.00		1.00	0.89		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1597	3189		1703	3492		1770	1685		1703	1860	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1597	3189		1703	3492		1770	1685		1703	1860	
Volume (vph)	9	674	220	22	900	29	312	9	28	22	39	6
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	10	741	242	24	989	32	343	10	31	24	43	7
RTOR Reduction (vph)	0	34	0	0	3	0	0	17	0	0	5	0
Lane Group Flow (vph)	10	949	0	24	1018	0	343	24	0	24	45	0
Heavy Vehicles (%)	13%	11%	3%	6%	3%	0%	2%	0%	0%	6%	0%	0%
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	0.8	35.2		1.6	36.0		22.5	44.6		2.6	24.7	
Effective Green, g (s)	0.8	35.2		1.6	36.0		22.5	44.6		2.6	24.7	
Actuated g/C Ratio	0.01	0.35		0.02	0.36		0.22	0.45		0.03	0.25	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	13	1123		27	1257		398	752		44	459	
v/s Ratio Prot	0.01	c0.30		c0.01	0.29		c0.19	0.01		0.01	c0.02	
v/s Ratio Perm												
v/c Ratio	0.77	0.84		0.89	0.81		0.86	0.03		0.55	0.10	
Uniform Delay, d1	49.5	29.9		49.1	28.9		37.3	15.6		48.1	29.0	
Progression Factor	1.00	1.00		0.94	0.98		0.96	0.39		1.00	1.00	
Incremental Delay, d2	128.6	6.0		25.6	0.4		10.5	0.0		13.1	0.4	
Delay (s)	178.1	35.9		72.0	28.6		46.5	6.0		61.2	29.5	
Level of Service	F	D		E	C		D	A		E	C	
Approach Delay (s)		37.3			29.6			42.1			39.8	
Approach LOS		D			C			D			D	

Intersection Summary			
HCM Average Control Delay	34.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	56.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	GAJ	Intersection	Highway 99W/Site Access
Agency/Co.	Lancaster Engineering	Jurisdiction	Sherwood
Date Performed	6/13/2007	Analysis Year	BK + ST Cond
Analysis Time Period	PM Peak Hour		

Project Description 07038 - Pfeifer Zone Change

East/West Street: | North/South Street: Highway 99W

Intersection Orientation: North-South | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		1751			2514	81
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR (veh/h)	0	1823	0	0	2618	84
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	2	0	0	2	1
Configuration		T			T	R
Upstream Signal		0			0	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			62			
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR (veh/h)	0	0	64	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	1	0	0	0
Configuration			R			

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration								R
v (veh/h)								64
C (m) (veh/h)								152
v/c								0.42
95% queue length								1.87
Control Delay (s/veh)								44.9
LOS								E
Approach Delay (s/veh)	--	--				44.9		
Approach LOS	--	--				E		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	GAJ	Intersection	Edy Road Site Access
Agency/Co.	Lancaster Engineering	Jurisdiction	Sherwood
Date Performed	6/13/2007	Analysis Year	BK + ST Cond
Analysis Time Period	PM Peak Hour		

Project Description 07038 - Pfeifer Zone Change

East/West Street: SW Edy Road | North/South Street: Site Access

Intersection Orientation: East-West | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		551	15	144	651	
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR (veh/h)	0	573	15	150	678	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	13		200			
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR (veh/h)	13	0	208	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	2
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
v (veh/h)		150		221				
C (m) (veh/h)		997		422				
v/c		0.15		0.52				
95% queue length		0.53		2.95				
Control Delay (s/veh)		9.2		22.5				
LOS		A		C				
Approach Delay (s/veh)	--	--	22.5					
Approach LOS	--	--	C					

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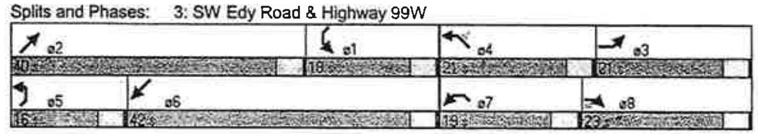
Lane Group	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	
Turning Speed (mph)	15	9	9	15	15	9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	0.97	0.97	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Frt		0.850	0.850			0.850		0.992			0.988	
Flt Protected	0.950			0.950	0.950		0.950			0.950		
Satd. Flow (prot)	1787	1599	1615	3467	3502	1553	1752	4908	0	1787	4987	0
Flt Permitted	0.950			0.950	0.950		0.950			0.950		
Satd. Flow (perm)	1787	1599	1615	3467	3502	1553	1752	4908	0	1787	4987	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			222			204		10			16	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)	30				30			30			30	
Link Distance (ft)	445				539			1905			1840	
Travel Time (s)	10.1				12.3			43.3			41.8	
Volume (vph)	194	306	224	382	321	196	288	1383	79	281	1984	169
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	1%	1%	0%	1%	0%	4%	3%	5%	2%	1%	3%	0%
Adj. Flow (vph)	202	319	233	398	334	204	300	1441	82	293	2067	176
Lane Group Flow (vph)	202	319	233	398	334	204	300	1523	0	293	2243	0
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases			8			4						
Detector Phases	3	8	8	7	4	4	5	2		1	6	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0		8.0	20.0	
Total Split (s)	21.0	23.0	23.0	19.0	21.0	21.0	16.0	40.0	0.0	18.0	42.0	0.0
Total Split (%)	21.0%	23.0%	23.0%	19.0%	21.0%	21.0%	16.0%	40.0%	0.0%	18.0%	42.0%	0.0%
Maximum Green (s)	17.0	19.0	19.0	15.0	17.0	17.0	12.0	36.0		14.0	38.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lead		Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Walk Time (s)	5.0	5.0	5.0		5.0	5.0		5.0			5.0	
Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.0		11.0			11.0	
Pedestrian Calls (#/hr)	0	0	0		0	0		0			0	
Act Effct Green (s)	19.3	19.5	19.5	14.5	14.7	14.7	12.0	36.0		14.0	38.0	
Actuated g/C Ratio	0.19	0.20	0.20	0.14	0.15	0.15	0.12	0.36		0.14	0.38	
v/c Ratio	0.59	1.02	0.47	0.79	0.65	0.51	1.43	0.86		1.17	1.18	
Control Delay	52.6	100.9	18.8	50.4	43.1	10.9	245.4	43.6		119.3	101.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0		0.0	40.6	
Total Delay	52.6	100.9	18.8	50.4	43.1	10.9	248.4	43.6		119.3	142.2	
LOS	D	F	B	D	D	B	F	D		F	F	
Approach Delay	62.6				39.2			77.3			139.6	

Lane Group	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS	E				D			E			F	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 30 (30%), Referenced to phase 2:NET and 6:SWT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.43
Intersection Signal Delay: 95.7 Intersection LOS: F
Intersection Capacity Utilization 93.0% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 3: SW Edy Road & Highway 99W



HCM Signalized Intersection Capacity Analysis
3: SW Edy Road & Highway 99W

9/24/2007

Movement	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↱	↱	↰↰	↰↰	↱	↰	↑↑↱		↰	↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.97	0.97	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	0.85	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	1599	1615	3467	3502	1553	1752	4908		1787	4988	
Flt Permitted	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1787	1599	1615	3467	3502	1553	1752	4908		1787	4988	
Volume (vph)	194	306	224	382	321	196	288	1383	79	281	1984	169
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	202	319	233	398	334	204	300	1441	82	293	2067	176
RTOR Reduction (vph)	0	0	179	0	0	174	0	6	0	0	10	0
Lane Group Flow (vph)	202	319	54	398	334	30	300	1517	0	293	2233	0
Heavy Vehicles (%)	1%	1%	0%	1%	0%	4%	3%	5%	2%	1%	3%	0%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases			8			4						
Actuated Green, G (s)	19.3	19.5	19.5	14.5	14.7	14.7	12.0	36.0		14.0	38.0	
Effective Green, g (s)	19.3	19.5	19.5	14.5	14.7	14.7	12.0	36.0		14.0	38.0	
Actuated g/C Ratio	0.19	0.20	0.20	0.14	0.15	0.15	0.12	0.36		0.14	0.38	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	345	312	315	503	515	228	210	1767		250	1895	
v/s Ratio Prot	0.11	c0.20		c0.11	0.10		c0.17	0.31		0.16	c0.45	
v/s Ratio Perm			0.03			0.02						
v/c Ratio	0.59	1.02	0.17	0.79	0.65	0.13	1.43	0.86		1.17	1.18	
Uniform Delay, d1	36.7	40.2	33.5	41.3	40.2	37.1	44.0	29.6		43.0	31.0	
Progression Factor	1.21	1.17	2.65	0.94	0.93	1.18	1.30	1.38		0.68	0.56	
Incremental Delay, d2	2.2	53.7	0.2	7.8	2.6	0.2	204.9	2.7		88.9	81.9	
Delay (s)	46.6	100.9	89.1	46.5	40.2	44.1	262.0	43.5		118.1	99.2	
Level of Service	D	F	F	D	D	D	F	D		F	F	
Approach Delay (s)	82.7				43.7			79.4			101.4	
Approach LOS	F				D			E			F	

Intersection Summary			
HCM Average Control Delay	83.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	93.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

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HCS+™ DETAILED REPORT

General Information		Site Information	
Analyst	GAJ	Intersection	Hwy 99W/Edy Rd
Agency or Co.	Lancaster Engineering	Area Type	All other areas
Date Performed	6/22/2007	Jurisdiction	ODOT
Time Period	PM Peak Hour	Analysis Year	BK Cond
		Project ID	07038 - Pfeifer Zone Change

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N_1	1	3	0	1	3	0	2	2	1	1	1	1
Lane Group	L	TR		L	TR		L	T	R	L	T	R
Volume, V (vph)	288	1383	79	281	1984	169	382	321	196	194	306	224
% Heavy Vehicles, %HV	3	5	2	1	3	0	1	1	4	1	1	0
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.95
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, l_1	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green, e	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Arrival Type, AT	3	3		3	3		3	3	3	3	3	3
Unit Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Filtering/Metering, I	1.000	1.000		1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Initial Unmet Demand, Q_b	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N_m												
Buses Stopping, N_B	0	0		0	0		0	0	0	0	0	0
Min. Time for Pedestrians, G_p	3.2			3.2			3.2			3.2		

Phasing	Excl. Left	WB Only	Thru & RT	04	Excl. Left	Thru & RT	07	08
Timing	G = 12.7	G = 6.0	G = 36.7	G =	G = 9.8	G = 12.8	G =	G =
	Y = 4	Y = 4	Y = 6	Y =	Y = 4	Y = 4	Y =	Y =
Duration of Analysis, T = 0.25						Cycle Length, C = 100.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	300	1523		293	2243		398	334	204	202	319	233
Lane Group Capacity, c	223	1797		406	2324		340	458	199	175	241	207
v/c Ratio, X	1.35	0.85		0.72	0.97		1.17	0.73	1.03	1.15	1.32	1.13
Total Green Ratio, g/C	0.13	0.37		0.23	0.47		0.10	0.13	0.13	0.10	0.13	0.13
Uniform Delay, d_1	43.7	29.1		35.7	25.9		45.1	41.9	43.6	45.1	43.6	43.6
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Delay Calibration, k	0.50	0.38		0.28	0.47		0.50	0.29	0.50	0.50	0.50	0.50
Incremental Delay, d_2	182.2	4.0		6.2	11.6		103.7	5.8	70.5	115.6	171.6	100.4
Initial Queue Delay, d_3	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay	225.9	33.1		41.9	37.5		148.8	47.8	114.1	160.7	215.2	144.0
Lane Group LOS	F	C		D	D		F	D	F	F	F	F
Approach Delay	64.8			38.0			105.2			178.6		
Approach LOS	E			D			F			F		
Intersection Delay	74.0			X_c = 1.11			Intersection LOS			E		

HCS+™ Version 5.21

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑	↱	↰↰	↑	↱	↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	5085	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	5085	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			176			135			262			285
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1110			2115			1840			1741	
Travel Time (s)		25.2			48.1			41.8			39.6	
Volume (vph)	140	388	162	356	349	124	262	995	241	294	1868	520
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	17%	6%	5%	4%	4%	5%	3%	6%	9%	6%	2%	2%
Adj. Flow (vph)	152	422	176	387	379	135	285	1082	262	320	2030	565
Lane Group Flow (vph)	152	422	176	387	379	135	285	1082	262	320	2030	565
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases		4	4			8			2			6
Detector Phases	7	4	4	3	8	8	5	2	2	1	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	12.0	26.0	26.0	13.0	27.0	27.0	16.0	34.0	34.0	27.0	45.0	45.0
Total Split (%)	12.0%	26.0%	26.0%	13.0%	27.0%	27.0%	16.0%	34.0%	34.0%	27.0%	45.0%	45.0%
Maximum Green (s)	8.0	22.0	22.0	9.0	23.0	23.0	12.0	30.0	30.0	23.0	41.0	41.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)		5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0
Flash Dont Walk (s)		11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	8.0	22.0	22.0	9.0	23.0	23.0	12.0	31.7	31.7	21.3	41.0	41.0
Actuated g/C Ratio	0.08	0.22	0.22	0.09	0.23	0.23	0.12	0.32	0.32	0.21	0.41	0.41
v/c Ratio	1.24	1.07	0.37	1.28	0.90	0.29	1.36	0.70	0.40	0.88	0.97	0.69
Control Delay	193.5	81.5	8.8	186.2	63.9	7.5	204.9	40.8	15.4	63.5	44.0	16.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	193.5	81.5	8.8	186.2	63.9	7.5	204.9	40.8	15.4	63.5	44.0	16.6
LOS	F	F	A	F	E	A	F	D	B	E	D	B
Approach Delay		87.1			108.0			65.4			40.8	

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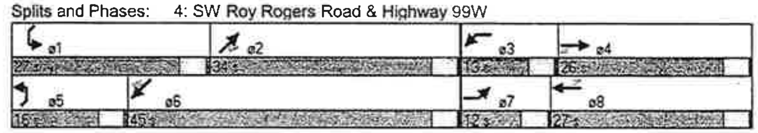
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS		F			F			E			D	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NET and 6:SWT, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.36
Intersection Signal Delay: 62.7 Intersection LOS: E
Intersection Capacity Utilization 94.5% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 4: SW Roy Rogers Road & Highway 99W



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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑	↱	↰↰	↑	↱	↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	5085	1583
Volume (vph)	140	388	162	356	349	124	262	995	241	294	1868	520
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	422	176	387	379	135	285	1082	262	320	2030	565
RTOR Reduction (vph)	0	0	137	0	0	104	0	0	179	0	0	168
Lane Group Flow (vph)	152	422	39	387	379	31	285	1082	83	320	2030	397
Heavy Vehicles (%)	17%	6%	5%	4%	4%	5%	3%	6%	9%	6%	2%	2%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases		4	4			8			2			6
Actuated Green, G (s)	8.0	22.0	22.0	9.0	23.0	23.0	12.0	31.7	31.7	21.3	41.0	41.0
Effective Green, g (s)	8.0	22.0	22.0	9.0	23.0	23.0	12.0	31.7	31.7	21.3	41.0	41.0
Actuated g/C Ratio	0.08	0.22	0.22	0.09	0.23	0.23	0.12	0.32	0.32	0.21	0.41	0.41
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	123	394	338	303	420	354	210	1551	470	363	2085	649
v/s Ratio Prot	0.10	c0.24		c0.11	0.21		c0.16	0.22		c0.19	c0.40	
v/s Ratio Perm			0.03			0.02			0.06			0.25
v/c Ratio	1.24	1.07	0.11	1.28	0.90	0.09	1.36	0.70	0.18	0.88	0.97	0.61
Uniform Delay, d1	46.0	39.0	31.2	45.5	37.4	30.3	44.0	29.9	24.7	38.1	29.0	23.2
Progression Factor	1.57	0.63	1.43	1.00	1.00	1.00	0.61	1.28	3.98	1.00	1.00	1.00
Incremental Delay, d2	138.4	54.3	0.1	147.8	22.1	0.1	178.0	1.6	0.5	21.3	14.4	4.3
Delay (s)	210.4	78.7	44.6	193.3	59.5	30.4	204.6	39.9	98.9	59.4	43.4	27.5
Level of Service	F	E	D	F	E	C	F	D	F	E	D	C
Approach Delay (s)		97.4			112.6			78.2			42.1	
Approach LOS		F			E			E			D	

Intersection Summary			
HCM Average Control Delay	68.5	HCM Level of Service	E
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	94.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Future (2020) System Assumptions

The Metro regional travel demand forecast model was used to determine future (2020) traffic volumes for the City of Sherwood. The 2020 base model assumed RTP programmed improvements as a base case scenario. The improvements that are located within the City of Sherwood and have an impact on motor vehicle roadway capacity are listed in Table 4-4. Other projects in the area (i.e. adjacent cities and counties) are included as listed in the RTP. These other projects could have impact on travel behavior within Sherwood.

Table 4-4: RTP Projects Included in Future (2020) Travel Demand Modeling

Project	Estimated Cost ($1,000s)	Model Updates
Oregon Street Improvements—widen to three lanes with a traffic signal at Tualatin-Sherwood Road (Tualatin-Sherwood to Murdock)	$5,500	Additional center turn lane
Edy Road/Sherwood Boulevard Improvements—Borchers to Pine/3rd Street	$1,500	Additional center turn lane
Tualatin-Sherwood Road Improvements—widen to five lanes with bike lanes and sidewalks, intertie signals at Oregon and Cipole streets	$25,000	Two additional travel lanes (one each direction)

Circulation and Capacity Needs

The motor vehicle capacity and circulation needs in Sherwood were determined for existing and future conditions. The process used for analysis is outlined below, followed by the findings and recommendations of the analysis. The extent and nature of the street improvements for Sherwood are significant. Many of the improvements discussed in this section were previously identified in the Washington County TSP and the RTP. The 2020 capacity analysis done through the city's Transportation System Plan confirmed the need for investments, plus it identifies additional projects for traffic signal and intersection improvements that compliment other roadway projects. The study also highlights long-range issues on state facilities that will require further analysis and design decisions to adequately support regional mobility and performance standards.

This section outlines the type of street improvements that would be necessary as part of a long-range master plan. Phasing of implementation will be necessary since not all the improvements can be done at once. This will require prioritization of projects and periodic updating to reflect current needs. It should be understood that the improvements outlined in the following section are a guide to managing growth in Sherwood, defining the types of right-of-way and street needs that will be required as development occurs.

Strategies

A series of strategies were developed to address the future motor vehicle needs of Sherwood. The following listing reflects the initial prioritization of strategies.

- Promote Regional Circulation (ORE 99W, Tualatin-Sherwood Road)
- Improve Local Street Circulation (connectivity)
- Provide Additional Street System Capacity to LOS D[11] (turn lanes, signals, widening, new roads)
- Improve Operation of Existing System (signal coordination, intelligent transportation systems, neighborhood traffic management)
- Transportation Demand Management (telecommuting, alternative modes, pricing)
- Change Land Use to Promote Alternative Modes Use
- Improve Access Control to increase capacity
- Change Level of Service Definitions

Future Intersection Capacity Analysis

Year 2020 traffic volume forecasts were analyzed to identify locations where peak hour performance will drop below minimum desirable levels (worse than LOS D). This focuses on the 35 study intersections that were previously examined under Existing Conditions (2003 traffic volumes), but also includes a review of road segment approaches to major intersections. The following tables summarize intersection levels of service in Sherwood for 2020 operating conditions for both Build and No-Build scenarios. The planned street improvements listed in Chapter 4 (see Table 4-4) are expected to be constructed and operational by 2020.

[11] Level of service D as defined by the Highway Capacity Manual, latest version.

The No-Build scenario includes the following improvement, which was constructed after the base year model (2000) was developed in 2000:

Oregon Street: Widen from two-lanes to three-lanes between Tualatin-Sherwood Road and Murdock Road. Traffic Signal at Oregon Street/Tualatin-Sherwood Road.

The Build scenario includes the "No-Build" improvement, plus the following improvements:

Tualatin-Sherwood Road: Widening from three-lanes to five-lanes between Teton Road and ORE 99W. Intertie signals from Borchers to Adams and between Oregon and Cipole.

Downtown Street Plan (i.e. Oregon Street Realignment, Pine Street Extension, Railroad Avenue disconnected)

Adams Street between Pine Street and Tualatin-Sherwood Road

Intersection-specific mitigation measures (these are described later in this chapter)

Traffic volumes were developed as described previously and applied to existing intersection geometries, except where additional through lane capacity was programmed in the future. The value in this analysis as a starting point in reviewing the motor vehicle system performance is that it highlights where the planned system fails to meet performance standards. These locations will be reviewed to consider street improvements alternatives that could better serve planned growth.

Findings

For the No-Build scenario, many of the intersections controlled by traffic signals will continue to operate at LOS C or better with growth planned to 2020. However, a number of intersections will degrade to LOS E. For the Build scenario, many study intersections improve slightly and none will degrade below LOS D or volume-to-capacity worse than 0.90.

Many of the unsignalized intersections operate at LOS D or worse for both the No-Build and Build scenarios. This means that the minor street approaches to these intersections experience moderate to long delays. The major street movements generally are not impeded and typically only a handful of minor street vehicles experience delay. Signal warrants were evaluated to determine where traffic signals might be needed at locations that do not have a traffic signal today (see discussion below). Several of the study intersections in Sherwood met MUTCD's Eight-Hour Volume Warrant (Warrant 1) under 2020 traffic volume conditions. Table 8-4 shows the future 2020 No-Build intersection levels of service within Sherwood and Table 8-5 shows the future 2020 Build intersection levels of service.

A 2020 Build (Mitigated) scenario was evaluated. This scenario includes improvements that are needed beyond the improvements that were assumed for the 2020 modeling work (described previously). The additional mitigation that would be required to achieve the levels of service for 2020 Build (Mitigated) are as follows:

- Tualatin-Sherwood Road/Langer Drive: Remove traffic signal due to close proximity to signal at Tualatin-Sherwood Road/Regals Cinemas and future signal at Tualatin-Sherwood Road/Adams Street.
- Sherwood Boulevard/Langer Drive: Remove traffic signal due to close proximity to signal at ORE 99W/Sherwood Boulevard and future signal at Sherwood Boulevard/Century Drive. Limit movements to left-in and right-in/right-out only (i.e. restrict left turn movement from Langer Drive onto Sherwood Boulevard south-eastbound.

- Edy Road/Borchers Drive: Some type of traffic control enhancement would be required at this intersection. A traffic signal or roundabout are possibilities. Level of service reported in table assumes traffic signal is in place.
- Sherwood Boulevard/Century Drive: Install traffic control device (could be traffic signal or roundabout).
- Oregon Street/Tonquin Road: Some sort of traffic control enhancement will be required at this intersection. A traffic signal is not a likely candidate due to the close proximity to the roundabout at Oregon Street/Murdock Road. A roundabout may be a candidate, however, there are topography and other issues that must be considered. No traffic control enhancements were assumed for the analysis reported in the table.
- Tualatin-Sherwood Road/Gerda Lane: This intersection operates poorly, but Gerda Lane is planned to be extended east to meet Cipole Road. This will provide an additional outlet to the businesses located along Gerda Lane, including access to a traffic signal at Tualatin-Sherwood Road/Cipole Road. The analysis reported in this table does not assume the Gerda Lane extension, but the minor street movement would likely still operate at LOS F, even with the extension in place. This poor level of service would be acceptable given alternative signalized access would be available and given access management policies on Tualatin-Sherwood Road.

The Oregon Highway Plan sets maximum volume-to-capacity ratios (v/c) for peak hour operating conditions, based on ODOT's highway classification and other criteria for state facilities (indicated with an * in Table 8-4 and Table 8-5). For statewide freight routes within the Metro area (i.e. ORE 99W through Sherwood), intersections are required to operate at a v/c of 0.95 or better (2040 Concept Area) or 0.90 or better (Non-Concept Area)[12]. Additionally, alternate highway mobility standards have been defined for specifically designated areas within Metro's boundaries[13]. Specifically, Corridors (as 99W is designated) have a maximum v/c ratio of 0.99 for both the first and second hours. Under existing and future conditions, these criteria are met for all state facilities in the study area.

Table 8-4: 2020 No-Build PM Peak Hour Intersection Level of Service

Intersection	*Level of Service*	*Average Delay*	*Volume / Capacity*
Signalized Intersections			
ORE 99W/Home Depot*	C	25.9	0.90
ORE 99W/Tualatin-Sherwood Rd*	E	55.9	0.99
ORE 99W/Sherwood Blvd*	D	48.0	0.94
ORE 99W/Meinecke Rd*	B	18.5	0.76
ORE 99W/Sunset Blvd*	D	36.8	0.92
Tualatin-Sherwood Rd/Cipole Rd	C	25.7	0.89
Tualatin-Sherwood Rd/Oregon St	E	78.6	1.20
Tualatin-Sherwood Rd/Langer Dr	C	33.4	0.90

[12] 2040 Growth Concept, Metro, adopted December 14, 1995 and last amended November 14, 2002.
[13] Amendment to 1999 Oregon Highway Plan Alternate Highway Mobility Standards Metro Area, Table 7.

Intersection	*Level of Service*	*Average Delay*	*Volume / Capacity*
Tualatin-Sherwood Rd/Regal Cinemas	C	23.9	0.72
Roy Rogers Rd/Borchers Dr	A	8.5	0.60
Sherwood Blvd/Langer Dr	E	55.5	0.77
Roundabout Intersections			
Meinecke Rd/Dewey Dr	A	4.0	0.30
Oregon St/Murdock Rd	A	7.9	0.72
All-Way Stop Controlled Intersections			
Sherwood Blvd/Railroad Ave	B	11.2	0.52
Sunset Blvd/Murdock Rd	B	11.2	0.47
Sunset Blvd/Pinehurst Dr	C	15.8	0.73
Sunset Blvd/Sherwood Blvd	D	33.3	0.97
Washington St/3rd Ave	A	9.5	0.36
Washington St/Railroad Ave	B	12.4	0.61
Cipole Rd/Herman Rd	B	10.2	0.41
Edy Rd/Elwert Rd	B	13.0	0.65
Unsignalized Intersections			
ORE 99W/Brookman Rd*	C/F		
Tualatin-Sherwood Rd/Gerda Ln	B/F		
Brookman Rd/Ladd Hill Rd	A/B		
Edy Rd/Borchers Dr	A/C		
Elwert Rd/Kruger Rd	A/B		
Elwert Rd/Swanstrom Dr	A/B		
Murdock Rd/Willamette St	A/B		
Oregon St/Lincoln St	A/B		
Oregon St/Tonquin Rd	A/F		
Pine St/Oregon St	A/F		
Sherwood Blvd/3rd St	A/D		
Sherwood Blvd/Century Dr	A/F		
Sunset Blvd/Pine St	A/D		
Sunset Blvd/Woodhaven Dr	A/E		

Signalized and All-Way Stop Intersection LOS:
LOS = Level of Service, Delay = Average vehicle delay in the peak hour for entire intersection,
V/C = Volume to Capacity Ratio
Unsignalized Intersection LOS:
A/A=Major Street turn LOS/Minor street turn LOS
Roundabout Intersection LOS:
LOS = FHWA Methodology Level of Service, Delay = FHWA Methodology Level of Service,
V/C = HCM Methodology worst approach Volume to Capacity Ratio
* Indicates intersection where ODOT v/c thresholds apply

Table 8-5: 2020 Build and Build (Mitigated) PM Peak Hour Intersection Level of Service

Intersection	2020 Build			2020 Build (Mitigated)		
	Level of Service	Average Delay	Volume / Capacity	Level of Service	Average Delay	Volume / Capacity
Signalized Intersections						
ORE 99W/Home Depot*	B	17.9	0.76	B	17.9	0.76
ORE 99W/Tualatin-Sherwood Rd*	D	43.9	0.86	D	43.9	0.86
ORE 99W/Sherwood Blvd*	D	38.1	0.80	D	38.1	0.80
ORE 99W/Meinecke Rd*	B	16.4	0.72	B	16.4	0.72
ORE 99W/Sunset Blvd*	C	31.3	0.85	C	31.3	0.85
Tualatin-Sherwood Rd/Cipole Rd	B	15.7	0.56	B	15.7	0.56
Tualatin-Sherwood Rd/Oregon St	C	22.1	0.75	C	22.1	0.75
Tualatin-Sherwood Rd/Langer Dr	**B**	**16.3**	**0.47**	**B/B**		
Tualatin-Sherwood Rd/Regal Cinemas	B	19.3	0.52	B	19.3	0.52
Roy Rogers Rd/Borchers Dr	A	7.6	0.56	A	7.6	0.56
Sherwood Blvd/Langer Dr	**D**	**39.0**	**0.61**	**A/C**		
Roundabout Intersections						
Meinecke Rd/Dewey Dr	A	2.8	0.15	A	2.8	0.15
Oregon St/Murdock Rd	A	5.4	0.34	A	5.4	0.34
All-Way Stop Controlled						
Sherwood Blvd/Railroad Ave	B	10.7	0.45	B	10.7	0.45
Sunset Blvd/Murdock Rd	B	10.2	0.39	B	10.2	0.39
Sunset Blvd/Pinehurst Dr	B	13.5	0.64	B	13.5	0.64
Sunset Blvd/Sherwood Blvd	C	23.0	0.83	C	23.0	0.83
Washington St/3rd Ave	A	7.5	0.12	A	7.5	0.12
Washington St/Railroad Ave	A	7.8	0.19	A	7.8	0.19
Cipole Rd/Herman Rd	A	9.2	0.28	A	9.2	0.28
Edy Rd/Elwert Rd	B	11.4	0.57	B	11.4	0.57
Unsignalized Intersections						
ORE 99W/Brookman Rd*	C/F			C/F		
Tualatin-Sherwood Rd/Gerda Ln	B/F			B/F		
Brookman Rd/Ladd Hill Rd	A/B			A/B		
Edy Rd/Borchers Dr	**A/C**			**B**	**13.7**	**0.50**
Elwert Rd/Kruger Rd	A/B			A/B		
Elwert Rd/Swanstrom Dr	A/B			A/B		
Murdock Rd/Willamette St	A/B			A/B		
Oregon St/Lincoln St	A/B			A/B		
Oregon St/Tonquin Rd	A/E			A/E		
Pine St/Oregon St	A/D			A/D		
Sherwood Blvd/3rd St	A/D			A/D		
Sherwood Blvd/Century Dr	**A/F**			**B**	**18.7**	**0.51**
Sunset Blvd/Pine St	A/C			A/C		
Sunset Blvd/Woodhaven Dr	A/D			A/D		

Signalized and All-Way Stop Intersection LOS:
LOS = Level of Service, Delay = Average vehicle delay in the peak hour for entire intersection,
V/C = Volume to Capacity Ratio
Unsignalized Intersection LOS:
A/A=Major Street turn LOS/Minor street turn LOS
Roundabout Intersection LOS:
LOS = FHWA Methodology Level of Service, Delay = FHWA Methodology Level of Service,
V/C = HCM Methodology worst approach Volume to Capacity Ratio
* Indicates intersection where ODOT v/c thresholds apply.

Bold indicates locations where mitigations beyond those assumed in the model (described previously) were analyzed.

The Highway Capacity Manual Methodology for signalized intersection analysis treats each intersection as an isolated signal within a roadway system. Congested environments where upstream intersection operations impact signal operations (usually excessive vehicle queues) can be better analyzed using Synchro and SimTraffic, which considers the intersections as a system and simulates each vehicle passing through the system. A simulation model was created to analyze the signals along Tualatin-Sherwood Road and Roy Rogers Road between Borchers Drive and Langer Drive. Table 8-6 lists the delay at each of the intersections estimated by twenty simulation iterations. As shown in the table, the impact of upstream signals can have a significant effect on the actual vehicle delay.

Table 8-6: 2020 No-Build PM Peak Hour Simulated Intersection Delay

Intersection	Lowest Average Delay	Highest Average Delay	Median Average Delay	Corresponding HCM LOS
Roy Rogers/Borchers	27.8	260.7	128.8	F
Tualatin-Sherwood/ORE 99W	55.6	70.0	63.8	E
Tualatin-Sherwood/Regal Cinemas	41.4	168.4	87.9	F
Tualatin-Sherwood/Langer Drive	48.9	320.4	165.0	F

In addition to the intersection operation, average travel speed was analyzed using the 2020 No-Build forecasts and intersection operations. Table 8-7 lists the travel time runs forecasted for Tualatin-Sherwood Road and Highway 99W. Travel speeds on Tualatin-Sherwood Road are forecasted to decrease by 35 to 50 percent from existing conditions.

Preliminary Traffic Signal Warrants

Preliminary signal warrants[14] were evaluated at all unsignalized intersections in the project study under year 2020 No-Build and 2020 Build traffic volume conditions. The results of this analysis are shown in Table 8-8. Meeting signal warrants does not guarantee that a signal will be installed. Before a signal can be installed on a state highway, a traffic signal investigation must be conducted or reviewed by the Oregon Department of Transportation. Traffic signal warrants must be met and the State Highway Engineer approval obtained before a signal will be placed on a state highway. Signals on non-state facilities need to be reviewed and approved by appropriate local officials.

[14] Preliminary Signal Warrants, MUTCD Warrant 1 (Eight Hour Vehicular Volume). Eight hour volumes were estimated based on peak hour volumes.

Table 8-7: Average PM Peak Hour Travel Speeds and LOS

Route	Average Travel Speed (mph) Existing	Average Travel Speed (mph) 2020 No-Build	LOS Existing	LOS 2020 No-Build
Tualatin-Sherwood Road Eastbound	30	19	B	D
Tualatin-Sherwood Road Westbound	27	13	C	E
Highway 99W Southbound	34	33	B	B
Highway 99W Northbound	34	30	B	B

Preliminary signal warrants were met under year 2020 Build traffic volume conditions at four of the study intersections in Sherwood. Since only peak hour traffic volumes were available for study intersections, peak hour volumes were factored to estimate eighth highest hour traffic volumes. Eighth highest hour volumes typically represent about 56.5 percent of peak hour volumes[15]. Therefore, peak hour volumes were multiplied by 0.565 to estimate eighth highest hour volumes. Condition A—Minimum Vehicular Volume reflects whether there is enough volume on both the main street and side street to warrant a traffic signal. Condition B—Interruption of Continuous Traffic is also a measure of volume, but puts more emphasis on the volume of the main street. If either Condition A or Condition B is met, Warrant 1 is met. Under some circumstances (when all other alternatives have been exhausted), Warrant 1 can be met if both Condition A and Condition B are met to the 80% level. Intersections meeting signal warrants should be analyzed further to determine if the intersection should be improved with a signal, turn lanes, a roundabout or increasing roadway connectivity.

[15] Based on surveys conducted by the Oregon Department of Transportation between 1991 and 1994.

Table 8-8: 2020 Signal Warrant Analysis

Intersection	2020 No-Build Cond A Met	2020 No-Build Cond B Met	2020 No-Build Signal Warranted	2020 Build Cond A Met	2020 Build Cond B Met	2020 Build Signal Warranted
ORE 99W/Brookman	No	80%	No	No	No	No
Tualatin-Sherwood/Gerda	No	No	No	No	No	No
Oregon/Tonquin	100%	100%	Yes	100%	No	Yes
Murdock/Willamette	No	No	No	No	No	No
Sunset/Murdock	80%	No	No	No	No	No
Sunset/Sherwood	100%	80%	Yes	100%	No	Yes
Edy/Elwert	No	No	No	No	No	No
Sherwood/Century	100%	100%	Yes	No	100%	Yes
Sherwood-Pine/3rd	No	No	No	No	80%	No
Pine/Oregon	100%	80%	Yes	80%	No	No
Washington/Railroad	No	No	No	No	No	No
Washington/3rd	No	No	No	No	No	No
Sherwood/Railroad	No	No	No	No	No	No
Cipole/Herman	No	No	No	No	No	No
Ladd Hill/Brookman	No	No	No	No	No	No
Sunset/Pine	No	80%	No	No	No	No
Sunset/Pinehurst	No	80%	No	No	80%	No
Sunset/Woodhaven	No	100%	Yes	No	80%	No
Elwert/Swanstrom	No	No	No	No	No	No
Elwert/Kruger	No	No	No	No	No	No
Borchers/Edy				100%	No	Yes
Oregon/Lincoln	No	No	No	No	No	No

System Circulation Alternatives

The 2020 traffic volume forecasts indicate significant growth on some facilities and negative growth on others. Selected model volumes for 2000 and 2020 summarized in Table 8-9 show substantial growth ORE 99W south of Tualatin-Sherwood Road, Tualatin-Sherwood Road and Sunset Boulevard. Negative growth is experienced on some facilities where planned improvements such as Adams Street and the downtown streets realignments redistribute traffic patterns. For example, Oregon Street between Tualatin-Sherwood Road and Tonquin Road is expected to decrease by 33% due to individuals taking the Adams Street connection between downtown and the northern section of Sherwood.

Table 8-9: Peak Hour Model Volumes (2000 and 2020)

Roadway	Segment	2000	2020	Percent Growth
ORE 99W	Tualatin-Sherwood north to Home Depot	2,700	2,800	4%
	Tualatin-Sherwood south to Sherwood Boulevard	3,250	4,000	23%
Tualatin-Sherwood Rd	ORE 99W to Langer	1,450	2,250	55%
Roy Rogers Road	ORE 99W to Borchers	875	1,000	14%
Oregon Street	Tualatin-Sherwood to Tonquin	900	600	-33%
Sherwood Boulevard	ORE 99W to Langer	700	575	-18%
	Century to 3rd	900	750	-17%
Sunset Boulevard	Pinehurst Drive to Sherwood Blvd	420	825	96%

I-5/Highway 99W Connector

Washington County and Metro are pursuing goal exceptions to make land use decisions regarding need, mode, function and general location for the bypass. In addition, Washington County is currently conducting an alignment study. When goal exceptions are in place, the city should amend the TSP to add the connector as a planned facility consistent with the county plan and goal exception. When the county completes studies to select a preferred alignment, the TSP should be amended to include the preferred alignment.

Outstanding 2020 Circulation Issues

Several deficiencies in the city, county or state street facilities were found that require further study. Alternative measures have been explored on a preliminary basis to identify possible performance gains, but further study will be required to select the preferred solutions.

Table 8-10: Outstanding Circulation Issues for 2020

Location / Key Issues	Possible Solutions / Options
Sherwood Bl. / Langer • Close spacing between major public street intersections including Highway 99, Langer Road, and Century Drive - 12th Street. Vehicle queues on Sherwood Boulevard can temporarily block upstream intersections during heavy use periods. • Limited alternative north-south circulation routes from retail on Langer to destinations in central and south city. Modifying existing provision could make for major out-of-direction travel. • Sherwood Boulevard is designated as a Collector facility. • High cross street turning volumes near retail uses and schools.	1. Restricted access at existing intersection with Sherwood at Langer. Removal or modification of existing traffic signal Eliminates queue blocking from ORE 99W signal. 2. Install new traffic signal or roundabout at Century Drive - 12th Street intersection as secondary access to retail site, and improved access from Century Drive and the planned Adams Street extension.
Elwert / Kruger / ORE 99W • Close spacing between ORE 99W and the north leg of Elwert Road (less than 100 feet) makes for awkward and potentially unsafe turning maneuvers. • Urban Growth Boundary (UGB) is located along the west edge of Elwert Road. Roadway capacity improvements outside the UGB has major restrictions. • Existing farm house west of intersection limits possible street re-alignments.	1. Realign Elwert Road approach so that intersection at ORE 99W opposite Sunset Drive is closer to 90 degrees. 2. Relocate and realign Kruger Road to intersect Elwert Road at least 500 feet from ORE 99W intersection.
Edy Road / Borchers Drive • Close spacing to ORE 99W creates operational conflicts with queued vehicles spilling back from ORE 99W to block Borchers Drive intersection. • Existing STOP sign controls on minor street approach will not be sufficient to serve future demands. • Intersection will have long delays for vehicles on Borchers Drive bound to ORE 99W during peak periods.	1. Install traffic signal controls that are coordinated with the ORE 99W intersection to reduce vehicle queue impacts. 2. Consider a roundabout installation at the Edy / Borchers intersection.
Oregon Street / Tonquin Road • Intersection likely to fail over the next 20 years without any improvements. • Existing roundabout at Murdock Road is	1. Evaluate potential roundabout design. Operations appear to be feasible with adjoining intersection at Murdock Road, given the volumes and adjacent "T" shaped intersections. However, the grade on Oregon

Location / Key Issues	Possible Solutions / Options
roughly 200 feet further south.	Street to the north and the slope in the northeast corner of this intersection may make the roundabout design inappropriate. 2. Traffic signal controls at Oregon / Tonquin were considered, but there were significant safety concerns about the close spacing to the roundabout, and the negative effects of vehicles slowing or stopping so close to the exit leg of the roundabout.
Langer Drive / Tualatin - Sherwood Road • Signal spacing on Tualatin-Sherwood Road should be 1,000 feet apart. • Existing and planned signals do not comply with this standard. • North-south cross circulation is limited for retail services.	1. Existing traffic signal may need to be removed or modified once new signal on Tualatin-Sherwood Road at Adams Street is built. 2. Signals on Tualatin-Sherwood Road should be interconnected to minimize delays for east-west traffic.
I-5 / ORE 99W Connector • Alternative routing for east-west commuter and freight traffic under study by Washington County and ODOT. • New facility could significantly reduce travel demands forecasted for Tualatin-Sherwood Road corridor presented in this report.	When the Connector Study is complete (anticipated for late 2004), this TSP should be updated or amended to reflect any recommendations from the I-5/ORE 99W Connector Study directly (or indirectly) affecting Sherwood.

ORE 99W Access Control. Several discussions were held between City and ODOT staff regarding access control along ORE 99W. A general access control plan has been agreed upon (i.e. where access will be allowed on ORE 99W in Sherwood). However, there has been some concern on the part of both ODOT and the City that by limiting all access to right-in, right-out only (de facto, by having a raised median in the center of the highway) will create the need for a large number of U-turns at signalized intersections (in particular, Sunset/ORE 99W). Based on preliminary development plans for properties located between Meinecke (the next traffic signal to the north) and Sunset, it was determined that this would likely not be an issue and that the planned capacity at that intersection could handle the volume of u-turning traffic that might be expected.

Improvements

Motor Vehicle Master Plan

The improvements needed to mitigate 2020 future conditions combine both those identified in prior plans (the Washington County TSP, Metro's RTP, and the ODOT STIP) and those determined as the outcome of the Transportation System Plan analysis. The improvements are shown in Figure 8-9 and listed in Table 8-11.

The cost estimates shown in these tables are taken from prior plan documents, or are estimated by DKS Associates using standard assumptions for new facilities. Further refinement should be made of these estimates prior to capital budgeting.

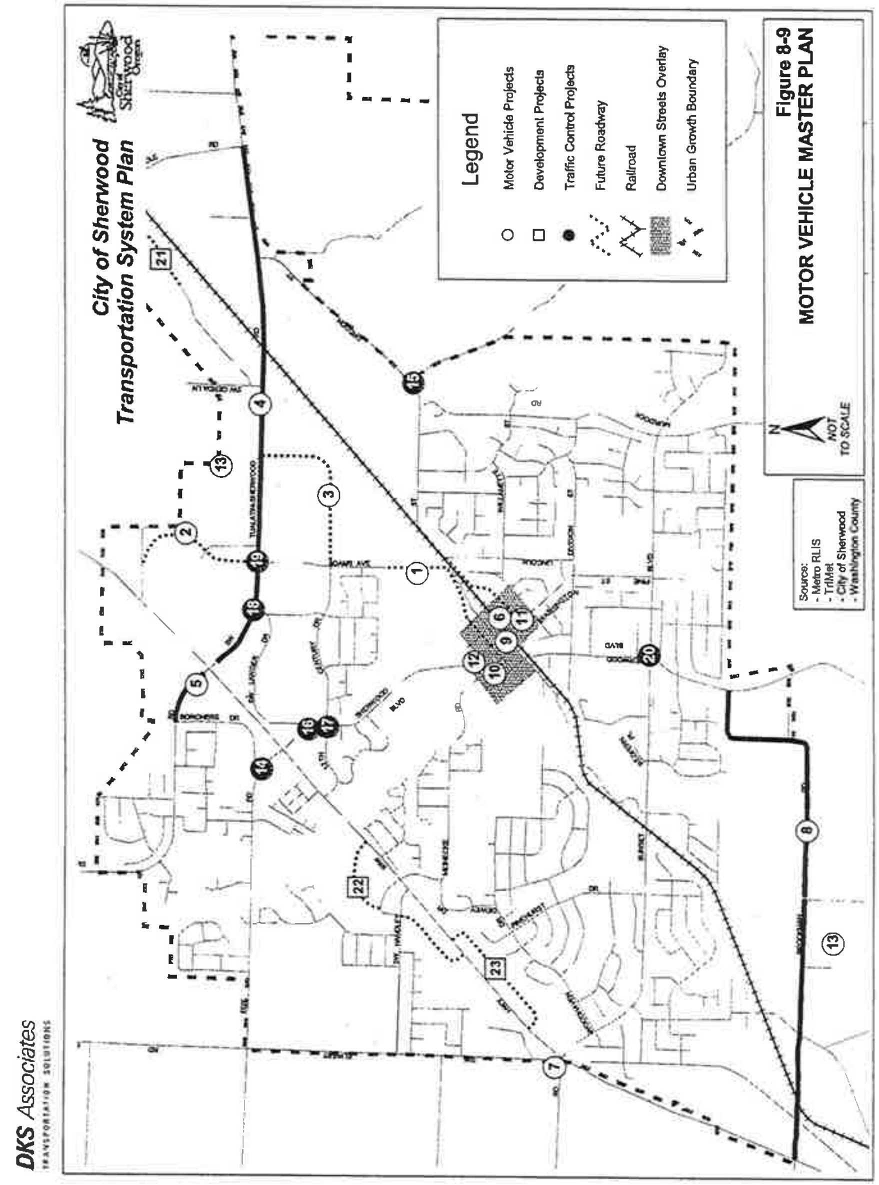


Table 8-11: City Street Projects

ID	Location	From	To	Project	Source*	Cost ($1,000's)
			City Funded Motor Vehicle Projects			
1	Adams Avenue	Pine Street	Tualatin-Sherwood Road	Construction of 3 lane road	CIP/TSP	$6,100
2	Adams Avenue	Tualatin-Sherwood Road	Home Depot	Construction of 3 lane road	CIP/TSP	$2,200
3	Century Drive	Adams Avenue	Tualatin-Sherwood Road	Construction of 3 lane road	TSP	$2,800
4/5	Tualatin-Sherwood Road	Cipole Road	Borchers Drive	Signal timing/interconnect project	TSP	$50
6	Oregon Street	Lincoln Street	Pine Street	Extension/realignment (3 lanes)	CIP	$2,800
9	Pine Street	Willamette	Sunset	Extension across rail road tracks	CIP	$2,550
10	Old Town Streets			Phase 1 of the Downtown Sherwood Streetscape Master Plan	City	$10,800
11	Cannery Arterials*			Phase 2 of the Downtown Sherwood Streetscape Master Plan	City	$2,550
12	Future Phases*			Phase 3-6 of the Downtown Sherwood Streetscape Master Plan	City	$4,700
13	I-5/Hwy 99W Connector	Highway 99W	Interstate 5	Specific alignment to be determined	RTP	N/A
Subtotal (City)						*$34,550*
			County Funded Motor Vehicle Projects			
4	Tualatin-Sherwood Road	Hwy 99W	Cipole Road	Widen existing road to 5 lanes	RTP/Washington County TSP	$15,900
5	Roy Rodgers Road	Borchers Drive	Hwy 99W	Widen existing road to 5 lanes	RTP/Washington County TSP	$1,450
7	Elwert Road	ORE 99W	Kruger	Intersection safety improvement	TSP	$1,550
8	Brookman Road	ORE 99W	Ladd Hill Road	Improve to collector standards	TSP	$9,000
Subtotal (County)						*$27,900*

ID	Location	From	To	Project Description	Source*	Cost ($1,000's)
			Development Related Projects			
21	Galbrieth Drive	Gerda Lane	Cipole Road	Construction of 2 lane road	TSP	$1,550
22	Cedar Brook Way	ORE 99W	ORE 99W	Construction of 2 lane road	TSP	$3,700
23	South Loop Road	ORE 99W	ORE 99W	Construction of 2 lane road	TSP	$1,900
11	Cannery Arterials**			Phase 2 of the downtown Sherwood Streetscape Master Plan	City	$1,150
12	Future Phases**			Phase 3-6 of the Downtown Sherwood Streetscape Master Plan	City	$1,050
Subtotal (Development Related Projects)						*$9,350*

ID	Location	Project Description	Source*	Cost ($1,000's)
		Traffic Control Enhancements (City Funded)		
14	Edy Road/Borchers Drive	Additional traffic control measure	TSP, CIP	$300
15	Langer Drive/Tualatin-Sherwood Road	Remove Traffic Signal. Install raised median	TSP	$100
16	Sherwood Boulevard/Langer Drive	Remove Traffic Signal. Allow lefts in only (no lefts from Langer to Sherwood)	TSP	$150
17	Sherwood Boulevard/Century Drive	Install Traffic Signal or Roundabout	TSP	$275
18	Oregon Street/Tonquin Road	Traffic Control Enhancement (consider roundabout)	TSP	$1,000
19	Adams Street/Tualatin-Sherwood Road	Install Traffic Signal	TSP	$250
20	Sherwood Blvd/Sunset Blvd	Traffic Control Enhancement	TSP	$250
Subtotal (Traffic Control Enhancements)				*$2,325*
Total (City Funded)				***$36,875***
Total (Other Funding: State, Region, Development)				*$37,250*

* Source: RTP=Metro's Regional Transportation System Plan, TSP=Mitigation Required Based on Sherwood TSP Analysis, CIP=City of Sherwood Capital Improvement Plan.

** Project costs paid through public/private partnership.

Traffic Control Master Plan

To guide future implementation of traffic signals to locations that have the maximum public benefit by serving arterial/collector/neighborhood routes, a framework master plan of traffic signal locations was developed (Figure 8-10). The intent of this plan is to outline potential locations where future traffic signals would be placed to avoid conflicts with other development site oriented signal placement. To maintain the best opportunity for efficient traffic signal coordination on arterials, spacing of up to 1,000 feet should be considered. No traffic signal should be installed unless it meets **Manual of Uniform Traffic Control Devices** warrants. The following key traffic signal issue should be addressed within the transportation policy of Sherwood:

> Establish a traffic signal spacing standard of 1,000 feet and a traffic signal master plan to guide future traffic signal placements. When this standard is not met, additional evaluation should be prepared to assure signal progression could be efficiently maintained.

Traffic signals disrupt traffic flow. Their placement is important for neighborhood access, pedestrian access and traffic control. To not utilize the limited placement of traffic signals to serve private land holdings will limit the potential for use that will generally benefit the public, neighborhoods and pedestrian access. Limiting placement of traffic signals to locations that are public streets would minimize or eliminate the potential for traffic signals solely serving private access.

Emergency Vehicle Preemption – Some of the existing traffic signals do not have the capability to be preempted by emergency vehicles. This is a significant asset to reducing emergency response time. This technology is readily available and includes receivers at each intersection, transmitters in emergency vehicles, and control units attached to the existing signal controllers. The existing controllers may require upgrades to enable this feature. The general cost for adding these units is $10,000 per intersection. This type of installation is required for every traffic signal in the city.

Traffic Signal Coordination – The existing traffic signals along Tualatin-Sherwood Road are not configured to provide progressive traffic flow through town. There is no interconnect or coordinated signal timings. Interconnect and coordinated signal timings should be conducted for the traffic signals along Tualatin-Sherwood/Roy Rodgers Roads between Borchers and Langer (to include Adams Street once it is built). Modern interconnect is preferred and could be either modem interconnect or radio interconnect, depending upon the specific conditions. There are existing loop detectors, so during peak periods when volume fluctuates, the controllers are responsive to changes in demand on an individual intersection basis. To upgrade these signals will likely require upgraded communication (either modem or radio interconnect) and new signal timing plans. The upgrade cost may range up to $5,000 per signal.

ORE 99W/Tualatin-Sherwood Road Gap Out Time – In conducting baseline intersection analysis, it was noted that the "gap out" time between vehicles at the ORE 99W/Tualatin-Sherwood Road intersection is set to a very short 0.5 second. Simulations runs indicated that the signal would often "gap out" before the queue was exhausted or before "max green" was reached, because the next vehicle in the queue could not get to the loop detector fast enough. By setting the "gap out" time to 1.0 second, the analysis indicates that the intersection would work much better, with queues clearing on a regular basis. This is something a signal technician could adjust fairly easily in the field and would likely have a significant positive impact on the operation of this intersection.

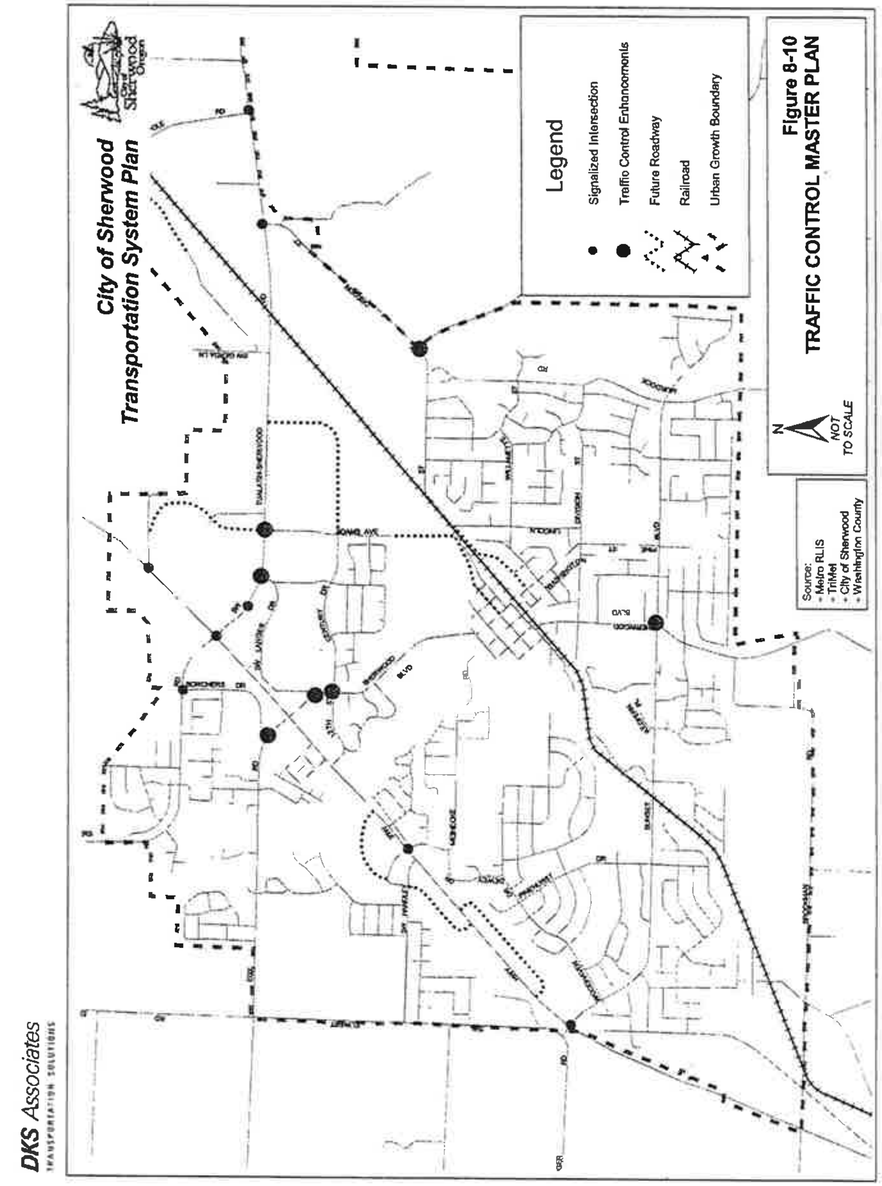


Figure 8-10
TRAFFIC CONTROL MASTER PLAN

Summary of All Intervals

Run Number	1	10	2	3	4	5	6	7
Start Time	4:00	4:00	4:00	4:00	4:00	4:00	4:00	4:00
End Time	4:15	4:15	4:15	4:15	4:15	4:15	4:15	4:15
Total Time (min)	15	15	15	15	15	15	15	15
Time Recorded (min)	10	10	10	10	10	10	10	10
# of Intervals	2	2	2	2	2	2	2	2
# of Recorded Intvls	1	1	1	1	1	1	1	1
Vehs Entered	1853	1907	1919	1864	1798	1767	1789	1851
Vehs Exited	1547	1524	1612	1600	1527	1586	1579	1570
Starting Vehs	663	650	614	670	611	694	587	617
Ending Vehs	969	1033	921	934	882	875	797	898
Denied Entry Before	0	1	1	0	0	0	0	0
Denied Entry After	8	9	3	7	6	6	6	1
Travel Distance (mi)	2000	1972	2011	2027	1973	1961	1943	1974
Travel Time (hr)	142.5	141.0	130.4	138.8	133.8	132.5	120.3	130.1
Total Delay (hr)	71.6	71.0	59.2	67.3	63.6	62.8	52.0	60.3
Total Stops	4383	4413	3884	4428	4127	4129	3650	4142
Fuel Used (gal)	174.7	172.9	167.6	172.5	167.7	164.2	164.3	164.8

Interval #0 Information Seeding

Start Time	4:00
End Time	4:05
Total Time (min)	5

Volumes adjusted by Growth Factors.
No data recorded this interval.

Interval #1 Information Recording

Start Time	4:05
End Time	4:15
Total Time (min)	10

Volumes adjusted by Growth Factors.

Run Number	1	10	2	3	4	5	6	7
Vehs Entered	1853	1907	1919	1864	1798	1767	1789	1851
Vehs Exited	1547	1524	1612	1600	1527	1586	1579	1570
Starting Vehs	663	650	614	670	611	694	587	617
Ending Vehs	969	1033	921	934	882	875	797	898
Denied Entry Before	0	1	1	0	0	0	0	0
Denied Entry After	8	9	3	7	6	6	6	1
Travel Distance (mi)	2000	1972	2011	2027	1973	1961	1943	1974
Travel Time (hr)	142.5	141.0	130.4	138.8	133.8	132.5	120.3	130.1
Total Delay (hr)	71.6	71.0	59.2	67.3	63.6	62.8	52.0	60.3
Total Stops	4383	4413	3884	4428	4127	4129	3650	4142
Fuel Used (gal)	174.7	172.9	167.6	172.5	167.7	164.2	164.3	164.8

1: SW Elwert Road & Highway 99W Performance by movement

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Total Delay (hr)	0.0	0.2	0.2	0.9	0.4	0.1	0.8	1.1	0.0	0.5	2.1	0.0
Delay / Veh (s)	38.5	34.3	17.1	122.5	114.1	6.2	109.5	18.3	2.7	55.1	28.8	7.5
Stop Delay (hr)	0.0	0.2	0.1	0.8	0.4	0.0	0.7	0.8	0.0	0.4	0.8	0.0
St Del/Veh (s)	34.8	29.3	14.1	114.6	105.1	3.3	104.4	12.5	2.3	44.2	11.0	1.6

1: SW Elwert Road & Highway 99W Performance by movement

Movement	All
Total Delay (hr)	6.2
Delay / Veh (s)	31.7
Stop Delay (hr)	4.3
St Del/Veh (s)	21.6

2: SW Meinecke Road & Highway 99W Performance by movement

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Total Delay (hr)	0.1	0.0	0.0	0.2	0.1	0.0	0.0	2.1	0.0	0.8	1.1	0.0
Delay / Veh (s)	49.8	47.2	0.2	51.1	43.9	1.1	60.4	29.5	9.5	68.6	12.6	3.8
Stop Delay (hr)	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.9	0.0	0.7	0.1	0.0
St Del/Veh (s)	48.3	44.0	0.1	48.8	39.5	0.1	50.6	12.8	0.1	57.0	1.1	0.1

2: SW Meinecke Road & Highway 99W Performance by movement

Movement	All
Total Delay (hr)	4.5
Delay / Veh (s)	23.8
Stop Delay (hr)	2.1
St Del/Veh (s)	11.2

3: SW Edy Road & Highway 99W Performance by movement

Movement	EBL	EBT	EBR	EBR2	NWL2	NWL	NWT	NWR	NEL	NET	NER	SWL
Total Delay (hr)	0.4	0.0	1.1	0.1	2.2	2.1	0.0	0.1	3.4	3.5	0.2	0.7
Delay / Veh (s)	49.8	3.7	87.4	9.2	152.0	169.9	11.6	17.7	368.4	56.8	48.2	63.9
Stop Delay (hr)	0.4	0.0	1.0	0.1	2.1	2.0	0.0	0.1	3.2	2.6	0.1	0.5
St Del/Veh (s)	46.4	2.1	82.4	7.8	142.9	160.1	8.5	15.6	351.1	42.8	40.1	53.0

3: SW Edy Road & Highway 99W Performance by movement

Movement	SWT	SWR	All
Total Delay (hr)	4.0	0.2	18.0
Delay / Veh (s)	52.5	34.4	76.8
Stop Delay (hr)	2.7	0.1	15.1
St Del/Veh (s)	35.1	24.4	64.3

4: SW Roy Rogers Road & Highway 99W Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Total Delay (hr)	1.3	3.4	0.1	2.1	1.4	0.0	1.0	1.5	0.2	1.0	8.2	2.2
Delay / Veh (s)	272.7	202.8	13.0	147.4	93.7	7.2	106.2	27.4	20.1	72.9	102.9	99.3
Stop Delay (hr)	1.2	3.1	0.1	2.0	1.2	0.0	0.9	0.9	0.2	0.8	6.5	1.7
St Del/Veh (s)	262.1	184.2	8.6	140.1	83.7	5.7	95.1	17.8	17.7	60.4	81.5	78.8

4: SW Roy Rogers Road & Highway 99W Performance by movement

Movement	All
Total Delay (hr)	22.4
Delay / Veh (s)	88.8
Stop Delay (hr)	18.8
St Del/Veh (s)	74.4

5: SW Edy Road & SW Elwert Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.0
Delay / Veh (s)		7.0	5.7	6.0	7.7	4.7	6.6	8.1	4.6	8.5	10.3	6.6
Stop Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
St Del/Veh (s)		3.5	3.8	3.7	3.6	3.4	4.0	3.7	3.0	4.5	4.2	3.9

5: SW Edy Road & SW Elwert Road Performance by movement

Movement	All
Total Delay (hr)	0.3
Delay / Veh (s)	8.4
Stop Delay (hr)	0.2
St Del/Veh (s)	3.9

6: SW Edy Road & SW Borchers Drive Performance by movement

Movement	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Total Delay (hr)	0.1	0.7	0.0	0.3	0.2	0.0	0.0	0.0	0.4	0.0	0.0	1.9
Delay / Veh (s)	34.3	44.7	36.4	27.1	20.9		8.2	6.2	26.8	0.3	3.9	27.9
Stop Delay (hr)	0.1	0.6	0.0	0.3	0.2	0.0	0.0	0.0	0.3	0.0	0.0	1.6
St Del/Veh (s)	31.3	38.8	34.2	21.1	17.1		7.1	6.0	21.7	0.1	3.2	23.3

7: SW Langer Drive & SW Edy Road Performance by movement

Movement	EBR	WBR	SEL	SET	SER	NWL	NWT	NWR	All
Total Delay (hr)	0.0	1.1	0.2	0.0	0.0	0.0	0.5	0.2	2.0
Delay / Veh (s)	5.1	77.8	35.1	1.0	0.5	7.6	16.8	12.3	22.8
Stop Delay (hr)	0.0	1.1	0.2	0.0	0.0	0.0	0.3	0.1	1.7
St Del/Veh (s)	4.8	74.8	32.6	0.1	0.1	4.7	10.7	7.3	19.2

8: NW 12th Street & SW Edy Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Total Delay (hr)	0.2	0.1	0.0	1.0	0.1	0.1	0.3	0.2	0.0	0.0	1.4	0.1
Delay / Veh (s)	47.7	19.9	7.3	60.8	28.8	27.7	93.3	13.3	10.2	33.2	42.6	36.9
Stop Delay (hr)	0.2	0.0	0.0	0.9	0.1	0.1	0.3	0.2	0.0	0.0	0.9	0.1
St Del/Veh (s)	44.7	16.3	6.7	52.8	24.3	25.5	91.5	10.1	8.3	29.8	28.8	25.8

8: NW 12th Street & SW Edy Road Performance by movement

Movement	All
Total Delay (hr)	3.7
Delay / Veh (s)	38.0
Stop Delay (hr)	2.9
St Del/Veh (s)	30.3

9: SW Roy Rogers Road & SW Borchers Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.0	1.0	0.3	0.0	0.9	0.0	0.4	0.0	0.0	0.0	0.0	0.0
Delay / Veh (s)	40.6	33.5	27.3	37.8	21.4	24.6	50.4	0.7	2.8	40.7	24.9	9.6
Stop Delay (hr)	0.0	0.8	0.2	0.0	0.7	0.0	0.4	0.0	0.0	0.0	0.0	0.0
St Del/Veh (s)	39.5	25.5	20.1	35.9	16.3	19.5	45.4	0.2	2.3	39.3	22.9	9.0

9: SW Roy Rogers Road & SW Borchers Drive Performance by movement

Movement	All
Total Delay (hr)	2.8
Delay / Veh (s)	27.7
Stop Delay (hr)	2.2
St Del/Veh (s)	21.9

Total Network Performance

Total Delay (hr)	63.7
Delay / Veh (s)	134.8
Stop Delay (hr)	48.8
St Del/Veh (s)	103.2

Intersection: 1: SW Elwert Road & Highway 99W

Movement	SE	SE	NW	NW	NE	NE	NE	NE	SW	SW	SW	SW
Directions Served	LT	R	LT	R	L	T	T	R	L	L	T	T
Maximum Queue (ft)	131	110	344	126	208	336	328	40	89	89	386	354
Average Queue (ft)	84	72	246	70	161	250	238	20	59	53	262	231
95th Queue (ft)	153	130	468	211	280	378	369	47	99	101	419	379
Link Distance (ft)	3032	3032	2371	2371	1051	1051	1051	1051	3921	3921	3921	3921
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 1: SW Elwert Road & Highway 99W

Movement	SW
Directions Served	R
Maximum Queue (ft)	6
Average Queue (ft)	2
95th Queue (ft)	8
Link Distance (ft)	3921
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: SW Meinecke Road & Highway 99W

Movement	SE	SE	NW	NW	NE	NE	NE	NE	SW	SW	SW
Directions Served	L	T	L	T	L	T	T	R	L	T	T
Maximum Queue (ft)	46	36	78	66	74	373	362	1	297	155	158
Average Queue (ft)	20	14	46	42	20	231	232	0	191	56	52
95th Queue (ft)	56	40	87	90	133	411	412	3	358	272	248
Link Distance (ft)	1364	1364	2484	2484	3921	3921	3921	3921	1781	1781	1781
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)											
Storage Blk Time (%)											
Queuing Penalty (veh)											

Intersection: 3: SW Edy Road & Highway 99W

Movement	EB	EB	EB	NW	NW	NW	NE	NE	NE	NE	SW	SW
Directions Served	L	R	>	<	<L	R	L	T	T	TR	L	T
Maximum Queue (ft)	169	273	121	430	450	347	791	737	682	539	284	435
Average Queue (ft)	110	230	71	360	412	171	520	443	411	303	169	315
95th Queue (ft)	200	346	185	505	517	459	931	896	821	595	347	513
Link Distance (ft)	296	296	296	417	417	417	1781	1781	1781	1781	1645	1645
Upstream Blk Time (%)		15		10	30	2						
Queuing Penalty (veh)		39		29	90	6						
Storage Bay Dist (ft)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 3: SW Edy Road & Highway 99W

Movement	SW	SW
Directions Served	T	TR
Maximum Queue (ft)	415	383
Average Queue (ft)	319	306
95th Queue (ft)	503	469
Link Distance (ft)	1645	1645
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: SW Roy Rogers Road & Highway 99W

Movement	EB	EB	EB	WB	WB	WB	WB	NE	NE	NE	NE	NE
Directions Served	L	T	R	L	L	T	R	L	T	T	T	R
Maximum Queue (ft)	693	739	392	274	303	390	110	274	260	218	187	78
Average Queue (ft)	464	610	177	200	200	303	49	151	156	131	92	26
95th Queue (ft)	941	913	638	362	367	497	175	345	322	271	217	83
Link Distance (ft)	910	910	910	2027	2027	2027	2027	1645	1645	1645	1645	1645
Upstream Blk Time (%)	2	5										
Queuing Penalty (veh)	5	12										
Storage Bay Dist (ft)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 4: SW Roy Rogers Road & Highway 99W

Movement	SW	SW	SW	SW
Directions Served	L	T	T	TR
Maximum Queue (ft)	937	973	963	965
Average Queue (ft)	708	757	757	766
95th Queue (ft)	1138	1149	1132	1145
Link Distance (ft)	1656	1656	1656	1656
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: SW Edy Road & SW Elwert Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	48	61	72	92
Average Queue (ft)	29	41	53	68
95th Queue (ft)	55	63	79	97
Link Distance (ft)	1726	1364	1204	1484
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: SW Edy Road & SW Borchers Drive

Movement	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	TR	L	TR	TR	L	TR
Maximum Queue (ft)	146	307	32	312	34	203	51
Average Queue (ft)	84	208	10	233	17	132	25
95th Queue (ft)	305	445	34	341	44	268	57
Link Distance (ft)	1229	1229	296	296	428	1152	1152
Upstream Blk Time (%)				3			
Queuing Penalty (veh)				13			
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 7: SW Langer Drive & SW Edy Road

Movement	EB	WB	SE	SE	NW	NW
Directions Served	R	R	L	TR	L	TR
Maximum Queue (ft)	46	376	99	5	32	260
Average Queue (ft)	33	238	58	1	13	131
95th Queue (ft)	53	573	113	13	42	341
Link Distance (ft)	369	964	417	417	292	292
Upstream Blk Time (%)						7
Queuing Penalty (veh)						33
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 8: NW 12th Street & SW Edy Road

Movement	EB	EB	WB	WB	SE	SE	NW	NW
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	122	81	414	284	105	205	330	632
Average Queue (ft)	77	45	278	140	63	140	109	461
95th Queue (ft)	154	95	525	367	148	236	446	736
Link Distance (ft)	908	908	1047	1047	292	292	1922	1922
Upstream Blk Time (%)						0		
Queuing Penalty (veh)						0		
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 9: SW Roy Rogers Road & SW Borchers Drive

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	11	322	316	35	227	225	240	42	38	48
Average Queue (ft)	4	234	240	17	179	177	134	9	16	22
95th Queue (ft)	16	348	359	43	259	245	312	92	45	56
Link Distance (ft)	1962	1962	1962	910	910	910	1152	1152	809	809
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)										
Storage Blk Time (%)										
Queuing Penalty (veh)										

Nework Summary

Network wide Queuing Penalty: 228

Summary of All Intervals

Run Number	1	10	2	3	4	5	6	7
Start Time	4:00	4:00	4:00	4:00	4:00	4:00	4:00	4:00
End Time	4:15	4:15	4:15	4:15	4:15	4:15	4:15	4:15
Total Time (min)	15	15	15	15	15	15	15	15
Time Recorded (min)	10	10	10	10	10	10	10	10
# of Intervals	2	2	2	2	2	2	2	2
# of Recorded Intvls	1	1	1	1	1	1	1	1
Vehs Entered	1855	1923	1920	1876	1804	1772	1795	1851
Vehs Exited	1625	1610	1664	1639	1595	1649	1595	1627
Starting Vehs	660	645	614	667	612	690	583	612
Ending Vehs	890	958	870	904	821	813	783	836
Denied Entry Before	0	0	1	0	0	0	0	0
Denied Entry After	6	2	2	0	0	1	0	1
Travel Distance (mi)	2104	2072	2056	2083	2042	2031	1989	2049
Travel Time (hr)	137.0	137.4	127.9	135.7	129.0	128.1	117.8	125.2
Total Delay (hr)	62.3	63.6	55.0	62.1	56.1	55.9	47.8	52.7
Total Stops	4218	4258	3732	4227	3976	3838	3520	3780
Fuel Used (gal)	178.9	174.2	169.0	176.8	171.9	165.0	166.1	165.9

Interval #0 Information Seeding

Start Time	4:00
End Time	4:05
Total Time (min)	5

Volumes adjusted by Growth Factors.
No data recorded this interval.

Interval #1 Information Recording

Start Time	4:05
End Time	4:15
Total Time (min)	10

Volumes adjusted by Growth Factors.

Run Number	1	10	2	3	4	5	6	7
Vehs Entered	1855	1923	1920	1876	1804	1772	1795	1851
Vehs Exited	1625	1610	1664	1639	1595	1649	1595	1627
Starting Vehs	660	645	614	667	612	690	583	612
Ending Vehs	890	958	870	904	821	813	783	836
Denied Entry Before	0	0	1	0	0	0	0	0
Denied Entry After	6	2	2	0	0	1	0	1
Travel Distance (mi)	2104	2072	2056	2083	2042	2031	1989	2049
Travel Time (hr)	137.0	137.4	127.9	135.7	129.0	128.1	117.8	125.2
Total Delay (hr)	62.3	63.6	55.0	62.1	56.1	55.9	47.8	52.7
Total Stops	4218	4258	3732	4227	3976	3838	3520	3780
Fuel Used (gal)	178.9	174.2	169.0	176.8	171.9	165.0	166.1	165.9

MITIGATED

1: SW Elwert Road & Highway 99W Performance by movement

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Total Delay (hr)	0.0	0.2	0.2	0.8	0.4	0.1	0.8	1.1	0.0	0.6	2.5	0.0
Delay / Veh (s)	39.4	33.9	18.7	116.9	98.5	6.1	120.7	18.1	2.6	58.5	32.3	7.3
Stop Delay (hr)	0.0	0.2	0.2	0.8	0.3	0.0	0.8	0.8	0.0	0.5	1.0	0.0
St Del/Veh (s)	35.7	28.8	15.6	109.4	90.5	3.2	115.3	12.3	2.2	46.8	12.6	2.4

1: SW Elwert Road & Highway 99W Performance by movement

Movement	All
Total Delay (hr)	6.7
Delay / Veh (s)	33.2
Stop Delay (hr)	4.5
St Del/Veh (s)	22.2

2: SW Meinecke Road & Highway 99W Performance by movement

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Total Delay (hr)	0.1	0.0	0.0	0.2	0.1	0.0	0.0	2.2	0.0	0.8	1.3	0.0
Delay / Veh (s)	53.8	45.5	0.2	51.9	44.0	1.1	61.4	31.2	8.4	63.1	14.5	3.8
Stop Delay (hr)	0.1	0.0	0.0	0.2	0.1	0.0	0.0	1.0	0.0	0.7	0.2	0.0
St Del/Veh (s)	52.3	42.3	0.1	49.5	39.6	0.1	49.2	14.1	0.1	51.6	1.7	0.1

2: SW Meinecke Road & Highway 99W Performance by movement

Movement	All
Total Delay (hr)	4.8
Delay / Veh (s)	24.8
Stop Delay (hr)	2.2
St Del/Veh (s)	11.5

3: SW Edy Road & Highway 99W Performance by movement

Movement	EBL	EBT	EBR	EBR2	NWL2	NWL	NWT	NWR	NEL	NET	NER	SWL
Total Delay (hr)	0.5	0.0	1.1	0.1	1.0	1.4	0.0	0.1	3.5	3.5	0.2	1.0
Delay / Veh (s)	59.9	1.6	84.7	11.0	52.3	92.2	2.4	10.3	398.0	57.5	51.6	87.8
Stop Delay (hr)	0.5	0.0	1.0	0.1	0.9	1.3	0.0	0.1	3.4	2.6	0.1	0.8
St Del/Veh (s)	56.3	0.1	79.8	9.4	47.9	87.1	0.2	8.5	379.9	43.2	42.4	72.8

3: SW Edy Road & Highway 99W Performance by movement

Movement	SWT	SWR	All
Total Delay (hr)	6.6	0.4	19.3
Delay / Veh (s)	79.1	66.6	77.0
Stop Delay (hr)	4.7	0.3	15.8
St Del/Veh (s)	55.9	50.1	62.9

4: SW Roy Rogers Road & Highway 99W Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Total Delay (hr)	1.0	3.5	0.1	1.7	1.4	0.0	1.0	1.5	0.2	0.8	3.3	0.2
Delay / Veh (s)	183.0	201.3	15.9	112.3	95.7	7.3	108.4	27.8	21.6	60.5	38.7	6.6
Stop Delay (hr)	0.9	3.2	0.1	1.6	1.3	0.0	0.9	1.0	0.2	0.7	2.4	0.1
St Del/Veh (s)	173.4	183.2	11.4	105.6	85.5	5.8	97.3	18.3	19.3	53.5	28.0	4.2

4: SW Roy Rogers Road & Highway 99W Performance by movement

Movement	All
Total Delay (hr)	14.7
Delay / Veh (s)	56.5
Stop Delay (hr)	12.4
St Del/Veh (s)	47.4

5: SW Edy Road & SW Elwert Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.0
Delay / Veh (s)		6.9	5.4	6.0	7.7	4.7	6.6	8.1	4.5	9.2	10.3	6.6
Stop Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
St Del/Veh (s)		3.4	3.6	3.7	3.6	3.4	4.0	3.7	3.0	4.8	4.2	3.9

5: SW Edy Road & SW Elwert Road Performance by movement

Movement	All
Total Delay (hr)	0.3
Delay / Veh (s)	8.4
Stop Delay (hr)	0.2
St Del/Veh (s)	3.9

6: SW Edy Road & SW Borchers Drive Performance by movement

Movement	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Total Delay (hr)	0.1	0.7	0.0	0.4	0.3	0.0	0.0	0.0	0.4	0.0	0.0	1.9
Delay / Veh (s)	32.5	41.0	28.5	26.9	21.9		8.2	6.4	28.0	0.3	3.8	27.2
Stop Delay (hr)	0.1	0.6	0.0	0.3	0.2	0.0	0.0	0.0	0.3	0.0	0.0	1.6
St Del/Veh (s)	30.0	35.6	26.1	20.3	17.5		6.8	6.3	22.6	0.2	3.1	22.5

7: SW Langer Drive & SW Edy Road Performance by movement

Movement	EBR	WBR	SEL	SET	SER	NWL	NWT	NWR	All
Total Delay (hr)	0.0	0.2	0.3	0.0	0.0	0.0	0.2	0.1	0.8
Delay / Veh (s)	5.0	12.9	48.1	1.1	0.5	4.9	6.8	4.4	8.4
Stop Delay (hr)	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.5
St Del/Veh (s)	4.6	11.3	45.3	0.1	0.1	2.3	1.5	0.4	5.4

8: NW 12th Street & SW Edy Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Total Delay (hr)	0.2	0.1	0.0	0.9	0.1	0.1	0.3	0.2	0.0	0.0	1.1	0.1
Delay / Veh (s)	32.8	20.0	8.7	54.8	24.6	18.3	108.3	13.2	11.4	33.1	34.0	29.2
Stop Delay (hr)	0.2	0.0	0.0	0.8	0.1	0.1	0.3	0.2	0.0	0.0	0.7	0.1
St Del/Veh (s)	30.1	16.2	8.0	47.1	20.5	16.6	106.2	9.9	9.4	29.9	21.7	19.4

8: NW 12th Street & SW Edy Road Performance by movement

Movement	All
Total Delay (hr)	3.2
Delay / Veh (s)	32.9
Stop Delay (hr)	2.5
St Del/Veh (s)	25.8

9: SW Roy Rogers Road & SW Borchers Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.0	1.0	0.3	0.0	1.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0
Delay / Veh (s)	40.6	31.6	24.4	42.4	23.3	22.9	44.1	1.0	4.6	44.2	26.3	9.6
Stop Delay (hr)	0.0	0.7	0.2	0.0	0.8	0.0	0.4	0.0	0.0	0.0	0.0	0.0
St Del/Veh (s)	39.5	23.9	17.7	40.3	17.3	18.0	39.5	0.4	4.1	42.8	23.8	9.0

9: SW Roy Rogers Road & SW Borchers Drive Performance by movement

Movement	All
Total Delay (hr)	2.9
Delay / Veh (s)	27.0
Stop Delay (hr)	2.2
St Del/Veh (s)	21.0

Total Network Performance

Total Delay (hr)	56.8
Delay / Veh (s)	117.9
Stop Delay (hr)	41.9
St Del/Veh (s)	87.0

MITIGATED

Intersection: 1: SW Elwert Road & Highway 99W

Movement	SE	SE	NW	NW	NE	NE	NE	NE	SW	SW	SW	SW
Directions Served	LT	R	LT	R	L	T	T	R	L	L	T	T
Maximum Queue (ft)	134	117	322	127	223	334	323	40	103	100	495	458
Average Queue (ft)	84	75	236	68	165	248	236	20	64	61	328	293
95th Queue (ft)	153	138	441	209	291	377	365	47	118	114	563	534
Link Distance (ft)	3032	3032	2371	2371	1051	1051	1051	1051	3921	3921	3921	3921
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 1: SW Elwert Road & Highway 99W

Movement	SW
Directions Served	R
Maximum Queue (ft)	10
Average Queue (ft)	3
95th Queue (ft)	13
Link Distance (ft)	3921
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: SW Meinecke Road & Highway 99W

Movement	SE	SE	NW	NW	NE	NE	NE	NE	SW	SW	SW
Directions Served	L	T	L	T	L	T	T	R	L	T	T
Maximum Queue (ft)	46	35	79	64	72	415	393	1	254	117	129
Average Queue (ft)	20	13	47	42	20	259	255	0	184	61	62
95th Queue (ft)	56	39	88	89	132	477	464	3	300	139	147
Link Distance (ft)	1364	1364	2484	2484	3921	3921	3921	3921	1781	1781	1781
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)											
Storage Blk Time (%)											
Queuing Penalty (veh)											

MITIGATED

Intersection: 3: SW Edy Road & Highway 99W

Movement	EB	EB	EB	NW	NW	NW	NW	NW	NE	NE	NE	NE
Directions Served	L	R	>	<	<	L	L	R	L	T	T	TR
Maximum Queue (ft)	187	268	109	184	146	128	307	79	807	748	700	502
Average Queue (ft)	117	231	66	146	104	63	234	49	543	453	417	314
95th Queue (ft)	214	349	130	224	177	161	377	91	946	897	810	598
Link Distance (ft)	296	296	296	414	414	414	414	414	1781	1781	1781	1781
Upstream Blk Time (%)	0	15				0	1					
Queuing Penalty (veh)	0	37				0	1					
Storage Bay Dist (ft)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 3: SW Edy Road & Highway 99W

Movement	SW	SW	SW	SW
Directions Served	L	T	T	TR
Maximum Queue (ft)	735	767	763	724
Average Queue (ft)	425	531	542	505
95th Queue (ft)	882	934	920	859
Link Distance (ft)	1631	1631	1631	1631
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

MITIGATED

Intersection: 4: SW Roy Rogers Road & Highway 99W

Movement	EB	EB	EB	WB	WB	WB	WB	NE	NE	NE	NE	NE
Directions Served	L	T	R	L	L	T	R	L	T	T	T	R
Maximum Queue (ft)	714	730	492	265	301	390	114	286	219	200	178	73
Average Queue (ft)	456	612	227	177	193	309	61	154	147	129	94	29
95th Queue (ft)	947	892	730	342	376	503	221	354	288	276	213	80
Link Distance (ft)	910	910	910	2027	2027	2027	2027	1631	1631	1631	1631	1631
Upstream Blk Time (%)	2	5										
Queuing Penalty (veh)	4	12										
Storage Bay Dist (ft)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 4: SW Roy Rogers Road & Highway 99W

Movement	SW	SW	SW	SW	SW
Directions Served	L	T	T	T	R
Maximum Queue (ft)	323	415	415	380	117
Average Queue (ft)	229	328	329	293	46
95th Queue (ft)	419	482	475	425	144
Link Distance (ft)	1656	1656	1656	1656	1656
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 5: SW Edy Road & SW Elwert Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	48	61	74	92
Average Queue (ft)	28	41	53	68
95th Queue (ft)	55	63	80	97
Link Distance (ft)	1726	1364	1204	1484
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

MITIGATED

Intersection: 6: SW Edy Road & SW Borchers Drive

Movement	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	TR	L	TR	TR	L	TR
Maximum Queue (ft)	140	318	70	313	37	230	48
Average Queue (ft)	62	198	17	252	18	149	27
95th Queue (ft)	203	427	116	342	45	291	58
Link Distance (ft)	1229	1229	296	296	428	1152	1152
Upstream Blk Time (%)				3			
Queuing Penalty (veh)				13			
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 7: SW Langer Drive & SW Edy Road

Movement	EB	WB	SE	SE	NW	NW
Directions Served	R	R	L	TR	L	TR
Maximum Queue (ft)	47	136	123	3	28	126
Average Queue (ft)	33	86	77	1	13	62
95th Queue (ft)	54	173	145	7	40	175
Link Distance (ft)	370	926	414	414	292	292
Upstream Blk Time (%)						0
Queuing Penalty (veh)						0
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 8: NW 12th Street & SW Edy Road

Movement	EB	EB	WB	WB	SE	SE	NW	NW
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	107	81	395	228	113	211	194	590
Average Queue (ft)	67	47	264	118	67	146	73	408
95th Queue (ft)	131	98	474	294	159	231	325	678
Link Distance (ft)	908	908	1047	1047	292	292	1922	1922
Upstream Blk Time (%)						0		
Queuing Penalty (veh)						0		
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

MITIGATED

Intersection: 9: SW Roy Rogers Road & SW Borchers Drive

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	11	301	296	35	261	272	232	46	38	48
Average Queue (ft)	4	221	227	16	214	221	124	11	18	23
95th Queue (ft)	16	337	348	42	287	292	287	99	46	58
Link Distance (ft)	1962	1962	1962	910	910	910	1152	1152	809	809
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)										
Storage Blk Time (%)										
Queuing Penalty (veh)										

Nework Summary

Network wide Queuing Penalty: 68

MITIGATED

Intersection / Scenario	Eastbound Left-turn lane	Westbound Left-turn lane	Northbound Left-turn lane	Southbound Left-turn lane
1 SW Elwert Road/Highway 99W				
15-year Background plus Site Trips Traffic Conditions	175	125	225	150
2 SW Meinkecke Road/Highway 99W				
15-year Background plus Site Trips Traffic Conditions	25	250	75	75
3 SW Edy Road/Highway 99W				
15-year Background plus Site Trips Traffic Conditions	300	275	175	200
15-year Background plus Site Trips Traffic Conditions				
4 SW Roy Rogers Road/Highway 99W				
15-year Background plus Site Trips Traffic Conditions	250	250	175	175
15-year Background plus Site Trips Traffic Conditions				
6 SW Edy Road/SW Borchers Drive				
15-year Background plus Site Trips Traffic Conditions	100	50	0	300
7 SW Langer Drive/N Sherwood Boulevard				
15-year Background plus Site Trips Traffic Conditions	100	150		
8 NW 12th Street/SW Century Drive/N Sherwood Boulevard				
15-year Background plus Site Trips Traffic Conditions	150	325	50	100
9 SW Roy Rogers Road/SW Borchers Drive				
15-year Background plus Site Trips Traffic Conditions	25	50	275	50
10 Site Access/Highway 99W				
15-year Background plus Site Trips Traffic Conditions	N/A	N/A	N/A	N/A
11 SW Edy Road/Site Access				
15-year Background plus Site Trips Traffic Conditions	N/A	150	425	N/A

ORIGINAL REPORT

Intersection / Scenario	Eastbound Left-turn lane	Westbound Left-turn lane	Northbound Left-turn lane	Southbound Left-turn lane
1 SW Elwert Road/Highway 99W				
15-year Background plus Site Trips Traffic Conditions	280	101	468	153
2 SW Meinkecke Road/Highway 99W				
15-year Background plus Site Trips Traffic Conditions	133	358	87	56
3 SW Edy Road/Highway 99W				
15-year Background plus Site Trips Traffic Conditions	1781	1645	417	296
15-year Background plus Site Trips Traffic Conditions				
4 SW Roy Rogers Road/Highway 99W				
15-year Background plus Site Trips Traffic Conditions	1138	367	367	941
15-year Background plus Site Trips Traffic Conditions				
6 SW Edy Road/SW Borchers Drive				
15-year Background plus Site Trips Traffic Conditions	305	34	0	268
7 SW Langer Drive/N Sherwood Boulevard				
15-year Background plus Site Trips Traffic Conditions	42	113		
8 NW 12th Street/SW Century Drive/N Sherwood Boulevard				
15-year Background plus Site Trips Traffic Conditions	446	148	525	154
9 SW Roy Rogers Road/SW Borchers Drive				
15-year Background plus Site Trips Traffic Conditions	16	43	312	45
10 Site Access/Highway 99W				
15-year Background plus Site Trips Traffic Conditions	N/A	N/A	N/A	N/A
11 SW Edy Road/Site Access				
15-year Background plus Site Trips Traffic Conditions	N/A	150	425	N/A

ADDENDUM

	Intersection	Eastbound Left-turn lane	Westbound Left-turn lane	Northbound Left-turn lane	Southbound Left-turn lane
1	SW Elwert Road/Highway 99W	200	225	155	90
2	SW Meinkecke Road/Highway 99W	400	375	205	330
3	SW Edy Road/Highway 99W	165	410	150	100
4	SW Roy Rogers Road/Highway 99W	445	250	210	225
6	SW Edy Road/SW Borchers Drive	70	70	50	50
7	SW Langer Drive/N Sherwood Boulevard	75	125	75	75
8	NW 12th Street/SW Century Drive/N Sherwood Boulevard	N/A	N/A	N/A	N/A
9	SW Roy Rogers Road/SW Borchers Drive	105	175	105	145

EXISTING STORAGE LENGTHS

LANCASTER
engineering

REGISTERED PROFESSIONAL ENGINEER
74680PE
OREGON
JULY 12, 2005
GEOFFREY A. JUDD
10/07
EXPIRES: 06/30/09

October 19, 2007

Gene Thomas
City of Sherwood
20 NW Washington Street
Sherwood, OR 97140

RE: Pfeifer Zone Change – Addendum

Dear Mr. Thomas:

This letter is written to provide the results of additional analyses conducted for the proposed Pfeifer Zone Change. This addendum will detail the results of the updated growth rates that were used to develop the future year volumes and will include the signal timing provided from ODOT staff. These issues were raised in a letter written by Chris Maciejewski of DKS Associates dated September 13, 2007. An addendum prepared to respond to these and other comments was prepared September 28, 2007.

Background Traffic

The I-5 to 99W Connector Study Baseline Report was used to develop growth rates for each of the approaches at every study intersection. This growth rate was then used to develop the 15-year future traffic volumes. Figures and detailed calculations are attached to this letter.

The growth rates for the entire study area averaged approximately 1.1 percent. The original traffic impact study assumed a 1.0 percent growth rate. While some of the minor street approaches had higher rates, there were also some approaches with lower growth rates.

Updated Analysis

The traffic signal timing worksheets were obtained from ODOT staff for the four study intersections along Highway 99W. This data was then used in the *SYNCHRO* analyses. Only two of the study intersections along Highway 99W operate in a coordinated manner. The intersections of Highway 99W at Edy Road/Sherwood Boulevard and Highway 99W at Tualatin-Sherwood Road operate in a coordinated system. The intersections of Highway 99W at Sunset Boulevard/Elwert Road and Highway 99W at Meinecke Road are fully actuated intersections without coordination.

321 SW 4th Avenue, Suite 400 ▪ Portland, OR 97204 ▪ Phone 503.248.0313 ▪ Fax 503.248.9251

In the original analyses, it was assumed that all of the intersections along Highway 99W operated in a coordinated actuated manner with a signal cycle length of 100 seconds. Based on the information from the signal timing worksheets, the signal cycle length was increased to 120 seconds.

The updated signal timing was used in all of the scenarios evaluated in the original traffic impact study. The results of this updated analysis are shown in the tables on the following pages. Detailed worksheets are attached to the end of this letter.

LEVEL OF SERVICE SUMMARY

	PM Peak Hour v/c	Mitigation
Elwert Road/Highway 99W		
Existing Conditions	0.85	
Background Conditions	1.01	
Background + Site Trips	1.02	
Background + Site Trips[1]	0.90	Add NWB LTL
Meinecke Road/Highway 99W		
Existing Conditions	0.72	
Background Conditions	0.78	
Background + Site Trips	0.80	None Required
Edy Road/Highway 99W		
Existing Conditions	0.95	
Background Conditions	1.11	
Background + Site Trips	1.23	
Background + Site Trips[1]	1.10	Add second NWB LTL and Prot phasing
Tualatin-Sherwood Road/Highway 99W		
Existing Conditions	1.04	
Background Conditions	1.23	
Background + Site Trips	1.24	
Background + Site Trips[1]	1.10	Add SWB RTL

[1] Mitigated

NWB = Northwestbound SWB = Southwestbound
LTL = Left-turn lane RTL = Right-turn lane

v/c = Volume-to-Capacity ratio

LEVEL OF SERVICE SUMMARY

	PM Peak Hour			
	LOS	Delay	v/c	Mitigation
Elwert Road/Edy Road				
Existing Conditions	B	11	0.51	
Background Conditions	B	13	0.59	
Background + Site Trips	B	13	0.59	None Required
Borchers Drive/Edy Road				
Existing Conditions	F	101	1.04[1]	
Background Conditions[2]	C	26	0.76	
Background + Site Trips[2]	C	26	0.85	None Required
Langer Drive/Sherwood Boulevard				
Existing Conditions	D	48	0.74	
Background Conditions[2]	C	21	0.60	
Background + Site Trips[2]	D	27	0.69	None Required
Century Drive/Sherwood Boulevard				
Existing Conditions	F	283	1.37[1]	
Background Conditions[2]	C	22	0.77	
Background + Site Trips[2]	C	24	0.80	None Required
Borchers Drive/Roy Rogers Road				
Existing Conditions	D	49	0.78	
Background Conditions[2]	F	106	1.08	
Background + Site Trips[2]	F	118	1.12	
Background + Site Trips[3]	E	78	0.96	EB RTL

LOS = Level of Service
Delay = Average Delay per Vehicle in Seconds
v/c = Volume-to-Capacity ratio
EB = Eastbound
RTL = Right-turn lane

[1] Existing traffic volumes seasonally adjusted

[2] Funded Transportation System Plan mitigations in place

[3] Mitigated

LEVEL OF SERVICE SUMMARY

	PM Peak Hour		
	LOS	Delay	V/C
Highway 99W/Site Access			
Background + Site Trips[1]	B	13	0.12
Edy Road/Site Access			
Background + Site Trips	B	14	0.35

LOS = Level of Service
Delay = Average Delay per Vehicle in Seconds
V/C = Volume-to-Capacity ratio
[1] Operations estimated due to limitations in analysis tools

As shown in the table and the detailed results attached to this letter, the mitigations proposed for some of the study intersections have changed. Some of the significant changes include the need for mitigation at the intersection of Highway 99W at Sunset Boulevard/Elwert Road and SW Roy Rogers Road at SW Borchers Drive.

The mitigations for the intersection of Highway 99W at Edy Road/Sherwood Boulevard were downgraded from the original traffic impact study. This is result of slight decrease in the future volumes as a result of the growth rate and the increased signal cycle length. This mitigation also addresses the concerns raised regarding the need for additional lanes along Edy Road.

The following table shows the differences in the mitigations needed in the original traffic impact study, the previous addendum and the current addendum.

MITIGATION SUMMARY

Intersection	Original Report and September 28 Addendum	October 19 Addendum
Highway 99W/Elwert Road/Sunset Boulevard	No Mitigation	Add Northbound Left-turn lane
Highway 99W/Meinecke Road	No Mitigation	No Mitigation
Highway 99W/Edy Road/Sherwood Boulevard	Add second Northbound Left-turn lane and second Through lane	Add second Northbound Left-turn lane and protected left-turn phasing
Highway 99W/Roy Rogers Road/Tualatin-Sherwood Boulevard	Add Southbound Right-turn lane	Add Southbound Right-turn lane
Edy Road/Elwert Road	No Mitigation	No Mitigation
Edy Road/Borchers Drive	No Mitigation	No Mitigation
Langer Drive/Sherwood Boulevard	No Mitigation	No Mitigation
Century Drive/12th Street/Sherwood Boulevard	No Mitigation	No Mitigation
Roy Rogers Road/Borchers Drive	No Mitigation	Add Eastbound Right-turn lane

Queuing Analysis

As stated previously, the queuing for the study intersections is not a reliable piece of information for the change in zoning, since it is based on a 15-year traffic forecast. The uncertainty of the future traffic volumes does not provide a good basis for determining the queue lengths at the study intersections. The information presented in the original report was provided for estimation purposes only.

However, the queue analysis was conducted to show the changes using the new growth rate and signal timing. The detailed analysis worksheets are attached to this letter.

Conclusions and Recommendations

The results of the updated analyses using the growth rates from the I-5 to 99W Connector Study Baseline Report and the ODOT signal timing spreadsheets show that some of the study intersection operations degrade, but some improve. Except for the modifications listed in this addendum, the findings from the original report and addendum dated September 28, 2007 remain unchanged.

Respectfully,

Geoffrey A. Judd, P.E.
Transportation Engineer

Existing Traffic Volumes
PM Peak Hour

Intersection	*EBLT*	*EBTH*	*EBRT*	*NBLT*	*NBTH*	*NBRT*	*WBLT*	*WBTH*	*WBRT*	*SBLT*	*SBTH*	*SBRT*	*PHF*
Highway 99W/Sunset Boulevard	127	1088	76	131	70	188	172	1540	29	16	101	173	0.96
Highway 99W/Meinecke Road	10	1246	14	40	40	121	249	1763	51	38	17	4	0.94
Highway 99W/Edy Road	179	1144	66	278	236	162	233	1611	130	116	172	168	0.96
Highway 99W/Tualatin-Sherwood Road	217	801	177	276	289	103	243	1526	430	116	321	134	0.92
Elwert Road/Edy Road	2	37	8	8	159	26	21	55	51	53	291	13	0.97
Borchers Drive/Edy Road	49	167	0	2	7	30	22	229	299	279	1	82	0.95
Langer Drive/Sherwood Boulevard	79	39	69	32	320	247	261	55	274	95	299	11	0.94
Century Drive/Sherwood Boulevard	21	16	54	24	520	67	58	15	72	49	560	36	0.96
Borchers Drive/Roy Rogers Road	8	558	162	236	8	23	18	745	24	18	32	5	0.91
Highway 99W/South Site Access	0	0	0	0	1389	0	0	0	0	0	2063	0	0.96
Edy Road/Site Access	0	216	0	0	0	0	0	313	0	0	0	0	0.95

Seasonal Adjustment Factor: 1.0525

Seasonally Adjusted Traffic Volumes
PM Peak Hour

Intersection	*EBLT*	*EBTH*	*EBRT*	*NBLT*	*NBTH*	*NBRT*	*WBLT*	*WBTH*	*WBRT*	*SBLT*	*SBTH*	*SBRT*	*PHF*
Highway 99W/Sunset Boulevard	134	1145	80	138	74	198	181	1621	31	17	106	182	0.96
Highway 99W/Meinecke Road	11	1311	15	42	42	127	262	1856	54	40	18	4	0.94
Highway 99W/Edy Road	188	1204	69	293	248	171	245	1696	137	122	181	177	0.96
Highway 99W/Tualatin-Sherwood Road	228	843	186	290	304	108	256	1606	453	122	338	141	0.92
Elwert Road/Edy Road	2	39	8	8	167	27	22	58	54	56	306	14	0.97
Borchers Drive/Edy Road	52	176	0	2	7	32	23	241	315	294	1	86	0.95
Langer Drive/Sherwood Boulevard	83	41	73	34	337	260	275	58	288	100	315	12	0.94
Century Drive/Sherwood Boulevard	22	17	57	25	547	71	61	16	76	52	589	38	0.96
Borchers Drive/Roy Rogers Road	8	587	171	248	8	24	19	784	25	19	34	5	0.91
Highway 99W/South Site Access	0	0	0	0	1462	0	0	0	0	0	2171	0	0.96
Edy Road/Site Access	0	227	0	0	0	0	0	329	0	0	0	0	0.95

Adjusted Background Traffic Conditions
PM Peak Hour

Intersection	*EBLT*	*EBTH*	*EBRT*	*NBLT*	*NBTH*	*NBRT*	*WBLT*	*WBTH*	*WBRT*	*SBLT*	*SBTH*	*SBRT*
Highway 99W/Sunset Boulevard	163	1392	97	174	93	254	209	1854	35	24	151	259
Highway 99W/Meinecke Road	13	1519	17	44	44	133	298	2110	61	61	27	6
Highway 99W/Edy Road	224	1381	79	336	283	192	277	1922	157	169	249	240
Highway 99W/Tualatin-Sherwood Road	258	956	212	299	310	110	284	1782	502	134	372	155
Elwert Road/Edy Road	2	45	9	9	192	31	25	67	62	64	351	16
Borchers Drive/Edy Road	75	257	0	2	8	37	30	327	410	360	1	108
Langer Drive/Sherwood Boulevard	0	0	76	36	455	276	0	0	320	106	336	13
Century Drive/Sherwood Boulevard	111	62	63	27	602	77	387	85	104	54	300	39
Borchers Drive/Roy Rogers Road	11	804	237	361	12	35	23	947	30	22	39	6
Highway 99W/South Site Access	0	0	4	0	1683	0	0	0	0	0	2487	11
Edy Road/Site Access	0	320	1	1	0	12	17	421	0	0	0	0

Background + Site Trips Traffic Conditions
PM Peak Hour

Intersection	*EBLT*	*EBTH*	*EBRT*	*NBLT*	*NBTH*	*NBRT*	*WBLT*	*WBTH*	*WBRT*	*SBLT*	*SBTH*	*SBRT*
Highway 99W/Sunset Boulevard	163	1412	97	174	93	284	247	1879	35	24	151	259
Highway 99W/Meinecke Road	13	1569	17	44	44	143	310	2173	61	61	27	6
Highway 99W/Edy Road	284	1381	79	373	313	192	277	1952	167	219	339	259
Highway 99W/Tualatin-Sherwood Road	258	981	237	319	310	110	284	1802	502	134	372	155
Elwert Road/Edy Road	2	45	9	9	192	31	25	67	62	64	351	16
Borchers Drive/Edy Road	100	416	0	2	8	37	30	427	410	360	1	128
Langer Drive/Sherwood Boulevard	0	0	76	36	511	276	0	0	331	119	413	13
Century Drive/Sherwood Boulevard	111	62	63	27	649	77	387	85	113	66	365	39
Borchers Drive/Roy Rogers Road	11	804	257	386	12	35	23	947	30	22	39	6
Highway 99W/South Site Access	0	0	60	0	1743	0	0	0	0	0	2506	78
Edy Road/Site Access	0	320	14	12	0	196	137	421	0	0	0	0

Projected Future Traffic Volumes

Project: 07038 - Pfeiffer Zone Change
Intersection: Highway 99W/Sunset Boulevard

2005 Volumes

		2010		1245		
		30	1700	280		
225	15				150	360
	146				90	
311	150				120	531
		105	1080	105		
		1970		1290		

TEV 3971

2007 Volumes

		1833		1360		
		31	1621	181		
239	17				198	410
	106				74	
305	182				138	367
		134	1145	80		
		1941		1359		

TEV 3907

2030 Volumes

		2510		1590		
		30	2200	280		
370	20				150	530
	290				180	
560	250				200	770
		160	1420	200		
		2650		1780		

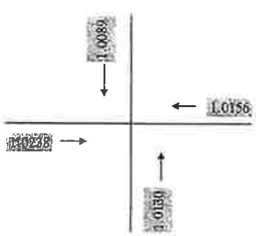
TEV 5380

2022 Volumes

		2094		1663		
		35	1852	207		
291	24				250	517
	151				93	
434	259				174	455
		163	1389	97		
		2285		1649		

TEV 4694

Growth Rates



Avg. Rate: 1.0153

Projected Future Traffic Volumes

Project: 07038 - Pfeiffer Zone Change
Intersection: Highway 99W/Meinecke Road

2005 Volumes

		2155		1330		
		35	1895	225		
45	3				95	140
	10				5	
25	10				40	270
		5	1230	35		
		1945		1270		

TEV 3590

2007 Volumes

		2172		1478		
		54	1856	262		
107	40				127	211
	18				42	
62	4				42	295
		13	1311	35		
		1902		1337		

TEV 3782

2030 Volumes

		2660		1680		
		80	2350	230		
100	20				100	150
	10				10	
50	20				40	280
		10	1560	40		
		2410		1610		

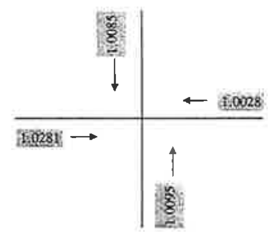
TEV 4470

2022 Volumes

		2464		1705		
		61	2106	297		
118	61				132	220
	27				44	
94	6				44	342
		13	1512	17		
		2156		1542		

TEV 4320

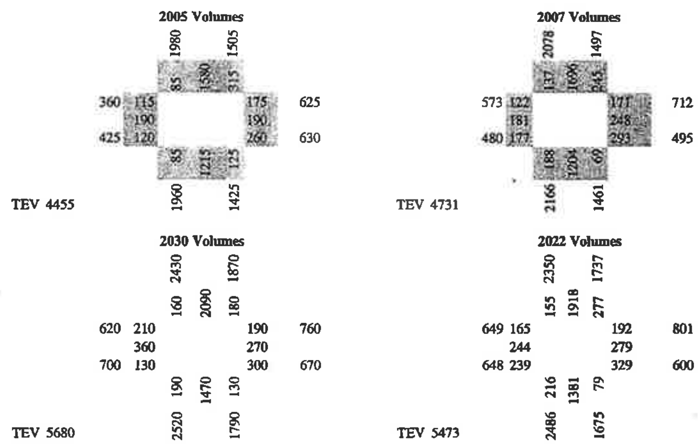
Growth Rates



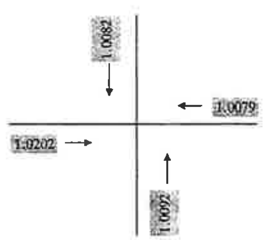
Avg. Rate: 1.0122

Projected Future Traffic Volumes

Project: 07038 - Pfeiffer Zone Change
Intersection: Highway 99W/Edy Road/Sherwood Boulevard



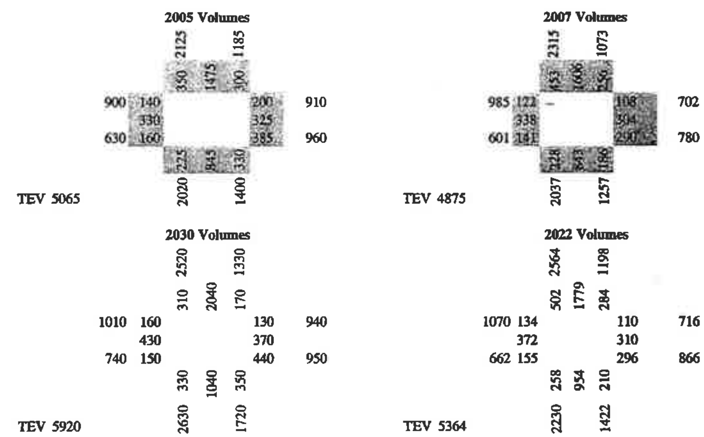
Growth Rates



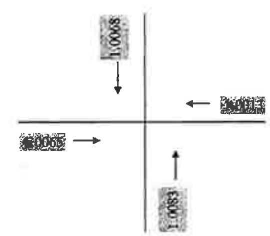
Avg. Rate: 1.0114

Projected Future Traffic Volumes

Project: 07038 - Pfeiffer Zone Change
Intersection: Highway 99W/Tualatin-Sherwood Boulevard



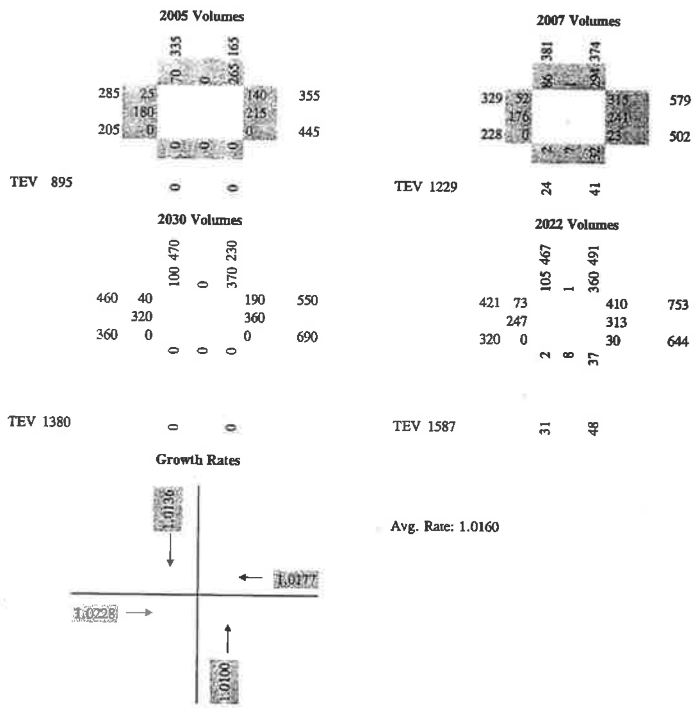
Growth Rates



Avg. Rate: 1.0057

Projected Future Traffic Volumes

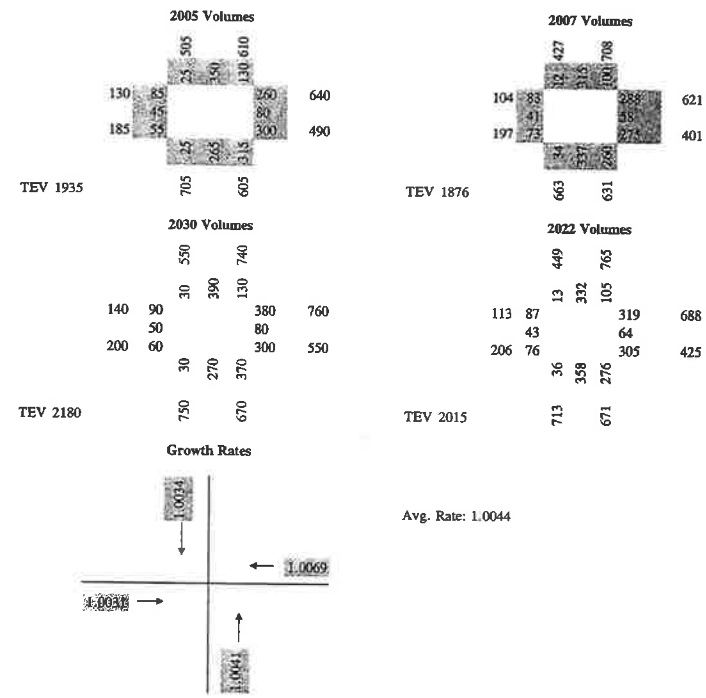
Project: 07038 - Pfeiffer Zone Change
Intersection: Edy Road/Borchers Drive



Avg. Rate: 1.0160

Projected Future Traffic Volumes

Project: 07038 - Pfeiffer Zone Change
Intersection: Sherwood Boulevard/Langer Drive

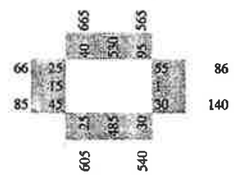


Avg. Rate: 1.0044

Projected Future Traffic Volumes

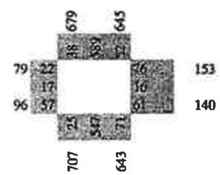
Project: 07038 - Pfeiffer Zone Change
Intersection: Sherwood Boulevard/Century Drive/12th Street

2005 Volumes



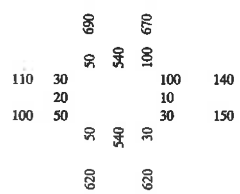
TEV 1376

2007 Volumes



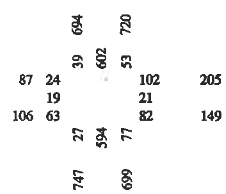
TEV 1571

2030 Volumes



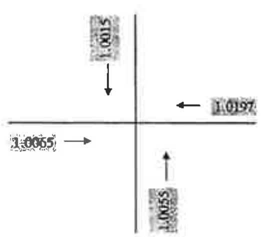
TEV 1550

2022 Volumes



TEV 1704

Growth Rates

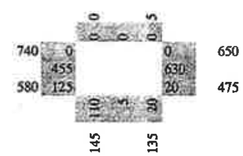


Avg. Rate: 1.0083

Projected Future Traffic Volumes

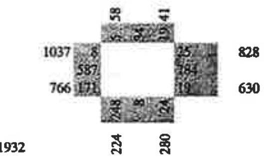
Project: 07038 - Pfeiffer Zone Change
Intersection: Roy Rogers Road/Borchers Drive

2005 Volumes



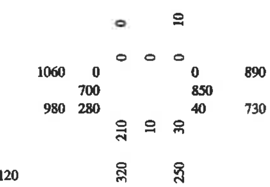
TEV 1365

2007 Volumes



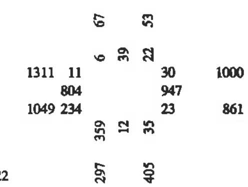
TEV 1932

2030 Volumes



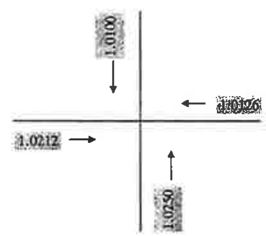
TEV 2120

2022 Volumes



TEV 2522

Growth Rates



Avg. Rate: 1.0172

SHEET 3

Date sheet in effect: Date sheet voided:

Location: 99W at Sunset

TABLE 1 Page 0

Phase Functions (0+Key)									
Function	Key	Phase Number * 1	2	3	4	5	6	7	8
Veh Recall	0		X				X		
Ped Recall	1								
Red Lock	2								
Yellow Lock	3								
Permit Phase	4	X	X		X	X	X		X
Ped Phases	5		X		X		X		X
Lead Phases	6	X		X		X		X	
Double Entry	7				X				X
Sequential	8								
Start Green	9		X				X		
OLA=	A								
OLB=	B								
OLC=	C								
OLD=	D								
Exclusive	E								
Sim Gap	F		X				X		

TABLE 2 Page 0

Miscellaneous (C+F+Key)			
Function	Key	Value	
Page ID	0		Keys 8 through F use Call/Active Display
	1		
	2		
	3		
OLA Red	4		
OLB Red	5		
OLC Red	6		
OLD Red	7		

Function	Key	Phase Number 1	2	3	4	5	6	7	8
RT OLE	8								
RT OLF	9								
Red Rest	A								
Max Recall	B								
Flash Green	C								
	D								
Advance WALK	E								
Restrictive Ph	F								

* Shown on Call/Active Display

TABLE 1 Page 0

Phase Timing (Ph. No. + Key)									
Interval	Key	SB left to Sunset	NB Hwy		Elwert	NB left to Elwert	SB Hwy		Sunset
		Phase Number 1	2	3	4	5	6	7	8
Max Green	0	20	60		20	15	60		20
Max2 / HFDW	1	30	60		35	15	60		35
Walk	2		5				5		13
Flashing DW	3		22				22		23
Max Initial	4	6	25		8	6	25		8
Min Green	5	6	15		6	6	15		6
TBR	6	8	25		10	8	25		10
TTR	7	3	20		5	3	20		5
Observe Gap	8								
Passage	9	2.5	5.0		3.5	2.5	5.0		3.5
Min Gap	A	1.0	3.0		2.5	1.0	3.0		2.5
Add per Act	B		1.0				1.0		
Yellow	C	4.0	5.0		4.0	4.0	5.0		4.0
Red Clear	D	1.0	1.0		2.0	1.0	1.0		2.0
Red Revert	E	5.0	5.0		5.0	5.0	5.0		5.0
Walk 2	F								

To observe timing for an individual phase:
Enter C + A + F for Ring A (Phase 1-4) or enter C + B + F for Ring B (Phase 5-8)

Page I.D. 0

Phase Conditions as shown on Free Display

00	Initial Entry	0C	Yellow
02	WALK	0D	Red Clear
03	Flashing DW	0E	Red Revert
05	Min Green	11	Gap Out
08	Rest	12	Force Off
09	Passage	14	Max Out
0B	Added Initial	15	Red Revert Timed out

TABLE 2 Page 0

Miscellaneous (9+Key)				
Parameter		Key	Value	Notes
Short Pwr Dn		0		Clock Correction Speed up 1 - 9 Slow down 11 - 19
Long Power Dn		1		
Preemption Delay Types	EVA	2		Preemption Delay Types:
	EVB	3		
	EVC	4		Hold 1 Latch 2 Both 3 Neither 0
	EVD	5		
	RR	6		
Ped Inhibit		7		Usually "0"
OLA	Green	8		Overlap Yellow Time should always be specified
	Yellow	9		
OLB	Green	A		
	Yellow	B		
OLC	Green	C		
	Yellow	D		
OLD	Green	E		
	Yellow	F		

Keyboard Entries when not in Free Display

A	Advance	D	Column Advance
B	Back	E	Enter and Advance
C	Clear Display	F	Free Display

Reinitialization
D + 1 + F + 1 + E
(Use only when in flash)

Phase Data Copy
C + x + C + y + D
x From Phase (x cannot be 3 or 8)
y To Phase(s) - up to 3 at a time

SHEET 4

Date sheet in effect: Date sheet voided:

Location: 99W at Sunset

TABLE 1 Page 1

Phase Functions (D+C+0+Key)									
Function	Key	Phase Number * 1	2	3	4	5	6	7	8
Veh Recall	0		X				X		
Ped Recall	1								
Red Lock	2								
Yellow Lock	3								
Permit Phase	4	X	X		X	X	X		X
Ped Phases	5		X		X		X		X
Lead Phases	6	X		X		X		X	
Double Entry	7				X				X
Sequential	8								
Start Green	9		X				X		
OLA=	A								
OLB=	B								
OLC=	C								
OLD=	D								
Exclusive	E								
Sim Gap	F		X				X		

TABLE 2 Page 1

Miscellaneous (D+C+B+Key)			
Function	Key	Value	
Page ID	0		Keys 8 through F use Call/Active Display
	1		
	2		
	3		
OLA Red	4		
OLB Red	5		
OLC Red	6		
OLD Red	7		

Function	Key	Phase Number 1	2	3	4	5	6	7	8
RT OLE	8								
RT OLF	9								
Red Rest	A								
Max Recall	B								
Flash Green	C								
	D								
Advance WALK	E								
Restrictive Ph	F								

* Shown on Call/Active Display

TABLE 1 Page 1

Phase Timing (D + C + Ph. No. + Key)									
Interval	Key	SB left to Sunset	NB Hwy		Elwert	NB left to Elwert	SB Hwy		Sunset
		Phase Number 1	2	3	4	5	6	7	8
Max Green	0	15	60		30	15	60		30
Max2 / HFDW	1	25	60		30	15	60		30
Walk	2		5				5		13
Flashing DW	3		22				22		23
Max Initial	4	6	25		8	6	25		8
Min Green	5	6	15		6	6	15		6
TBR	6	8	25		10	8	25		10
TTR	7	3	20		5	3	20		5
Observe Gap	8								
Passage	9	2.5	5.0		3.5	2.5	5.0		3.5
Min Gap	A	1.0	3.0		2.5	1.0	3.0		2.5
Add per Act	B		1.0				1.0		
Yellow	C	4.0	5.0		4.0	4.0	5.0		4.0
Red Clear	D	1.0	1.0		2.0	1.0	1.0		2.0
Red Revert	E	5.0	5.0		5.0	5.0	5.0		5.0
Walk 2	F								

To observe timing for an individual phase:
Enter C + A + F for Ring A (Phase 1-4) or enter C + B + F for Ring B (Phase 5-8)

Page I.D. 1

Phase Conditions as shown on Free Display

00	Initial Entry	0C	Yellow
02	WALK	0D	Red Clear
03	Flashing DW	0E	Red Revert
05	Min Green	11	Gap Out
08	Rest	12	Force Off
09	Passage	14	Max Out
0B	Added Initial	15	Red Revert Timed out

TABLE 2 Page 1

Miscellaneous (D+C+9+Key)				
Parameter		Key	Value	Notes
Short Pwr Dn		0		Clock Correction Speed up 1 - 9 Slow down 11 - 19
Long Power Dn		1		
Preemption Delay Types	EVA	2		Preemption Delay Types:
	EVB	3		
	EVC	4		Hold 1 Latch 2 Both 3 Neither 0
	EVD	5		
	RR	6		
Ped Inhibit		7		Usually "0"
OLA	Green	8		Overlap Yellow Time should always be specified
	Yellow	9		
OLB	Green	A		
	Yellow	B		
OLC	Green	C		
	Yellow	D		
OLD	Green	E		
	Yellow	F		

Keyboard Entries when not in Free Display

A	Advance	D	Column Advance
B	Back	E	Enter and Advance
C	Clear Display	F	Free Display

Reinitialization
D + 1 + F + 1 + E
(Use only when in flash)

Phase Data Copy
C + x + C + y + D
x From Phase (x cannot be 3 or 8)
y To Phase(s) - up to 3 at a time

Date sheet in effect: Date sheet voided: **Location:** 99W at Sunset

TABLE 7 (1 of 2)

Hardwire Conversion	Dial	1			2			3		
	Offset	1	2	3	1	2	3	1	2	3

Parameter	Key	Coordination Timing (B + Plan No. + Key) 1	2	3	4	5	6	7	8	9	Plan Number
Cycle Length	0										
Forceoffs for Phase indicated by Key number	1										
	2										
	3										
	4										
	5										
	6										
	7										
	8										
Offset	9										
Permissive	A										
Max. Dwell	B										

Plan			1	2	3	4	5	6	7	8
1	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
2	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
3	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
4	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
5	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
6	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
7	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
8	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
9	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								

TABLE 7 (2 of 2)

Parameter	Key 2	Coordination Timing (B + D + Key 1 + Key 2) 10	11	12	13	14	15	16	17	18	Plan Number
		7	8	9	A	B	C	D	E	F	Key 1
Cycle Length	0										
Forceoffs for Phase indicated by Key number	1										
	2										
	3										
	4										
	5										
	6										
	7										
	8										
Offset	9										
Permissive	A										
Max. Dwell	B										

Plan			1	2	3	4	5	6	7	8
10	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
11	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
12	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
13	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
14	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
15	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
16	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
17	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
18	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								

Date sheet in effect: Date sheet voided: **Location:** 99W at Sunset

TABLE 5 (1 of 2)

Time Clock Control (A+Code)

Event Number	Code	S 1	M 2	T 3	W 4	T 5	F 6	S 7	Hour	Min.	Func
1	80		X	X	X	X	X		81 15	82 00	83 129
2	84		X	X	X	X	X		85 20	86 00	87 128
3	88	X							89 06	8A 00	8B 101
4	8C	X							8D 13	8E 00	8F 100
5	90								91	92	93
6	94								95	96	97
7	98								99	9A	9B
8	9C								9D	9E	9F
9	A0								A1	A2	A3
10	A4								A5	A6	A7
11	A8								A9	AA	AB
12	AC								AD	AE	AF
13	B0								B1	B2	B3
14	B4								B5	B6	B7
15	B8								B9	BA	BB
16	BC								BD	BE	BF

Time Clock Control (A+Code)

Event Number	Code	S 1	M 2	T 3	W 4	T 5	F 6	S 7	Hour	Min.	Func
17	C0	X	X	X	X	X	X	X	C1 05	C2 15	C3 131
18	C4	X	X	X	X	X	X	X	C5 20	C6 15	C7 132
19	C8								C9	CA	CB
20	CC								CD	CE	CF
21	D0								D1	D2	D3
22	D4								D5	D6	D7
23	D8								D9	DA	DB
24	DC								DD	DE	DF
25	E0								E1	E2	E3
26	E4								E5	E6	E7
27	E8								E9	EA	EB
28	EC								ED	EE	EF
29	F0								F1	F2	F3
30	F4								F5	F6	F7
31	F8								F9	FA	FB
32	FC								FD	FE	FF

Event numbers are for reference only.
Local TOD "Free" will override any plan received via an Interconnect line.

TABLE 5 (2 of 2)

Time Clock Control (D+8+Code)

Event Number	Code	S 1	M 2	T 3	W 4	T 5	F 6	S 7	Hour	Min.	Func
33	80								81	82	83
34	84								85	86	87
35	88								89	8A	8B
36	8C								8D	8E	8F
37	90								91	92	93
38	94								95	96	97
39	98								99	9A	9B
40	9C								9D	9E	9F
41	A0								A1	A2	A3
42	A4								A5	A6	A7
43	A8								A9	AA	AB
44	AC								AD	AE	AF
45	B0								B1	B2	B3
46	B4								B5	B6	B7
47	B8								B9	BA	BB
48	BC								BD	BE	BF

Time Clock Control (D+8+Code)

Event Number	Code	S 1	M 2	T 3	W 4	T 5	F 6	S 7	Hour	Min.	Func
49	C0								C1	C2	C3
50	C4								C5	C6	C7
51	C8								C9	CA	CB
52	CC								CD	CE	CF
53	D0								D1	D2	D3
54	D4								D5	D6	D7
55	D8								D9	DA	DB
56	DC								DD	DE	DF
57	E0								E1	E2	E3
58	E4								E5	E6	E7
59	E8								E9	EA	EB
60	EC								ED	EE	EF
61	F0								F1	F2	F3
62	F4								F5	F6	F7
63	F8								F9	FA	FB
64	FC								FD	FE	FF

Date sheet in effect: Date sheet voided:

Location: 99W at Meineckie

TABLE 1 Page 0

Phase Functions (0+Key)									
Function	Key	Phase Number * 1	2	3	4	5	6	7	8
Veh Recall	0		X				X		
Ped Recall	1								
Red Lock	2								
Yellow Lock	3								
Permit Phase	4	X	X		X	X	X		X
Ped Phases	5		X		X		X		
Lead Phases	6	X		X		X		X	
Double Entry	7				X				X
Sequential	8								
Start Green	9		X				X		
OLA=	A								
OLB=	B								
OLC=	C								
OLD=	D								
Exclusive	E								
Sim Gap	F		X				X		

TABLE 2 Page 0

Miscellaneous (C+F+Key)		
Function	#	Value
Page ID	0	
	1	
	2	
	3	
OLA Red	4	
OLB Red	5	
OLC Red	6	
OLD Red	7	

Keys 8 through F use Call/Active Display

Function	#	Phase Number 1	2	3	4	5	6	7	8
RT OLE	8								
RT OLF	9								
Red Rest	A								
Max Recall	B								
Flash Green	C								
	D								
Advance WALK	E								
Restrictive Ph	F								

* Shown on Call/Active Display

SHEET 3

TABLE 1 Page 0

Phase Timing (Ph. No. + Key)									
Interval	Key	1 SB 99W to EB	2 NB 99W	3	4 EB Handley	5 NB to WB	6 SB 99W	7	8 WB Meinecke
Max Green	0	25	70		20	12	70		20
Max2 / HFDW	1	25	70		20	12	70		20
Walk	2		5		5		5		
Flashing DW	3		15		28		14		
Max Initial	4	4	15		6	4	15		6
Min Green	5	4	10		6	4	10		6
TBR	6	8	10		5	8	10		5
TTR	7	3	20		5	3	20		5
Observe Gap	8								
Passage	9	2.3	4.5		2.5	2.3	4.5		2.5
Min Gap	A	0.5	2.5		2.0	0.5	2.5		2.0
Add per Act	B		1.2				1.2		
Yellow	C	3.5	5.0		4.0	3.5	5.0		4.0
Red Clear	D	1.0	1.0		2.0	1.0	1.0		2.0
Red Revert	E	5.0	5.0		5.0	5.0	5.0		5.0
Walk 2	F								

To observe timing for an individual phase:
Enter C + A + F for Ring A (Phase 1-4) or enter C + B + F for Ring B (Phase 5-8)

Page I.D. 0

Phase Conditions as shown on Free Display

00	Initial Entry	0C	Yellow
02	WALK	0D	Red Clear
03	Flashing DW	0E	Red Revert
05	Min Green	11	Gap Out
08	Rest	12	Force Off
09	Passage	14	Max Out
0B	Added Initial	15	Red Revert Timed out

TABLE 2 Page 0

Miscellaneous (9+Key)				
Parameter		Key	Value	Notes
Short Pwr Dn		0		Clock Correction Speed up 1 - 9 Slow down 11 - 19
Long Power Dn		1		
Preemption Delay Types	EVA	2		Preemption Delay Types: Hold 1 Latch 2 Both 3 Neither 0
	EVB	3		
	EVC	4		
	EVD	5		
	RR	6		
Ped Inhibit		7		Usually "0"
OLA	Green	8		Overlap Yellow Time should always be specified
	Yellow	9		
OLB	Green	A		
	Yellow	B		
OLC	Green	C		
	Yellow	D		
OLD	Green	E		
	Yellow	F		

Keyboard Entries when not in Free Display

A	Advance	D	Column Advance
B	Back	E	Enter and Advance
C	Clear Display	F	Free Display

Reinitialization
D + 1 + F + 1 + E
(Use only when in flash)

Phase Data Copy
C + x + C + y + D
x From Phase (x cannot be 3 or 8)
y To Phase(s) - up to 3 at a time

TABLE 7 (1 of 2) Coordination Timing (B + Plan No. + Key)

Date sheet in effect: Date sheet voided:

Location: 99W at Meineckie

Parameter	Key	Plan Number 1	2	3	4	5	6	7	8	9
Hardwire Conversion Dial		1	1	1	2	2	2	3	3	3
Hardwire Conversion Offset		1	2	3	1	2	3	1	2	3
Cycle Length	0									
Forceoffs for Phase indicated by Key number	1									
	2									
	3									
	4									
	5									
	6									
	7									
	8									
Offset	9									
Permissive	A									
Max. Dwell	B									

Plans 1, 2, 3, 4, 5, 6, 7, 8, 9 (each):

		1	2	3	4	5	6	7	8
C	Lead Phases								
D	Coord. Phases								
E	Perm. 2 Ph.								
F	Man. Recall								

TABLE 7 (2 of 2) Coordination Timing (B + D + Key 1 + Key 2)

Parameter	Key 2	Plan Number 10	11	12	13	14	15	16	17	18
	Key 1	7	8	9	A	B	C	D	E	F
Cycle Length	0									
Forceoffs for Phase indicated by Key number	1									
	2									
	3									
	4									
	5									
	6									
	7									
	8									
Offset	9									
Permissive	A									
Max. Dwell	B									

Plans 10, 11, 12, 13, 14, 15, 16, 17, 18 (each):

		1	2	3	4	5	6	7	8
C	Lead Phases								
D	Coord. Phases								
E	Perm. 2 Ph.								
F	Man. Recall								

SHEET 8

TABLE 5 (1 of 2)

Time Clock Control (A+Code)

Event Number	S M T W T F S (1 2 3 4 5 6 7)	Hour	Min.	Func
1	80	81	82	83
2	84	85	86	87
3	88	89	8A	8B
4	8C	8D	8E	8F
5	90	91	92	93
6	94	95	96	97
7	98	99	9A	9B
8	9C	9D	9E	9F
9	A0	A1	A2	A3
10	A4	A5	A6	A7
11	A8	A9	AA	AB
12	AC	AD	AE	AF
13	B0	B1	B2	B3
14	B4	B5	B6	B7
15	B8	B9	BA	BB
16	BC	BD	BE	BF
17	C0: X X X X X X X	C1: 05	C2: 15	C3: 131
18	C4: X X X X X X X	C5: 22	C6: 15	C7: 132
19	C8	C9	CA	CB
20	CC	CD	CE	CF
21	D0	D1	D2	D3
22	D4	D5	D6	D7
23	D8	D9	DA	DB
24	DC	DD	DE	DF
25	E0	E1	E2	E3
26	E4	E5	E6	E7
27	E8	E9	EA	EB
28	EC	ED	EE	EF
29	F0	F1	F2	F3
30	F4	F5	F6	F7
31	F8	F9	FA	FB
32	FC	FD	FE	FF

TABLE 5 (2 of 2)

Time Clock Control (D+8+Code)

Event Number	S M T W T F S (1 2 3 4 5 6 7)	Hour	Min.	Func
33	80	81	82	83
34	84	85	86	87
35	88	89	8A	8B
36	8C	8D	8E	8F
37	90	91	92	93
38	94	95	96	97
39	98	99	9A	9B
40	9C	9D	9E	9F
41	A0	A1	A2	A3
42	A4	A5	A6	A7
43	A8	A9	AA	AB
44	AC	AD	AE	AF
45	B0	B1	B2	B3
46	B4	B5	B6	B7
47	B8	B9	BA	BB
48	BC	BD	BE	BF
49	C0	C1	C2	C3
50	C4	C5	C6	C7
51	C8	C9	CA	CB
52	CC	CD	CE	CF
53	D0	D1	D2	D3
54	D4	D5	D6	D7
55	D8	D9	DA	DB
56	DC	DD	DE	DF
57	E0	E1	E2	E3
58	E4	E5	E6	E7
59	E8	E9	EA	EB
60	EC	ED	EE	EF
61	F0	F1	F2	F3
62	F4	F5	F6	F7
63	F8	F9	FA	FB
64	FC	FD	FE	FF

Event numbers are for reference only.

Local TOD "Free" will override any plan received via an interconnect line.

Date sheet in effect:

Date sheet voided:

Location: 99W at Meineckie

Date sheet in effect: Date sheet voided:

Location: 99W at Edy Rd

TABLE 1 Page 0

Phase Functions (0+Key)

Function	Key	1	2	3	4	5	6	7	8
Veh Recall	0		X				X		
Ped Recall	1								
Red Lock	2								
Yellow Lock	3								
Permit Phase	4	X	X		X	X	X	X	X
Ped Phases	5		X		X		X		
Lead Phases	6	X		X		X			X
Double Entry	7				X				
Sequential	8								
Start Green	9		X				X		
OLA=	A								
OLB=	B								
OLC=	C								
OLD=	D								
Exclusive	E								
Sim Gap	F		X				X		

Phase Number *

TABLE 2 Page 0

Miscellaneous (C+F+Key)

Function	#	Value	
Page ID	0		Keys 8 through F use Call/Active Display
	1		
	2		
	3		
OLA Red	4		
OLB Red	5		
OLC Red	6		
OLD Red	7		

Function	Key	1	2	3	4	5	6	7	8
RT OLE	8								
RT OLF	9								
Red Rest	A								
Max Recall	B								
Flash Green	C								
	D								
Advance WALK	E								
Restrictive Ph	F								

Phase Number

* Shown on Call/Active Display

TABLE 1 Page 0

Phase Timing (Ph. No. + Key)

Interval	Key	1 SB to EB left	2 NB 99W	3	4 Ped Phase	5 NB to WB	6 SB 99W	7 EB Edy	8 WB N. Sherwood
Max Green	0	20	60		6	20	60	20	20
Max2 / HFDW	1	25	100		6	13	100	35	30
Walk	2		5		5		5		
Flashing DW	3		21		28		21		
Max Initial	4	4	15		4	4	23	6	6
Min Green	5	4	10		4	4	15	6	6
TBR	6	8	10			8	23	8	8
TTR	7	3	20			3	18	3	3
Observe Gap	8								
Passage	9	2.3	4.7		0.2	2.3	4.7	2.3	2.3
Min Gap	A	0.5	2.7		0.2	0.5	2.7	0.5	0.5
Add per Act	B		1.2				1.2		
Yellow	C	3.5	5.0		4.0	3.5	5.0	4.0	4.0
Red Clear	D	1.0	0.5		1.0	1.0	0.5	1.0	1.0
Red Revert	E	5.0	5.0		5.0	5.0	5.0	5.0	5.0
Walk 2	F								

Phase Number

To observe timing for an individual phase:
Enter C + A + F for Ring A (Phase 1-4) or enter C + B + F for Ring B (Phase 5-8)

Page I.D. 0

Phase Conditions as shown on Free Display

00	Initial Entry	0C	Yellow
02	WALK	0D	Red Clear
03	Flashing DW	0E	Red Revert
05	Min Green	11	Gap Out
08	Rest	12	Force Off
09	Passage	14	Max Out
0B	Added Initial	15	Red Revert Timed out

TABLE 2 Page 0

Miscellaneous (9+Key)

Parameter		Key	Value	Notes
Short Pwr Dn		0		Clock Correction Speed up 1 - 9 Slow down 11 - 19
Long Power Dn		1		
Preemption Delay Types	EVA	2		Preemption Delay Types: Hold 1 Latch 2 Both 3 Neither 0
	EVB	3		
	EVC	4		
	EVD	5		
	RR	6		
Ped Inhibit		7		Usually "0"
OLA	Green	8		Overlap Yellow Time should always be specified
	Yellow	9		
OLB	Green	A		
	Yellow	B		
OLC	Green	C		
	Yellow	D		
OLD	Green	E		
	Yellow	F		

Keyboard Entries when not in Free Display

A Advance
B Back
C Clear Display
D Column Advance
E Enter and Advance
F Free Display

Reinitialization

D + 1 + F + 1 + E
(Use only when in flash)

Phase Data Copy

C + x + C + y + D
x From Phase (x cannot be 3 or 8)
y To Phase(s) - up to 3 at a time

SHEET 3

Date sheet in effect: Date sheet voided:

Location: 99W at Edy Rd

TABLE 7 (1 of 2)

Hardwire Conversion		1			2			3		
Dial		1	1	1	2	2	2	3	3	3
Offset		1	2	3	1	2	3	1	2	3

Parameter	Key	Coordination Timing (B + Plan No. + Key) 1	2	3	4	5	6	7	8	9
		Plan Number								
Cycle Length	0		120		120	100				
Forceoffs for Phase indicated by Key number	1		24		16	26				
	2									
	3									
	4		62		60	68				
	5		80		75	86				
	6		24		16	26				
	7		62		60	68				
	8		46		45	47				
Offset	9		2		5	97				
Permissive	A		26		18	28				
Max. Dwell	B		40		40	34				

Plan			1	2	3	4	5	6	7	8
1	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
2	C	Lead Phases		X	X		X			X
	D	Coord. Phases		X				X		
	E	Perm. 2 Ph.								
	F	Min. Recall								
3	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
4	C	Lead Phases		X	X		X			X
	D	Coord. Phases		X				X		
	E	Perm. 2 Ph.								
	F	Min. Recall								
5	C	Lead Phases		X	X		X			X
	D	Coord. Phases		X						
	E	Perm. 2 Ph.								
	F	Min. Recall								
6	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
7	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
8	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
9	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								

TABLE 7 (2 of 2)

Parameter	Key 2	Coordination Timing (B + D + Key 1 + Key 2) 10	11	12	13	14	15	16	17	18	Plan Number
		7	8	9	A	B	C	D	E	F	Key 1
Cycle Length	0										
Forceoffs for Phase indicated by Key number	1										
	2										
	3										
	4										
	5										
	6										
	7										
	8										
Offset	9										
Permissive	A										
Max. Dwell	B										

Plan			1	2	3	4	5	6	7	8
10	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
11	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
12	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
13	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
14	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
15	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
16	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
17	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
18	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								

Date sheet in effect: Date sheet voided:

Location: 99W at Edy Rd

TABLE 5 (1 of 2)

Event Number	Days Code	S 1	M 2	T 3	W 4	T 5	F 6	S 7	Hour	Min.	Func
1	80		X	X	X	X	X		81: 05	82: 59	83: 129
2	84		X	X	X	X	X		85: 06	86: 00	87: 4
3	88		X	X	X	X	X		89: 08	8A: 15	8B: 5
4	8C		X	X	X	X	X		8D: 16	8E: 00	8F: 2
5	90		X	X	X	X	X		91: 18	92: 30	93: 5
6	94	X	X	X	X	X	X	X	95: 22	96: 00	97: 20
7	98	X	X	X	X	X	X	X	99: 22	9A: 01	9B: 128
8	9C	X						X	9D: 07	9E: 59	9F: 129
9	A0	X						X	A1: 08	A2: 00	A3: 5
10	A4								A5	A6	A7
11	A8								A9	AA	AB
12	AC								AD	AE	AF
13	B0								B1	B2	B3
14	B4								B5	B6	B7
15	B8								B9	BA	BB
16	BC								BD	BE	BF
17	C0	X	X	X	X	X	X	X	C1: 05	C2: 15	C3: 131
18	C4	X	X	X	X	X	X	X	C5: 22	C6: 15	C7: 132
19	C8								C9	CA	CB
20	CC								CD	CE	CF
21	D0								D1	D2	D3
22	D4								D5	D6	D7
23	D8								D9	DA	DB
24	DC								DD	DE	DF
25	E0								E1	E2	E3
26	E4								E5	E6	E7
27	E8								E9	EA	EB
28	EC								ED	EE	EF
29	F0								F1	F2	F3
30	F4								F5	F6	F7
31	F8								F9	FA	FB
32	FC								FD	FE	FF

(Events 1–32: Time Clock Control (A+Code))

TABLE 5 (2 of 2)

(Events 33–64: Time Clock Control (D+8+Code))

Event Number	Days Code	S 1	M 2	T 3	W 4	T 5	F 6	S 7	Hour	Min.	Func
33	80								81	82	83
34	84								85	86	87
35	88								89	8A	8B
36	8C								8D	8E	8F
37	90								91	92	93
38	94								95	96	97
39	98								99	9A	9B
40	9C								9D	9E	9F
41	A0								A1	A2	A3
42	A4								A5	A6	A7
43	A8								A9	AA	AB
44	AC								AD	AE	AF
45	B0								B1	B2	B3
46	B4								B5	B6	B7
47	B8								B9	BA	BB
48	BC								BD	BE	BF
49	C0								C1	C2	C3
50	C4								C5	C6	C7
51	C8								C9	CA	CB
52	CC								CD	CE	CF
53	D0								D1	D2	D3
54	D4								D5	D6	D7
55	D8								D9	DA	DB
56	DC								DD	DE	DF
57	E0								E1	E2	E3
58	E4								E5	E6	E7
59	E8								E9	EA	EB
60	EC								ED	EE	EF
61	F0								F1	F2	F3
62	F4								F5	F6	F7
63	F8								F9	FA	FB
64	FC								FD	FE	FF

Event numbers are for reference only.

Local TOD "Free" will override any plan received via an interconnect line.

SHEET 3

Date sheet in effect:

Date sheet voided:

Location: 99W at Tualatin-Sherwood Rd

TABLE 1 Page 0

Phase Functions (0+Key)									
Function	Key	Phase Number *							
		1	2	3	4	5	6	7	8
Veh Recall	0		X				X		
Ped Recall	1								
Red Lock	2								
Yellow Lock	3								
Permit Phase	4	X	X		X	X	X	X	X
Ped Phases	5		X		X		X		
Lead Phases	6	X		X		X			X
Double Entry	7				X				
Sequential	8								
Start Green	9		X				X		
OLA=	A								
OLB=	B								
OLC=	C								
OLD=	D								
Exclusive	E								
Sim Gap	F		X				X		

TABLE 2 Page 0

Miscellaneous (C+F+Key)			
Function	Key	Value	
Page ID	0		Keys 8 through F use Call/Active Display
	1		
	2		
	3		
OLA Red	4		
OLB Red	5		
OLC Red	6		
OLD Red	7		

		Phase Number							
		1	2	3	4	5	6	7	8
RT OLE	8								
RT OLF	9								
Red Rest	A								
Max Recall	B								
Flash Green	C								
	D								
Advance WALK	E								
Restrictive Ph	F								

* Shown on Call/Active Display

TABLE 1 Page 0

Phase Timing (Ph. No. + Key)									
		SB to T-S Rd	NB 99W		Ped only	NB to Roy Rogers	SB 99W	Roy Rogers Rd	Tualatin-Sherwood Rd
Interval	Key	Phase Number							
		1	2	3	4	5	6	7	8
Max Green	0	20	60		6	20	60	20	20
Max2 / HFDW	1	16	120		6	20	120	40	28
Walk	2		5		5		5		
Flashing DW	3		22		26		21		
Max Initial	4	4	20		4	4	20	6	6
Min Green	5	4	15		4	4	15	6	6
TBR	6	8	15			8	15	8	8
TTR	7	3	20			3	20	3	3
Observe Gap	8								
Passage	9	2.3	4.7		0.2	2.3	4.7	2.3	2.3
Min Gap	A	0.5	2.7		0.2	0.5	2.7	0.5	0.5
Add per Act	B		1.2				1.2		
Yellow	C	3.5	5.0		4.0	3.5	5.0	4.0	4.0
Red Clear	D	1.0	0.5		1.0	1.0	0.5	1.0	1.0
Red Revert	E	5.0	5.0		5.0	5.0	5.0	5.0	5.0
Walk 2	F								

To observe timing for an individual phase:
Enter C + A + F for Ring A (Phase 1-4) or
enter C + B + F for Ring B (Phase 5-8)

Page I.D. 0

Phase Conditions as shown on Free Display

00	Initial Entry	0C	Yellow
02	WALK	0D	Red Clear
03	Flashing DW	0E	Red Revert
05	Min Green	11	Gap Out
08	Rest	12	Force Off
09	Passage	14	Max Out
0B	Added Initial	15	Red Revert Timed out

TABLE 2 Page 0

Miscellaneous (9+Key)				
Parameter		Key	Value	Notes
Short Pwr Dn		0		Clock Correction Speed up 1 - 9 Slow down 11 - 19
Long Power Dn		1		
Preemption Delay Types	EVA	2		Preemption Delay Types: Hold 1 Latch 2 Both 3 Neither 0
	EVB	3		
	EVC	4		
	EVD	5		
	RR	6		
Ped Inhibit		7		Usually "0"
OLA	Green	8		Overlap Yellow Time should always be specified
	Yellow	9		
OLB	Green	A		
	Yellow	B		
OLC	Green	C		
	Yellow	D		
OLD	Green	E		
	Yellow	F		

Keyboard Entries when not in Free Display

A Advance	D Column Advance
B Back	E Enter and Advance
C Clear Display	F Free Display

Reinitialization
D + 1 + F + 1 + E
(Use only when in flash)

Phase Data Copy
C + x + C + y + D
x From Phase (x cannot be 3 or 8)
y To Phase(s) - up to 3 at a time

SHEET 4

Date sheet in effect:

Date sheet voided:

Location: 99W at Tualatin-Sherwood Rd

TABLE 1 Page 1

Phase Functions (D+C+0+Key)									
Function	Key	Phase Number *							
		1	2	3	4	5	6	7	8
Veh Recall	0		X				X		
Ped Recall	1								
Red Lock	2								
Yellow Lock	3								
Permit Phase	4	X	X		X	X	X	X	X
Ped Phases	5		X		X		X		
Lead Phases	6	X		X		X			X
Double Entry	7				X				
Sequential	8								
Start Green	9		X				X		
OLA=	A								
OLB=	B								
OLC=	C								
OLD=	D								
Exclusive	E								
Sim Gap	F		X				X		

TABLE 2 Page 1

Miscellaneous (D+C+B+Key)			
Function	Key	Value	
Page ID	0		Keys 8 through F use Call/Active Display
	1		
	2		
	3		
OLA Red	4		
OLB Red	5		
OLC Red	6		
OLD Red	7		

		Phase Number							
		1	2	3	4	5	6	7	8
RT OLE	8								
RT OLF	9								
Red Rest	A								
Max Recall	B								
Flash Green	C								
	D								
Advance WALK	E								
Restrictive Ph	F								

* Shown on Call/Active Display

TABLE 1 Page 1

Phase Timing (D + C + Ph. No. + Key)									
Interval	Key	Phase Number							
		1	2	3	4	5	6	7	8
Max Green	0	19	120		6	20	120	40	28
Max2 / HFDW	1	19	120		6	20	120	40	28
Walk	2		5		5		5		
Flashing DW	3		21		26		21		
Max Initial	4	4	20		4	4	20	6	6
Min Green	5	4	15		4	4	15	6	6
TBR	6	8	15			8	15	8	8
TTR	7	3	20			3	20	3	3
Observe Gap	8								
Passage	9	2.3	4.7		0.2	2.3	4.7	2.3	2.3
Min Gap	A	0.5	2.7		0.2	0.5	2.7	0.5	0.5
Add per Act	B		1.2				1.2		
Yellow	C	3.5	5.0		4.0	3.5	5.0	4.0	4.0
Red Clear	D	1.0	0.5		1.0	1.0	0.5	1.0	1.0
Red Revert	E	5.0	5.0		5.0	5.0	5.0	5.0	5.0
Walk 2	F								

To observe timing for an individual phase:
Enter C + A + F for Ring A (Phase 1-4) or
enter C + B + F for Ring B (Phase 5-8)

Page I.D. 1

Phase Conditions as shown on Free Display

00	Initial Entry	0C	Yellow
02	WALK	0D	Red Clear
03	Flashing DW	0E	Red Revert
05	Min Green	11	Gap Out
08	Rest	12	Force Off
09	Passage	14	Max Out
0B	Added Initial	15	Red Revert Timed out

TABLE 2 Page 1

Miscellaneous (D+C+9+Key)				
Parameter		Key	Value	Notes
Short Pwr Dn		0		Clock Correction Speed up 1 - 9 Slow down 11 - 19
Long Power Dn		1		
Preemption Delay Types	EVA	2		Preemption Delay Types: Hold 1 Latch 2 Both 3 Neither 0
	EVB	3		
	EVC	4		
	EVD	5		
	RR	6		
Ped Inhibit		7		Usually "0"
OLA	Green	8		Overlap Yellow Time should always be specified
	Yellow	9		
OLB	Green	A		
	Yellow	B		
OLC	Green	C		
	Yellow	D		
OLD	Green	E		
	Yellow	F		

Keyboard Entries when not in Free Display

A Advance	D Column Advance
B Back	E Enter and Advance
C Clear Display	F Free Display

Reinitialization
D + 1 + F + 1 + E
(Use only when in flash)

Phase Data Copy
C + x + C + y + D
x From Phase (x cannot be 3 or 8)
y To Phase(s) - up to 3 at a time

Date sheet in effect: Date sheet voided:

Location: 99W at Tualatin-Sherwood Rd

TABLE 7 (1 of 2)

Hardwire Conversion		1			2			3		
Dial Offset		1	2	3	1	2	3	1	2	3

Parameter	Key	Coordination Timing (B + Plan No. + Key) 1	2	3	4	5	6	7	8	9	Plan Number
Cycle Length	0		120		120	100					
Forceoffs for Phase indicated by Key number	1		91		93	83					
	2		18		18	16					
	3										
	4		67		74	63					
	5		18		18	16					
	6										
	7		67		74	63					
	8		42		45	40					
Offset	9										
Permissive	A		20		20	18					
Max. Dwell	B		40		40	34					

Plan	Row	Parameter	1	2	3	4	5	6	7	8
1	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
2	C	Lead Phases	X		X			X		X
	D	Coord. Phases						X		
	E	Perm. 2 Ph.								
	F	Min. Recall								
3	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
4	C	Lead Phases	X		X			X		X
	D	Coord. Phases						X		
	E	Perm. 2 Ph.								
	F	Min. Recall								
5	C	Lead Phases	X		X			X		X
	D	Coord. Phases						X		
	E	Perm. 2 Ph.								
	F	Min. Recall								
6	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
7	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
8	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								
9	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								

TABLE 7 (2 of 2)

Parameter	Key 2	Coordination Timing (B + D + Key 1 + Key 2) 10	11	12	13	14	15	16	17	18	Plan Number
		7	8	9	A	B	C	D	E	F	Key 1
Cycle Length	0										
Forceoffs for Phase indicated by Key number	1										
	2										
	3										
	4										
	5										
	6										
	7										
	8										
Offset	9										
Permissive	A										
Max. Dwell	B										

Plan	Row	Parameter	1	2	3	4	5	6	7	8
10–18 (each)	C	Lead Phases								
	D	Coord. Phases								
	E	Perm. 2 Ph.								
	F	Min. Recall								

Date sheet in effect: Date sheet voided:

Location: 99W at Tualatin-Sherwood Rd

TABLE 5 (1 of 2)

Time Clock Control (A+Code)

Event Number	Day code	S 1	M 2	T 3	W 4	T 5	F 6	S 7	Hour	Min.	Func
1	80		X	X	X	X	X		81: 05	82: 59	83: 129
2	84		X	X	X	X	X		85: 06	86: 00	87: 4
3	88		X	X	X	X	X		89: 08	8A: 15	8B: 5
4	8C		X	X	X	X	X		8D: 16	8E: 00	8F: 2
5	90		X	X	X	X	X		91: 18	92: 30	93: 5
6	94	X	X	X	X	X	X	X	95: 22	96: 00	97: 20
7	98	X	X	X	X	X	X	X	99: 22	9A: 01	9B: 128
8	9C	X						X	9D: 07	9E: 59	9F: 129
9	A0	X						X	A1: 08	A2: 00	A3: 5
10	A4		X	X	X	X	X		A5: 15	A6: 59	A7: 101
11	A8		X	X	X	X	X		A9: 18	AA: 31	AB: 100
12	AC								AD	AE	AF
13	B0								B1	B2	B3
14	B4								B5	B6	B7
15	B8								B9	BA	BB
16	BC								BD	BE	BF
17	C0	X	X	X	X	X	X	X	C1: 05	C2: 15	C3: 131
18	C4	X	X	X	X	X	X	X	C5: 22	C6: 15	C7: 132
19	C8								C9	CA	CB
20	CC								CD	CE	CF
21	D0								D1	D2	D3
22	D4								D5	D6	D7
23	D8								D9	DA	DB
24	DC								DD	DE	DF
25	E0								E1	E2	E3
26	E4								E5	E6	E7
27	E8								E9	EA	EB
28	EC								ED	EE	EF
29	F0								F1	F2	F3
30	F4								F5	F6	F7
31	F8								F9	FA	FB
32	FC								FD	FE	FF

TABLE 5 (2 of 2)

Time Clock Control (D+8+Code)

Event Number	Day code	S 1	M 2	T 3	W 4	T 5	F 6	S 7	Hour	Min.	Func
33	80								81	82	83
34	84								85	86	87
35	88								89	8A	8B
36	8C								8D	8E	8F
37	90								91	92	93
38	94								95	96	97
39	98								99	9A	9B
40	9C								9D	9E	9F
41	A0								A1	A2	A3
42	A4								A5	A6	A7
43	A8								A9	AA	AB
44	AC								AD	AE	AF
45	B0								B1	B2	B3
46	B4								B5	B6	B7
47	B8								B9	BA	BB
48	BC								BD	BE	BF
49	C0								C1	C2	C3
50	C4								C5	C6	C7
51	C8								C9	CA	CB
52	CC								CD	CE	CF
53	D0								D1	D2	D3
54	D4								D5	D6	D7
55	D8								D9	DA	DB
56	DC								DD	DE	DF
57	E0								E1	E2	E3
58	E4								E5	E6	E7
59	E8								E9	EA	EB
60	EC								ED	EE	EF
61	F0								F1	F2	F3
62	F4								F5	F6	F7
63	F8								F9	FA	FB
64	FC								FD	FE	FF

Event numbers are for reference only.

Local TOD "Free" will override any plan received via an interconnect line.

99W at Tualatin Sherwood Rd rev2d (autoload) SHEET 8

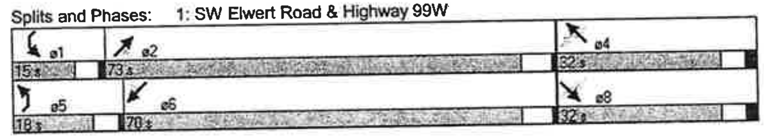
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.993			0.968		0.950			0.950		
Satd. Flow (prot)	0	1871	1583	0	1809	1583	1736	3406	1599	3467	3505	1509
Flt Permitted		0.940			0.648		0.950			0.950		
Satd. Flow (perm)	0	1771	1583	0	1211	1583	1736	3406	1599	3467	3505	1509
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			162			206			83			26
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		3096			2452			1095			4015	
Travel Time (s)		70.4			55.7			24.9			91.3	
Volume (vph)	17	106	182	138	74	198	134	1145	80	181	1621	31
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	1%	2%	2%	1%	2%	4%	6%	1%	1%	3%	7%
Adj. Flow (vph)	18	110	190	144	77	206	140	1193	83	189	1689	32
Lane Group Flow (vph)	0	128	190	0	221	206	140	1193	83	189	1689	32
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		8			4		5	2		1	6	
Permitted Phases	8		8	4		4			2			6
Detector Phases	8	8	8	4	4	4	5	2	2	1	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	9.0	22.0	22.0	9.0	22.0	22.0
Total Split (s)	32.0	32.0	32.0	32.0	32.0	32.0	18.0	73.0	73.0	15.0	70.0	70.0
Total Split (%)	26.7%	26.7%	26.7%	26.7%	26.7%	26.7%	15.0%	60.8%	60.8%	12.5%	58.3%	58.3%
Maximum Green (s)	26.0	26.0	26.0	26.0	26.0	26.0	13.0	67.0	67.0	10.0	64.0	64.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	5.0	4.0	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	Max	Max	Max	Max	Max	Max	None	Max	Max	None	Max	Max
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0	0		0	0
Act Effct Green (s)		28.0	28.0		28.0	28.0	13.3	69.0	69.0	10.7	66.4	66.4
Actuated g/C Ratio		0.23	0.23		0.23	0.23	0.11	0.58	0.58	0.09	0.55	0.55
v/c Ratio		0.31	0.38		0.78	0.39	0.73	0.61	0.09	0.61	0.87	0.04
Control Delay		40.5	11.0		63.0	7.3	73.0	18.2	2.6	61.4	29.2	5.5
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		40.5	11.0		63.0	7.3	73.0	18.2	2.6	61.4	29.2	5.5
LOS		D	B		E	A	E	B	A	E	C	A
Approach Delay		22.9			36.2			22.7			32.0	

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS		C			D			C			C	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 119.7
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 28.5 Intersection LOS: C
Intersection Capacity Utilization 80.4% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 1: SW Elwert Road & Highway 99W



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.99	1.00		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1871	1583		1810	1583	1736	3406	1599	3467	3505	1509
Flt Permitted		0.94	1.00		0.65	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1770	1583		1213	1583	1736	3406	1599	3467	3505	1509
Volume (vph)	17	106	182	138	74	198	134	1145	80	181	1621	31
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	18	110	190	144	77	206	140	1193	83	189	1689	32
RTOR Reduction (vph)	0	0	124	0	0	158	0	0	35	0	0	12
Lane Group Flow (vph)	0	128	66	0	221	48	140	1193	48	189	1689	20
Heavy Vehicles (%)	0%	1%	2%	2%	1%	2%	4%	6%	1%	1%	3%	7%
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		8			4		5	2		1	6	
Permitted Phases	8		8	4		4			2			6
Actuated Green, G (s)		26.0	26.0		26.0	26.0	12.3	67.0	67.0	9.7	64.4	64.4
Effective Green, g (s)		28.0	28.0		28.0	28.0	13.3	69.0	69.0	10.7	66.4	66.4
Actuated g/C Ratio		0.23	0.23		0.23	0.23	0.11	0.58	0.58	0.09	0.55	0.55
Clearance Time (s)		6.0	6.0		6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		414	370		284	370	193	1963	922	310	1944	837
v/s Ratio Prot							c0.08	c0.35		0.05	c0.48	
v/s Ratio Perm		0.07	0.04		c0.18	0.03			0.03			0.01
v/c Ratio		0.31	0.18		0.78	0.13	0.73	0.61	0.05	0.61	0.87	0.02
Uniform Delay, d1		37.9	36.7		42.9	36.2	51.4	16.5	11.1	52.5	22.9	12.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.9	1.1		18.7	0.7	12.7	1.4	0.1	3.4	5.6	0.1
Delay (s)		39.8	37.7		61.7	37.0	64.1	17.9	11.2	55.9	28.5	12.1
Level of Service		D	D		E	D	E	B	B	E	C	B
Approach Delay (s)		38.5			49.7			22.1			30.9	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM Average Control Delay	30.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	119.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

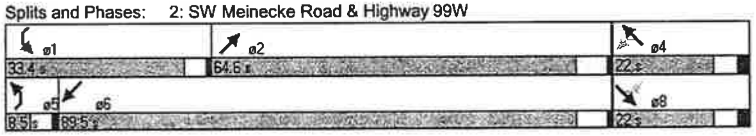
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	1792	1615	1752	1900	1615	1805	3471	1615	1787	3505	1615
Flt Permitted	0.728			0.745			0.950			0.950		
Satd. Flow (perm)	1383	1792	1615	1374	1900	1615	1805	3471	1615	1787	3505	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			4			135			7			18
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1172			2933			4015			1905	
Travel Time (s)		26.6			66.7			91.3			43.3	
Volume (vph)	40	18	4	42	42	127	11	1311	15	262	1856	54
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	6%	0%	3%	0%	0%	0%	4%	0%	1%	3%	0%
Adj. Flow (vph)	43	19	4	45	45	135	12	1395	16	279	1974	57
Lane Group Flow (vph)	43	19	4	45	45	135	12	1395	16	279	1974	57
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		8			4		5	2		1	6	
Permitted Phases	8		Free	4	4	Free			Free			Free
Detector Phases	8	8		4	4		5	2		1	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0		22.0	22.0		8.5	22.0		8.5	22.0	
Total Split (s)	22.0	22.0	0.0	22.0	22.0	0.0	8.5	64.6	0.0	33.4	89.5	0.0
Total Split (%)	18.3%	18.3%	0.0%	18.3%	18.3%	0.0%	7.1%	53.8%	0.0%	27.8%	74.6%	0.0%
Maximum Green (s)	16.0	16.0		16.0	16.0		4.0	58.6		28.9	83.5	
Yellow Time (s)	4.0	4.0		4.0	4.0		3.5	5.0		3.5	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	1.0		1.0	1.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	None		None	None	
Walk Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0			11.0			11.0	
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effct Green (s)	11.6	11.6	76.7	11.6	11.6	76.7	5.7	48.5	76.7	18.3	66.2	76.7
Actuated g/C Ratio	0.14	0.14	1.00	0.14	0.14	1.00	0.07	0.63	1.00	0.23	0.86	1.00
v/c Ratio	0.22	0.07	0.00	0.23	0.17	0.08	0.10	0.63	0.01	0.67	0.65	0.04
Control Delay	43.9	42.1	0.0	44.1	42.1	0.1	53.8	17.1	0.0	40.9	6.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.9	42.1	0.0	44.1	42.1	0.1	53.8	17.1	0.0	40.9	6.1	0.0
LOS	D	D	A	D	D	A	D	B	A	D	A	A
Approach Delay		40.7			17.3			17.2			10.1	

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS		D			B			B			B	

Intersection Summary

Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 76.7	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.67	
Intersection Signal Delay: 13.5	Intersection LOS: B
Intersection Capacity Utilization 73.6%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 2: SW Meinecke Road & Highway 99W



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1792	1615	1752	1900	1615	1805	3471	1615	1787	3505	1615
Flt Permitted	0.73	1.00	1.00	0.75	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1383	1792	1615	1374	1900	1615	1805	3471	1615	1787	3505	1615
Volume (vph)	40	18	4	42	42	127	11	1311	15	262	1856	54
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	43	19	4	45	45	135	12	1395	16	279	1974	57
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	43	19	4	45	45	135	12	1395	16	279	1974	57
Heavy Vehicles (%)	0%	6%	0%	3%	0%	0%	0%	4%	0%	1%	3%	0%
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		8			4		5	2		1	6	
Permitted Phases	8		Free	4	4	Free			Free			Free
Actuated Green, G (s)	4.7	4.7	81.3	4.7	4.7	81.3	0.5	45.7	81.3	14.4	59.6	81.3
Effective Green, g (s)	6.7	6.7	81.3	6.7	6.7	81.3	1.0	47.7	81.3	14.9	61.6	81.3
Actuated g/C Ratio	0.08	0.08	1.00	0.08	0.08	1.00	0.01	0.59	1.00	0.18	0.76	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0		4.5	6.0		4.5	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	114	148	1615	113	157	1615	22	2036	1615	328	2656	1615
v/s Ratio Prot		0.01			0.02		0.01	0.40		c0.16	c0.56	
v/s Ratio Perm	0.03		0.00	c0.03		0.08			0.01			0.04
v/c Ratio	0.38	0.13	0.00	0.40	0.29	0.08	0.55	0.69	0.01	0.85	0.74	0.04
Uniform Delay, d1	35.3	34.6	0.0	35.4	35.1	0.0	39.9	11.6	0.0	32.1	5.5	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.1	0.4	0.0	2.3	1.0	0.1	24.9	1.0	0.0	18.6	1.2	0.0
Delay (s)	37.4	35.0	0.0	37.7	36.1	0.1	64.8	12.6	0.0	50.7	6.6	0.0
Level of Service	D	C	A	D	D	A	E	B	A	D	A	A
Approach Delay (s)		34.4			14.8			12.9			11.8	
Approach LOS		C			B			B			B	

Intersection Summary

HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	81.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

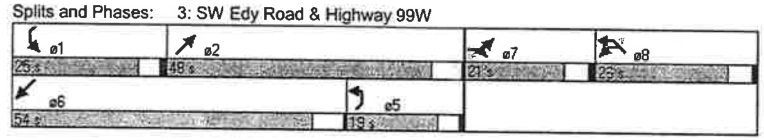
Lane Group	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	
Turning Speed (mph)	15	9	9	15	15	9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Frt		0.850	0.850			0.850		0.992			0.989	
Flt Protected	0.950			0.950	0.950		0.950			0.950		
Satd. Flow (prot)	1787	1599	1615	1698	1713	1553	1752	4908	0	1787	4991	0
Flt Permitted	0.950			0.950	0.950		0.950			0.950		
Satd. Flow (perm)	1787	1599	1615	1698	1713	1553	1752	4908	0	1787	4991	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			184			178		8			13	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)	30				30			30			30	
Link Distance (ft)	445				539			1905			1840	
Travel Time (s)	10.1				12.3			43.3			41.8	
Volume (vph)	122	181	177	293	248	171	188	1204	69	245	1696	137
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	1%	1%	0%	1%	0%	4%	3%	5%	2%	1%	3%	0%
Adj. Flow (vph)	127	189	184	305	258	178	196	1254	72	255	1767	143
Lane Group Flow (vph)	127	189	184	280	283	178	196	1326	0	255	1910	0
Turn Type	Split		Perm	Split		Perm	Prot			Prot		
Protected Phases	7	7		8	8		5	2		1	6	
Permitted Phases			7			8						
Detector Phases	7	7	7	8	8	8	5	2		1	6	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	8.5	21.5		8.5	21.5	
Total Split (s)	21.0	21.0	21.0	26.0	26.0	26.0	19.0	48.0	0.0	25.0	54.0	0.0
Total Split (%)	17.5%	17.5%	17.5%	21.7%	21.7%	21.7%	15.8%	40.0%	0.0%	20.8%	45.0%	0.0%
Maximum Green (s)	16.0	16.0	16.0	21.0	21.0	21.0	14.5	42.5		20.5	48.5	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.5	5.0		3.5	5.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5		1.0	0.5	
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0			5.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0		11.0			11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0			0	
Act Effct Green (s)	16.5	16.5	16.5	21.7	21.7	21.7	15.0	45.7		20.1	50.8	
Actuated g/C Ratio	0.14	0.14	0.14	0.18	0.18	0.18	0.12	0.38		0.17	0.42	
v/c Ratio	0.52	0.86	0.48	0.91	0.92	0.42	0.89	0.71		0.85	0.90	
Control Delay	56.0	83.6	11.1	61.0	61.0	8.7	90.9	34.2		56.5	58.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	56.0	83.6	11.1	61.0	61.0	8.7	90.9	34.2		56.5	58.3	
LOS	E	F	B	E	E	A	F	C		E	E	
Approach Delay	49.9				48.4			41.5			58.1	

Lane Group	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS	D				D			D			E	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 2 (2%), Referenced to phase 2:NET and 6:SWT, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 50.7 Intersection LOS: D
Intersection Capacity Utilization 81.3% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 3: SW Edy Road & Highway 99W



HCM Signalized Intersection Capacity Analysis
3: SW Edy Road & Highway 99W 10/10/2007

Movement	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	0.85	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	1599	1615	1698	1713	1553	1752	4907		1787	4990	
Flt Permitted	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1787	1599	1615	1698	1713	1553	1752	4907		1787	4990	
Volume (vph)	122	181	177	293	248	171	188	1204	69	245	1696	137
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	127	189	184	305	258	178	196	1254	72	255	1767	143
RTOR Reduction (vph)	0	0	159	0	0	146	0	5	0	0	7	0
Lane Group Flow (vph)	127	189	25	280	283	32	196	1321	0	255	1903	0
Heavy Vehicles (%)	1%	1%	0%	1%	0%	4%	3%	5%	2%	1%	3%	0%
Turn Type	Split		Perm	Split		Perm	Prot			Prot		
Protected Phases	7	7		8	8		5	2		1	6	
Permitted Phases			7			8						
Actuated Green, G (s)	15.5	15.5	15.5	20.7	20.7	20.7	14.5	44.2		19.6	49.3	
Effective Green, g (s)	16.5	16.5	16.5	21.7	21.7	21.7	15.0	45.7		20.1	50.8	
Actuated g/C Ratio	0.14	0.14	0.14	0.18	0.18	0.18	0.12	0.38		0.17	0.42	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	4.5	5.5		4.5	5.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	246	220	222	307	310	281	219	1869		299	2112	
v/s Ratio Prot	0.07	c0.12		0.16	c0.17		c0.11	0.27		0.14	c0.38	
v/s Ratio Perm			0.02			0.02						
v/c Ratio	0.52	0.86	0.11	0.91	0.91	0.11	0.89	0.71		0.85	0.90	
Uniform Delay, d1	48.0	50.6	45.3	48.2	48.2	41.1	51.7	31.5		48.5	32.3	
Progression Factor	1.00	1.00	1.00	0.78	0.78	1.12	1.00	1.00		0.90	1.72	
Incremental Delay, d2	1.8	26.7	0.2	19.2	19.2	0.1	33.7	2.3		9.8	3.1	
Delay (s)	49.9	77.3	45.6	57.1	57.0	46.1	85.4	33.8		53.3	58.4	
Level of Service	D	E	D	E	E	D	F	C		D	E	
Approach Delay (s)	58.7				54.4			40.4			57.8	
Approach LOS	E				D			D			E	

Intersection Summary			
HCM Average Control Delay	52.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	81.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCS+™ DETAILED REPORT

General Information		Site Information	
Analyst	GAJ	Intersection	Hwy 99W/Edy Rd
Agency or Co.	Lancaster Engineering	Area Type	All other areas
Dale Performed	6/22/2007	Jurisdiction	ODOT
Time Period	PM Peak Hour	Analysis Year	EX Cond
		Project ID	07038 - Pfeifer Zone Change

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N_1	1	3	0	1	3	0	1	1	1	1	1	1
Lane Group	L	TR		L	TR		L	LT	R	L	T	R
Volume, V (vph)	188	1204	69	245	1696	137	293	248	171	122	181	177
% Heavy Vehicles, %HV	3	5	2	1	3	0	1	1	4	1	1	0
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, l_1	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green, e	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Arrival Type, AT	3	3		3	3		3	3	3	3	3	3
Unit Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Filtering/Metering, I	1.000	1.000		1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Initial Unmet Demand, Q_b	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N_m												
Buses Stopping, N_B	0	0		0	0		0	0	0	0	0	0
Min. Time for Pedestrians, G_p	3.2			3.2			3.2			3.2		

Phasing	WB Only	Thru & RT	EB Only	04	SB Only	NB Only	07	08
Timing	G = 20.5	G = 23.5	G = 13.5	G =	G = 16.0	G = 21.0	G =	G =
	Y = 4.5	Y = 5.5	Y = 5.5	Y =	Y = 5	Y = 5	Y =	Y =
Duration of Analysis, T = 0.25						Cycle Length, C = 120.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	196	1326		255	1910		305	258	178	127	189	184
Lane Group Capacity, c	197	1734		305	2012		313	329	272	238	251	215
v/c Ratio, X	0.99	0.76		0.84	0.95		0.97	0.78	0.65	0.53	0.75	0.86
Total Green Ratio, g/C	0.11	0.35		0.17	0.40		0.17	0.17	0.17	0.13	0.13	0.13
Uniform Delay, d_1	53.2	34.3		48.1	34.6		49.2	47.3	46.1	48.5	50.1	50.9
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Delay Calibration, k	0.50	0.32		0.37	0.46		0.48	0.33	0.23	0.14	0.31	0.39
Incremental Delay, d_2	62.6	2.1		18.0	10.5		43.8	11.8	5.6	2.3	12.1	27.2
Initial Queue Delay, d_3	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay	115.8	36.4		66.1	45.1		93.0	59.1	51.7	50.9	62.2	78.0
Lane Group LOS	F	D		E	D		F	E	D	D	E	E
Approach Delay	46.6			47.6			71.3			65.1		
Approach LOS	D			D			E			E		
Intersection Delay	52.6			X_c = 0.95			Intersection LOS			D		

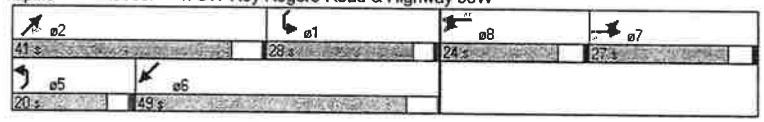
 HCS+™ Version 5.21 Generated: 10/11/2007 8:40 AM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.91	1.00	1.00	0.91	0.91
Frt			0.850			0.850			0.850		0.988	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	5024	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	5024	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			153			117			202		13	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1110			2115			1840			1741	
Travel Time (s)		25.2			48.1			41.8			39.6	
Volume (vph)	122	338	141	290	304	108	228	843	186	256	1606	137
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	17%	6%	5%	4%	4%	5%	3%	6%	9%	6%	2%	2%
Adj. Flow (vph)	133	367	153	315	330	117	248	916	202	278	1746	149
Lane Group Flow (vph)	133	367	153	315	330	117	248	916	202	278	1895	0
Turn Type	Split		Perm	Split		Perm	Prot		Perm	Prot		
Protected Phases	7	7		8	8		5	2		1	6	
Permitted Phases		7	7			8			2			
Detector Phases	7	7	7	8	8	8	5	2	2	1	6	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	8.5	21.5	21.5	8.5	21.5	
Total Split (s)	27.0	27.0	27.0	24.0	24.0	24.0	20.0	41.0	41.0	28.0	49.0	0.0
Total Split (%)	22.5%	22.5%	22.5%	20.0%	20.0%	20.0%	16.7%	34.2%	34.2%	23.3%	40.8%	0.0%
Maximum Green (s)	22.0	22.0	22.0	19.0	19.0	19.0	15.5	35.5	35.5	23.5	43.5	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.5	5.0	5.0	3.5	5.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5	0.5	1.0	0.5	
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lead	Lead	Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0	0		0	
Act Effct Green (s)	23.0	23.0	23.0	20.0	20.0	20.0	16.0	37.0	37.0	24.0	45.0	
Actuated g/C Ratio	0.19	0.19	0.19	0.17	0.17	0.17	0.13	0.31	0.31	0.20	0.38	
v/c Ratio	0.45	1.07	0.37	0.56	1.08	0.33	1.06	0.61	0.34	0.82	1.00	
Control Delay	27.5	83.9	7.3	50.4	122.3	10.5	107.2	39.2	19.2	65.6	58.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	27.5	83.9	7.3	50.4	122.3	10.5	107.2	39.2	19.2	65.6	58.5	
LOS	C	F	A	D	F	B	F	D	B	E	E	
Approach Delay		54.5			75.4			48.6			59.4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS		D			E			D			E	

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 112 (93%), Referenced to phase 2:NET and 6:SWT, Start of Green	
Natural Cycle: 120	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.08	
Intersection Signal Delay: 58.2	Intersection LOS: E
Intersection Capacity Utilization 86.1%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 4: SW Roy Rogers Road & Highway 99W



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.91	1.00	1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	5025	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	5025	
Volume (vph)	122	338	141	290	304	108	228	843	186	256	1606	137
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	133	367	153	315	330	117	248	916	202	278	1746	149
RTOR Reduction (vph)	0	0	124	0	0	98	0	0	140	0	8	0
Lane Group Flow (vph)	133	367	29	315	330	20	248	916	62	278	1887	0
Heavy Vehicles (%)	17%	6%	5%	4%	4%	5%	3%	6%	9%	6%	2%	2%
Turn Type	Split		Perm	Split		Perm	Prot		Perm	Prot		
Protected Phases	7	7		8	8		5	2		1	6	
Permitted Phases		7	7			8			2			
Actuated Green, G (s)	22.0	22.0	22.0	19.0	19.0	19.0	15.5	35.5	35.5	23.5	43.5	
Effective Green, g (s)	23.0	23.0	23.0	20.0	20.0	20.0	16.0	37.0	37.0	24.0	45.0	
Actuated g/C Ratio	0.19	0.19	0.19	0.17	0.17	0.17	0.13	0.31	0.31	0.20	0.38	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	4.5	5.5	5.5	4.5	5.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	296	343	295	561	305	256	234	1509	457	341	1884	
v/s Ratio Prot	0.09	c0.20		0.09	c0.18		c0.14	0.19		0.16	c0.38	
v/s Ratio Perm			0.02			0.01			0.04			
v/c Ratio	0.45	1.07	0.10	0.56	1.08	0.08	1.06	0.61	0.14	0.82	1.00	
Uniform Delay, d1	42.9	48.5	40.0	46.0	50.0	42.2	52.0	35.3	30.0	45.9	37.5	
Progression Factor	0.58	0.62	0.94	1.00	1.00	1.00	0.75	1.06	4.22	1.00	1.00	
Incremental Delay, d2	0.5	52.3	0.1	1.3	75.1	0.1	67.5	1.4	0.5	13.9	21.1	
Delay (s)	25.4	82.2	37.5	47.3	125.1	42.3	106.7	38.9	127.0	59.8	58.6	
Level of Service	C	F	D	D	F	D	F	D	F	E	E	
Approach Delay (s)		60.2			80.2			64.3			58.7	
Approach LOS		E			F			E			E	

Intersection Summary

HCM Average Control Delay	63.8	HCM Level of Service	E
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	86.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.978			0.946			0.982			0.995	
Flt Protected		0.998			0.992			0.998			0.993	
Satd. Flow (prot)	0	1742	0	0	1769	0	0	1817	0	0	1847	0
Flt Permitted		0.998			0.992			0.998			0.993	
Satd. Flow (perm)	0	1742	0	0	1769	0	0	1817	0	0	1847	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1754			4157			1233			1513	
Travel Time (s)		39.9			94.5			28.0			34.4	
Volume (vph)	2	39	8	22	58	54	8	167	27	56	306	14
Confl. Peds. (#/hr)			1	1								
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	50%	3%	13%	0%	0%	2%	0%	3%	0%	0%	2%	0%
Adj. Flow (vph)	2	40	8	23	60	56	8	172	28	58	315	14
Lane Group Flow (vph)	0	50	0	0	139	0	0	208	0	0	387	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 55.2% ICU Level of Service B
Analysis Period (min) 15

ALL-WAY STOP CONTROL ANALYSIS

General Information		Site Information	
Analyst	GAJ	Intersection	Edy Rd/Elwert Rd
Agency/Co.	Lancaster Engineering	Jurisdiction	Sherwood
Date Performed	6/13/2007	Analysis Year	EX Cond
Analysis Time Period	PM Peak Hour		

Project ID 07038 - Pfeifer Zone Change

East/West Street: SW Edy Road | North/South Street: SW Elwert Road

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	2	39	8	22	58	54
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	8	167	27	56	306	14
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.97		0.97		0.97		0.97	
Flow Rate (veh/h)	50		136		207		386	
% Heavy Vehicles	6		1		2		1	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

	Eastbound L1	Eastbound L2	Westbound L1	Westbound L2	Northbound L1	Northbound L2	Southbound L1	Southbound L2
Prop. Left-Turns	0.0		0.2		0.0		0.1	
Prop. Right-Turns	0.2		0.4		0.1		0.0	
Prop. Heavy Vehicle	0.1		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.0		-0.2		-0.0		0.0	

Departure Headway and Service Time

	Eastbound L1	Eastbound L2	Westbound L1	Westbound L2	Northbound L1	Northbound L2	Southbound L1	Southbound L2
hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.04		0.12		0.18		0.34	
hd, final value (s)	5.60		5.24		4.87		4.72	
x, final value	0.08		0.20		0.28		0.51	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	3.6		3.2		2.9		2.7	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	300		386		457		636	
Delay (s/veh)	9.08		9.52		9.76		12.45	
LOS	A		A		A		B	
Approach: Delay (s/veh)	9.08		9.52		9.76		12.45	
LOS	A		A		A		B	
Intersection Delay (s/veh)	11.01							
Intersection LOS	B							

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.915			0.876			0.852	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1881	0	1805	1721	0	1805	1664	0	1787	1587	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	1881	0	1805	1721	0	1805	1664	0	1787	1587	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		552			445			264			1271	
Travel Time (s)		12.5			10.1			6.0			28.9	
Volume (vph)	52	176	0	23	241	315	2	7	32	294	1	86
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	2%	1%	0%	0%	1%	1%	0%	0%	0%	1%	0%	2%
Adj. Flow (vph)	55	185	0	24	254	332	2	7	34	309	1	91
Lane Group Flow (vph)	55	185	0	24	586	0	2	41	0	309	92	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 68.3% ICU Level of Service C
Analysis Period (min) 15

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	GAJ	Intersection	Edy Rd/Borchers Dr
Agency/Co.	Lancaster Engineering	Jurisdiction	Sherwood
Date Performed	6/13/2007	Analysis Year	EX Cond
Analysis Time Period	PM Peak Hour		

Project Description 07038 - Pfeifer Zone Change	
East/West Street: SW Edy Road	North/South Street: SW Borchers Drive
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	52	176	0	23	241	315
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR (veh/h)	54	185	0	24	253	331
Percent Heavy Vehicles	2	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal		0			1	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	2	7	32	294	1	86
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR (veh/h)	2	7	33	309	1	90
Percent Heavy Vehicles	0	0	0	1	0	2
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L	L		TR	L		TR
v (veh/h)	54	24	2		40	309		91
C (m) (veh/h)	963	1397	262		595	298		721
v/c	0.06	0.02	0.01		0.07	1.04		0.13
95% queue length	0.18	0.05	0.02		0.22	11.47		0.43
Control Delay (s/veh)	9.0	7.6	18.8		11.5	100.9		10.7
LOS	A	A	C		B	F		B
Approach Delay (s/veh)	--	--	11.8			80.4		
Approach LOS	--	--	B			F		

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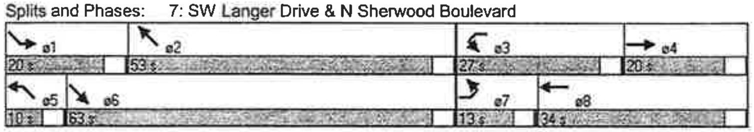
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.904			0.875			0.994			0.935	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1787	1705	0	1752	1630	0	1805	1889	0	1736	1691	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1787	1705	0	1752	1630	0	1805	1889	0	1736	1691	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		61			197			2			39	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		194			1023			539			367	
Travel Time (s)		4.4			23.3			12.3			8.3	
Volume (vph)	83	41	73	275	58	288	100	315	12	34	337	260
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	2%	0%	3%	2%	2%	0%	0%	0%	4%	9%	0%
Adj. Flow (vph)	88	44	78	293	62	306	106	335	13	36	359	277
Lane Group Flow (vph)	88	122	0	293	368	0	106	348	0	36	636	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases												
Detector Phases	7	4		3	8		1	6		5	2	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	8.0	20.0		20.0	20.0		20.0	20.0		8.0	20.0	
Total Split (s)	13.0	20.0	0.0	27.0	34.0	0.0	20.0	63.0	0.0	10.0	53.0	0.0
Total Split (%)	10.8%	16.7%	0.0%	22.5%	28.3%	0.0%	16.7%	52.5%	0.0%	8.3%	44.2%	0.0%
Maximum Green (s)	9.0	16.0		23.0	30.0		16.0	59.0		6.0	49.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	C-Max		None	C-Max	
Walk Time (s)		5.0		5.0	5.0		5.0	5.0			5.0	
Flash Dont Walk (s)		11.0		11.0	11.0		11.0	11.0			11.0	
Pedestrian Calls (#/hr)		0		0	0		0	0			0	
Act Effct Green (s)	8.6	10.1		22.1	23.6		22.7	68.7		7.0	49.0	
Actuated g/C Ratio	0.07	0.08		0.18	0.20		0.19	0.57		0.06	0.41	
v/c Ratio	0.68	0.61		0.91	0.77		0.31	0.32		0.36	0.89	
Control Delay	80.5	40.1		79.2	31.5		50.2	16.8		64.2	47.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	80.5	40.1		79.2	31.5		50.2	16.8		64.2	47.4	
LOS	F	D		E	C		D	B		E	D	
Approach Delay		57.0			52.6			24.6			48.3	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Approach LOS		E			D			C			D	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.91
Intersection Signal Delay: 45.3 Intersection LOS: D
Intersection Capacity Utilization 77.9% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 7: SW Langer Drive & N Sherwood Boulevard



Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.90		1.00	0.88		1.00	0.99		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	1705		1752	1630		1805	1889		1736	1690	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1787	1705		1752	1630		1805	1889		1736	1690	
Volume (vph)	83	41	73	275	58	288	100	315	12	34	337	260
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	88	44	78	293	62	306	106	335	13	36	359	277
RTOR Reduction (vph)	0	56	0	0	158	0	0	1	0	0	23	0
Lane Group Flow (vph)	88	66	0	293	210	0	106	347	0	36	613	0
Heavy Vehicles (%)	1%	2%	0%	3%	2%	2%	0%	0%	0%	4%	9%	0%
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases												
Actuated Green, G (s)	8.6	10.1		22.1	23.6		22.7	67.2		4.6	49.1	
Effective Green, g (s)	8.6	10.1		22.1	23.6		22.7	67.2		4.6	49.1	
Actuated g/C Ratio	0.07	0.08		0.18	0.20		0.19	0.56		0.04	0.41	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	128	144		323	321		341	1058		67	691	
v/s Ratio Prot	0.05	0.04		c0.17	c0.13		c0.06	0.18		c0.02	c0.36	
v/s Ratio Perm												
v/c Ratio	0.69	0.46		0.91	0.65		0.31	0.33		0.54	0.89	
Uniform Delay, d1	54.4	52.3		47.9	44.4		41.9	14.2		56.7	32.9	
Progression Factor	1.00	1.00		1.00	1.00		1.10	1.05		1.00	1.00	
Incremental Delay, d2	14.3	2.3		27.6	4.7		1.2	0.4		8.1	15.6	
Delay (s)	68.7	54.7		75.5	49.2		47.3	15.4		64.7	48.5	
Level of Service	E	D		E	D		D	B		E	D	
Approach Delay (s)		60.5			60.8			22.9			49.4	
Approach LOS		E			E			C			D	

Intersection Summary

HCM Average Control Delay	48.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	77.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.920			0.933			0.991			0.983	
Flt Protected		0.989			0.980		0.950			0.950		
Satd. Flow (prot)	0	1709	0	0	1729	0	1805	1848	0	1805	1835	0
Flt Permitted		0.989			0.980		0.950			0.950		
Satd. Flow (perm)	0	1709	0	0	1729	0	1805	1848	0	1805	1835	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		947			1090			367			1964	
Travel Time (s)		21.5			24.8			8.3			44.6	
Volume (vph)	22	17	57	61	16	76	52	589	38	25	547	71
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	2%	0%	0%	1%	0%	2%	0%	0%	2%	0%
Adj. Flow (vph)	23	18	59	64	17	79	54	614	40	26	570	74
Lane Group Flow (vph)	0	100	0	0	160	0	54	654	0	26	644	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 61.9% ICU Level of Service B
Analysis Period (min) 15

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	GAJ	Intersection	Century Dr/Sherwood Blvd
Agency/Co.	Lancaster Engineering	Jurisdiction	Sherwood
Date Performed	6/13/2007	Analysis Year	EX Cond
Analysis Time Period	PM Peak Hour		
Project Description 07038 - Pfeifer Zone Change			
East/West Street: SW Century Drive		North/South Street: SW Sherwood Boulevard	
Intersection Orientation: North-South		Study Period (hrs): 0.25	

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	25	547	71	52	589	38
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR (veh/h)	26	569	73	54	613	39
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal		0			1	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	22	17	57	61	16	76
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR (veh/h)	22	17	59	63	16	79
Percent Heavy Vehicles	0	0	2	0	0	1
Percent Grade (%)	0			0		
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L		LTR			LTR	
v (veh/h)	26	54		158			98	
C (m) (veh/h)	877	946		115			139	
v/c	0.03	0.06		1.37			0.71	
95% queue length	0.09	0.18		10.84			4.02	
Control Delay (s/veh)	9.2	9.0		283.0			76.9	
LOS	A	A		F			F	
Approach Delay (s/veh)	--	--	283.0			76.9		
Approach LOS	--	--	F			F		

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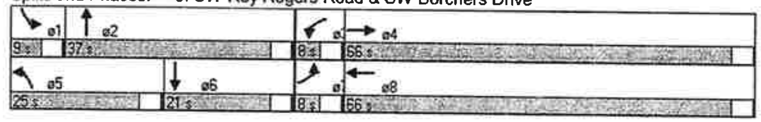
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.966			0.995			0.889			0.982	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1597	1681	0	1703	1837	0	1770	1689	0	1703	1866	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1597	1681	0	1703	1837	0	1770	1689	0	1703	1866	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		18			2			26			5	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2043			1110			1271			856	
Travel Time (s)		46.4			25.2			28.9			19.5	
Volume (vph)	8	587	171	19	784	25	248	8	24	19	34	5
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	13%	11%	3%	6%	3%	0%	2%	0%	0%	6%	0%	0%
Adj. Flow (vph)	9	645	188	21	862	27	273	9	26	21	37	5
Lane Group Flow (vph)	9	833	0	21	889	0	273	35	0	21	42	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Detector Phases	7	4		3	8		5	2		1	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	8.0	20.0		8.0	20.0		8.0	20.0		8.0	20.0	
Total Split (s)	8.0	66.0	0.0	8.0	66.0	0.0	25.0	37.0	0.0	9.0	21.0	0.0
Total Split (%)	6.7%	55.0%	0.0%	6.7%	55.0%	0.0%	20.8%	30.8%	0.0%	7.5%	17.5%	0.0%
Maximum Green (s)	4.0	62.0		4.0	62.0		21.0	33.0		5.0	17.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.6		0.5	0.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Walk Time (s)		5.0			5.0			5.0			5.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	4.0	62.3		4.0	63.9		20.3	42.9		5.3	22.2	
Actuated g/C Ratio	0.03	0.52		0.03	0.53		0.17	0.36		0.04	0.18	
v/c Ratio	0.17	0.94		0.37	0.91		0.91	0.06		0.28	0.12	
Control Delay	63.8	46.7		69.5	42.6		73.8	19.8		65.5	41.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	63.8	46.7		69.5	42.6		73.8	19.8		65.5	41.8	
LOS	E	D		E	D		E	B		E	D	
Approach Delay		46.8			43.2			67.7			49.7	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		D			D			E			D	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 98 (82%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 48.4 Intersection LOS: D
Intersection Capacity Utilization 69.9% ICU Level of Service C
Analysis Period (min) 15

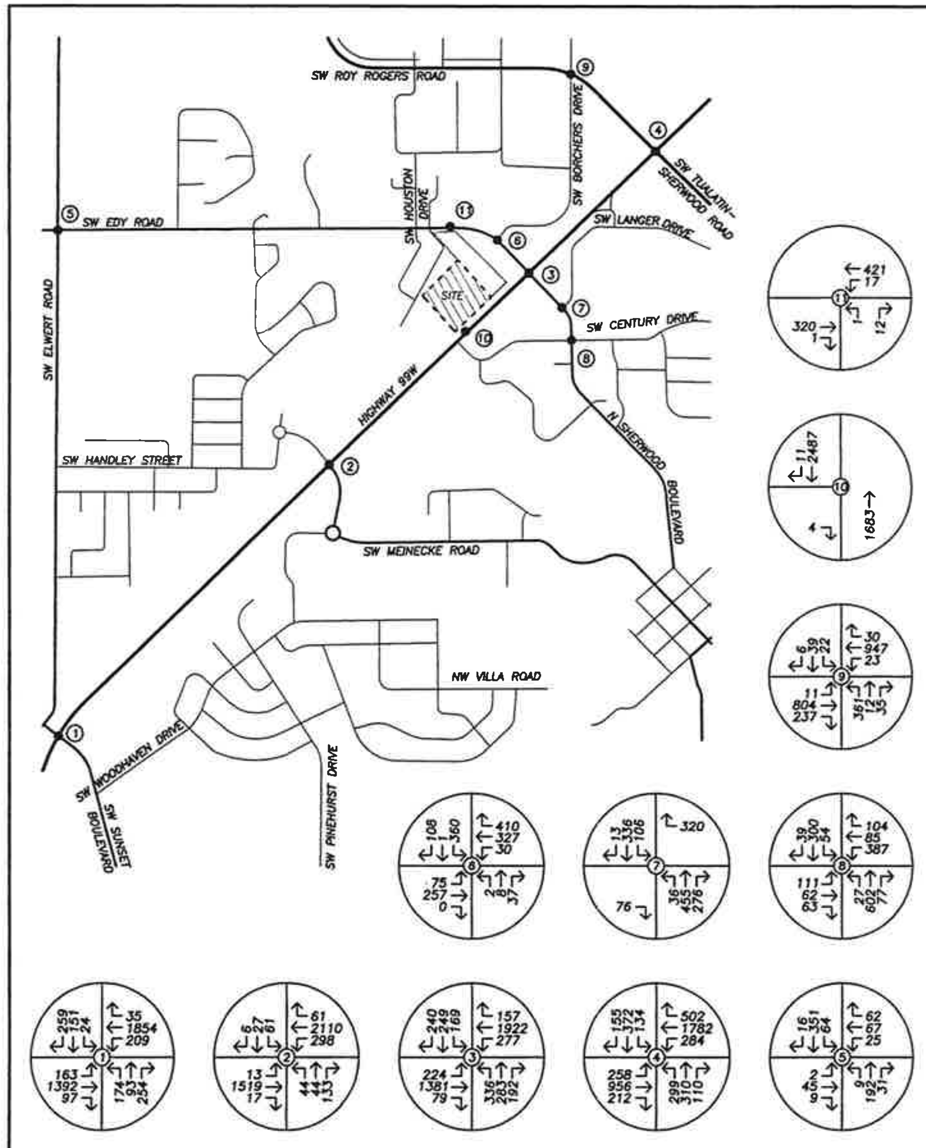
Splits and Phases: 9: SW Roy Rogers Road & SW Borchers Drive



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.89		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1597	1681		1703	1838		1770	1688		1703	1866	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1597	1681		1703	1838		1770	1688		1703	1866	
Volume (vph)	8	587	171	19	784	25	248	8	24	19	34	5
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	9	645	188	21	862	27	273	9	26	21	37	5
RTOR Reduction (vph)	0	9	0	0	1	0	0	18	0	0	4	0
Lane Group Flow (vph)	9	824	0	21	888	0	273	17	0	21	38	0
Heavy Vehicles (%)	13%	11%	3%	6%	3%	0%	2%	0%	0%	6%	0%	0%
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	0.8	63.1		1.6	63.9		20.3	37.3		2.0	19.0	
Effective Green, g (s)	0.8	63.1		1.6	63.9		20.3	37.3		2.0	19.0	
Actuated g/C Ratio	0.01	0.53		0.01	0.53		0.17	0.31		0.02	0.16	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	11	884		23	979		299	525		28	295	
v/s Ratio Prot	0.01	c0.49		c0.01	0.48		c0.15	0.01		0.01	c0.02	
v/s Ratio Perm												
v/c Ratio	0.82	0.93		0.91	0.91		0.91	0.03		0.75	0.13	
Uniform Delay, d1	59.5	26.5		59.1	25.4		49.0	28.8		58.8	43.4	
Progression Factor	1.00	1.00		1.05	1.39		0.99	1.32		1.00	1.00	
Incremental Delay, d2	167.9	16.3		100.0	6.6		22.3	0.1		71.8	0.9	
Delay (s)	227.4	42.8		162.4	41.9		70.8	38.0		130.6	44.3	
Level of Service	F	D		F	D		E	D		F	D	
Approach Delay (s)		44.7			44.7			67.1			73.0	
Approach LOS		D			D			E			E	

Intersection Summary			
HCM Average Control Delay	48.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	69.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



TRAFFIC VOLUMES
15-year Background Traffic Conditions
PM Peak Hour

FIGURE 5

PAGE 17

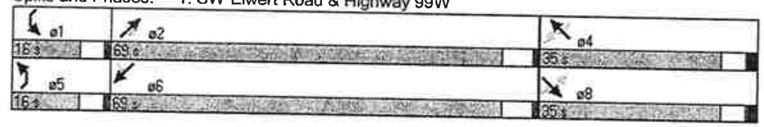
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.993			0.968		0.950			0.950		
Satd. Flow (prot)	0	1871	1583	0	1809	1583	1736	3406	1599	3467	3505	1509
Flt Permitted		0.848			0.562		0.950			0.950		
Satd. Flow (perm)	0	1597	1583	0	1050	1583	1736	3406	1599	3467	3505	1509
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			169			187			95			26
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		3096			2452			1095			4015	
Travel Time (s)		70.4			55.7			24.9			91.3	
Volume (vph)	24	151	259	174	93	254	163	1392	97	209	1854	35
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	1%	2%	2%	1%	2%	4%	6%	1%	1%	3%	7%
Adj. Flow (vph)	25	157	270	181	97	265	170	1450	101	218	1931	36
Lane Group Flow (vph)	0	182	270	0	278	265	170	1450	101	218	1931	36
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		8			4		5	2		1	6	
Permitted Phases	8		8	4		4			2			6
Detector Phases	8	8	8	4	4	4	5	2	2	1	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	9.0	22.0	22.0	9.0	22.0	22.0
Total Split (s)	35.0	35.0	35.0	35.0	35.0	35.0	16.0	69.0	69.0	16.0	69.0	69.0
Total Split (%)	29.2%	29.2%	29.2%	29.2%	29.2%	29.2%	13.3%	57.5%	57.5%	13.3%	57.5%	57.5%
Maximum Green (s)	29.0	29.0	29.0	29.0	29.0	29.0	11.0	63.0	63.0	11.0	63.0	63.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	5.0	4.0	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	Max	Max	Max	Max	Max	Max	None	Max	Max	None	Max	Max
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0	0		0	0
Act Effct Green (s)		31.0	31.0		31.0	31.0	12.0	65.4	65.4	11.6	65.0	65.0
Actuated g/C Ratio		0.26	0.26		0.26	0.26	0.10	0.54	0.54	0.10	0.54	0.54
v/c Ratio		0.44	0.51		1.03	0.48	0.98	0.78	0.11	0.65	1.02	0.04
Control Delay		41.3	17.7		105.9	14.8	116.8	25.6	3.3	61.7	52.8	6.3
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		41.3	17.7		105.9	14.8	116.8	25.6	3.3	61.7	52.8	6.3
LOS		D	B		F	B	F	C	A	E	D	A
Approach Delay		27.2			61.5			33.3			52.9	

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS		C			E			C			D	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.03
Intersection Signal Delay: 44.6 Intersection LOS: D
Intersection Capacity Utilization 97.4% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 1: SW Elwert Road & Highway 99W



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.99	1.00		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1871	1583		1810	1583	1736	3406	1599	3467	3505	1509
Flt Permitted		0.85	1.00		0.56	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1597	1583		1051	1583	1736	3406	1599	3467	3505	1509
Volume (vph)	24	151	259	174	93	254	163	1392	97	209	1854	35
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	25	157	270	181	97	265	170	1450	101	218	1931	36
RTOR Reduction (vph)	0	0	125	0	0	139	0	0	43	0	0	12
Lane Group Flow (vph)	0	182	145	0	278	126	170	1450	58	218	1931	24
Heavy Vehicles (%)	0%	1%	2%	2%	1%	2%	4%	6%	1%	1%	3%	7%
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		8			4		5	2		1	6	
Permitted Phases	8		8	4		4			2			6
Actuated Green, G (s)		29.0	29.0		29.0	29.0	11.0	63.4	63.4	10.6	63.0	63.0
Effective Green, g (s)		31.0	31.0		31.0	31.0	12.0	65.4	65.4	11.6	65.0	65.0
Actuated g/C Ratio		0.26	0.26		0.26	0.26	0.10	0.55	0.55	0.10	0.54	0.54
Clearance Time (s)		6.0	6.0		6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		413	409		272	409	174	1856	871	335	1899	817
v/s Ratio Prot							c0.10	0.43		0.06	c0.55	
v/s Ratio Perm		0.11	0.09		c0.26	0.08			0.04			0.02
v/c Ratio		0.44	0.35		1.02	0.31	0.98	0.78	0.07	0.65	1.02	0.03
Uniform Delay, d1		37.2	36.3		44.5	35.9	53.9	21.6	12.9	52.2	27.5	12.8
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		3.4	2.4		60.4	2.0	60.8	3.3	0.1	4.5	25.0	0.1
Delay (s)		40.6	38.7		104.9	37.8	114.7	25.0	13.0	56.7	52.5	12.9
Level of Service		D	D		F	D	F	C	B	E	D	B
Approach Delay (s)		39.5			72.1			33.1			52.2	
Approach LOS		D			E			C			D	

Intersection Summary			
HCM Average Control Delay	46.6	HCM Level of Service	D
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	97.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	1792	1615	1752	1900	1615	1805	3471	1615	1787	3505	1615
Flt Permitted	0.726			0.738			0.950			0.950		
Satd. Flow (perm)	1379	1792	1615	1361	1900	1615	1805	3471	1615	1787	3505	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			6			141			7			18
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1172			2933			4015			1905	
Travel Time (s)		26.6			66.7			91.3			43.3	
Volume (vph)	61	27	6	44	44	133	13	1519	17	298	2110	61
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	6%	0%	3%	0%	0%	0%	4%	0%	1%	3%	0%
Adj. Flow (vph)	65	29	6	47	47	141	14	1616	18	317	2245	65
Lane Group Flow (vph)	65	29	6	47	47	141	14	1616	18	317	2245	65
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		8			4		5	2		1	6	
Permitted Phases	8		Free	4	4	Free			Free			Free
Detector Phases	8	8		4	4		5	2		1	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0		22.0	22.0		8.5	22.0		8.5	22.0	
Total Split (s)	22.0	22.0	0.0	22.0	22.0	0.0	8.5	64.6	0.0	33.4	89.5	0.0
Total Split (%)	18.3%	18.3%	0.0%	18.3%	18.3%	0.0%	7.1%	53.8%	0.0%	27.8%	74.6%	0.0%
Maximum Green (s)	16.0	16.0		16.0	16.0		4.0	58.6		28.9	83.5	
Yellow Time (s)	4.0	4.0		4.0	4.0		3.5	5.0		3.5	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	1.0		1.0	1.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	None		None	None	
Walk Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0			11.0			11.0	
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effct Green (s)	12.6	12.6	95.3	12.6	12.6	95.3	5.1	51.7	95.3	21.7	77.4	95.3
Actuated g/C Ratio	0.13	0.13	1.00	0.13	0.13	1.00	0.05	0.54	1.00	0.23	0.81	1.00
v/c Ratio	0.36	0.12	0.00	0.27	0.19	0.09	0.15	0.86	0.01	0.78	0.79	0.04
Control Delay	51.5	45.5	0.0	49.0	46.3	0.1	59.1	27.0	0.0	52.4	11.4	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.5	45.5	0.0	49.0	46.3	0.1	59.1	27.0	0.0	52.4	11.4	0.0
LOS	D	D	A	D	D	A	E	C	A	D	B	A
Approach Delay		46.7			19.1			27.0			16.1	

Lanes, Volumes, Timings
2: SW Meinecke Road & Highway 99W

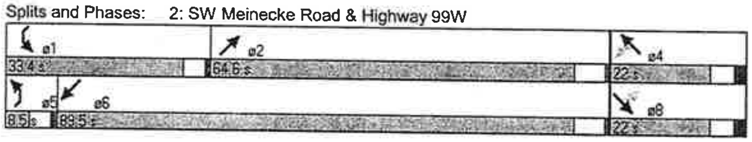
10/10/2007

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS		D			B			C			B	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 95.3
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 20.8 — Intersection LOS: C
Intersection Capacity Utilization 81.7% — ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 2: SW Meinecke Road & Highway 99W



HCM Signalized Intersection Capacity Analysis
2: SW Meinecke Road & Highway 99W

10/10/2007

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1792	1615	1752	1900	1615	1805	3471	1615	1787	3505	1615
Flt Permitted	0.73	1.00	1.00	0.74	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1380	1792	1615	1362	1900	1615	1805	3471	1615	1787	3505	1615
Volume (vph)	61	27	6	44	44	133	13	1519	17	298	2110	61
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	65	29	6	47	47	141	14	1616	18	317	2245	65
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	65	29	6	47	47	141	14	1616	18	317	2245	65
Heavy Vehicles (%)	0%	6%	0%	3%	0%	0%	0%	4%	0%	1%	3%	0%
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		8			4		5	2		1	6	
Permitted Phases	8		Free	4	4	Free			Free			Free
Actuated Green, G (s)	8.1	8.1	98.9	8.1	8.1	98.9	1.3	53.2	98.9	21.1	73.0	98.9
Effective Green, g (s)	10.1	10.1	98.9	10.1	10.1	98.9	1.8	55.2	98.9	21.6	75.0	98.9
Actuated g/C Ratio	0.10	0.10	1.00	0.10	0.10	1.00	0.02	0.56	1.00	0.22	0.76	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0		4.5	6.0		4.5	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	141	183	1615	139	194	1615	33	1937	1615	390	2658	1615
v/s Ratio Prot		0.02			0.02		0.01	0.47		c0.18	c0.64	
v/s Ratio Perm	c0.05		0.00	0.03		0.09			0.01			0.04
v/c Ratio	0.46	0.16	0.00	0.34	0.24	0.09	0.42	0.83	0.01	0.81	0.84	0.04
Uniform Delay, d1	41.8	40.5	0.0	41.3	40.9	0.0	48.0	18.1	0.0	36.7	8.0	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.4	0.4	0.0	1.4	0.7	0.1	8.6	3.3	0.0	12.2	2.6	0.0
Delay (s)	44.2	40.9	0.0	42.7	41.5	0.1	56.6	21.3	0.0	48.9	10.7	0.0
Level of Service	D	D	A	D	D	A	E	C	A	D	B	A
Approach Delay (s)		40.6			16.9			21.4			15.0	
Approach LOS		D			B			C			B	

Intersection Summary			
HCM Average Control Delay	18.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	98.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

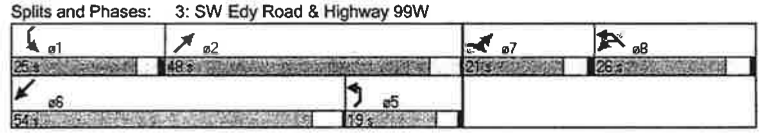
Lane Group	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	
Turning Speed (mph)	15	9	9	15	15	9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Frt		0.850	0.850			0.850		0.992			0.989	
Flt Protected	0.950			0.950	0.950		0.950			0.950		
Satd. Flow (prot)	1787	1599	1615	1698	1713	1553	1752	4908	0	1787	4992	0
Flt Permitted	0.950			0.950	0.950		0.950			0.950		
Satd. Flow (perm)	1787	1599	1615	1698	1713	1553	1752	4908	0	1787	4992	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			211			200		8			13	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)	30				30			30			30	
Link Distance (ft)	445				539			1905			1840	
Travel Time (s)	10.1				12.3			43.3			41.8	
Volume (vph)	169	249	240	336	283	192	224	1381	79	277	1922	157
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	1%	1%	0%	1%	0%	4%	3%	5%	2%	1%	3%	0%
Adj. Flow (vph)	176	259	250	350	295	200	233	1439	82	289	2002	164
Lane Group Flow (vph)	176	259	250	321	324	200	233	1521	0	289	2166	0
Turn Type	Split		Perm	Split		Perm	Prot			Prot		
Protected Phases	7	7		8	8		5	2		1	6	
Permitted Phases			7			8						
Detector Phases	7	7	7	8	8	8	5	2		1	6	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	8.5	21.5		8.5	21.5	
Total Split (s)	21.0	21.0	21.0	26.0	26.0	26.0	19.0	48.0	0.0	25.0	54.0	0.0
Total Split (%)	17.5%	17.5%	17.5%	21.7%	21.7%	21.7%	15.8%	40.0%	0.0%	20.8%	45.0%	0.0%
Maximum Green (s)	16.0	16.0	16.0	21.0	21.0	21.0	14.5	42.5		20.5	48.5	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.5	5.0		3.5	5.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5		1.0	0.5	
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0			5.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0		11.0			11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0			0	
Act Effct Green (s)	17.0	17.0	17.0	22.0	22.0	22.0	15.0	44.1		20.9	50.0	
Actuated g/C Ratio	0.14	0.14	0.14	0.18	0.18	0.18	0.12	0.37		0.17	0.42	
v/c Ratio	0.70	1.14	0.61	1.03	1.03	0.45	1.06	0.84		0.93	1.04	
Control Delay	50.9	137.4	15.1	107.7	107.4	9.2	128.8	39.8		51.4	72.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	10.7	0.0		0.0	0.0	
Total Delay	50.9	137.4	15.1	107.7	107.4	9.2	139.4	39.8		51.4	72.9	
LOS	D	F	B	F	F	A	F	D		D	E	
Approach Delay	70.5				84.3			53.1			70.4	

Lane Group	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS	E				F			D			E	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 2 (2%), Referenced to phase 2:NET and 6:SWT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.14
Intersection Signal Delay: 67.2 Intersection LOS: E
Intersection Capacity Utilization 92.9% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 3: SW Edy Road & Highway 99W



HCM Signalized Intersection Capacity Analysis
3: SW Edy Road & Highway 99W

10/10/2007

Movement	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↱	↱	↰	↰	↱	↰	↑↑↑↱		↰	↑↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	0.85	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	1599	1615	1698	1713	1553	1752	4908		1787	4990	
Flt Permitted	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1787	1599	1615	1698	1713	1553	1752	4908		1787	4990	
Volume (vph)	169	249	240	336	283	192	224	1381	79	277	1922	157
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	176	259	250	350	295	200	233	1439	82	289	2002	164
RTOR Reduction (vph)	0	0	181	0	0	163	0	5	0	0	8	0
Lane Group Flow (vph)	176	259	69	321	324	37	233	1516	0	289	2158	0
Heavy Vehicles (%)	1%	1%	0%	1%	0%	4%	3%	5%	2%	1%	3%	0%
Turn Type	Split		Perm	Split		Perm	Prot			Prot		
Protected Phases	7	7		8	8		5	2		1	6	
Permitted Phases			7			8						
Actuated Green, G (s)	16.0	16.0	16.0	21.0	21.0	21.0	14.5	42.6		20.4	48.5	
Effective Green, g (s)	17.0	17.0	17.0	22.0	22.0	22.0	15.0	44.1		20.9	50.0	
Actuated g/C Ratio	0.14	0.14	0.14	0.18	0.18	0.18	0.12	0.37		0.17	0.42	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	4.5	5.5		4.5	5.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	253	227	229	311	314	285	219	1804		311	2079	
v/s Ratio Prot	0.10	c0.16		0.19	c0.19		c0.13	0.31		0.16	c0.43	
v/s Ratio Perm			0.04			0.02						
v/c Ratio	0.70	1.14	0.30	1.03	1.03	0.13	1.06	0.84		0.93	1.04	
Uniform Delay, d1	49.0	51.5	46.2	49.0	49.0	41.0	52.5	34.7		48.8	35.0	
Progression Factor	0.76	0.77	0.88	1.00	1.00	1.00	1.00	1.00		0.92	1.64	
Incremental Delay, d2	7.1	99.2	0.6	59.6	59.3	0.2	78.7	4.9		5.1	19.1	
Delay (s)	44.1	139.1	41.3	108.6	108.3	41.2	131.2	39.6		50.0	76.4	
Level of Service	D	F	D	F	F	D	F	D		D	E	
Approach Delay (s)	79.0				92.5			51.8			73.3	
Approach LOS	E				F			D			E	

Intersection Summary

HCM Average Control Delay	70.3	HCM Level of Service	E
HCM Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	92.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCS+™ DETAILED REPORT

General Information		Site Information	
Analyst	GAJ	Intersection	Hwy 99W/Edy Rd
Agency or Co.	Lancaster Engineering	Area Type	All other areas
Date Performed	6/22/2007	Jurisdiction	ODOT
Time Period	PM Peak Hour	Analysis Year	BK Cond
		Project ID	07038 - Pfeifer Zone Change

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N_1	1	3	0	1	3	0	1	1	1	1	1	1
Lane Group	L	TR		L	TR		L	LT	R	L	T	R
Volume, V (vph)	224	1381	79	277	1922	157	336	283	192	169	249	240
% Heavy Vehicles, %HV	3	5	2	1	3	0	1	1	4	1	1	0
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, l_1	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green, e	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Arrival Type, AT	3	3		3	3		3	3	3	3	3	3
Unit Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Filtering/Metering, I	1.000	1.000		1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Initial Unmet Demand, Q_b	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N_m												
Buses Stopping, N_B	0	0		0	0		0	0	0	0	0	0
Min. Time for Pedestrians, G_p		3.2			3.2			3.2			3.2	

Phasing	WB Only	Thru & RT	EB Only	04	SB Only	NB Only	07	08
Timing	G = 20.5	G = 23.5	G = 13.5	G =	G = 16.0	G = 21.0	G =	G =
	Y = 4.5	Y = 5.5	Y = 5.5	Y =	Y = 5	Y = 5	Y =	Y =
Duration of Analysis, T = 0.25						Cycle Length, C = 120.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	233	1521		289	2166		350	295	200	176	259	250
Lane Group Capacity, c	197	1734		305	2012		313	329	272	238	251	215
v/c Ratio, X	1.18	0.88		0.95	1.08		1.12	0.90	0.74	0.74	1.03	1.16
Total Green Ratio, g/C	0.11	0.35		0.17	0.40		0.17	0.17	0.17	0.13	0.13	0.13
Uniform Delay, d_1	53.3	36.3		49.2	35.8		49.5	48.4	46.9	50.0	52.0	52.0
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Delay Calibration, k	0.50	0.40		0.46	0.50		0.50	0.42	0.29	0.30	0.50	0.50
Incremental Delay, d_2	122.1	5.5		37.7	44.2		86.6	25.7	10.0	11.6	65.3	112.3
Initial Queue Delay, d_3	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay	175.3	41.8		86.9	80.0		136.1	74.1	56.8	61.6	117.3	164.3
Lane Group LOS	F	D		F	E		F	E	E	E	F	F
Approach Delay		59.5			80.8			95.7			120.1	
Approach LOS		E			F			F			F	
Intersection Delay		81.2			X_c = 1.11			Intersection LOS			F	

HCS+™ Version 5.21
Generated: 10/11/2007 8:51 AM

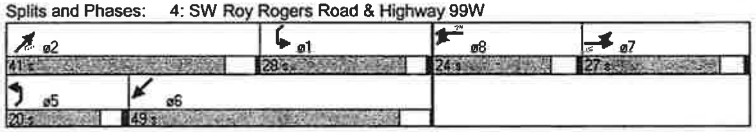
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.91	1.00	1.00	0.91	0.91
Frt			0.850			0.850			0.850		0.967	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	4917	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	4917	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			168			120			230		68	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1110			2115			1840			1741	
Travel Time (s)		25.2			48.1			41.8			39.6	
Volume (vph)	134	372	155	299	310	110	258	956	212	284	1782	502
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	17%	6%	5%	4%	4%	5%	3%	6%	9%	6%	2%	2%
Adj. Flow (vph)	146	404	168	325	337	120	280	1039	230	309	1937	546
Lane Group Flow (vph)	146	404	168	325	337	120	280	1039	230	309	2483	0
Turn Type	Split		Perm	Split		Perm	Prot		Perm	Prot		
Protected Phases	7	7		8	8		5	2		1	6	
Permitted Phases		7	7			8			2			
Detector Phases	7	7	7	8	8	8	5	2	2	1	6	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	8.5	21.5	21.5	8.5	21.5	
Total Split (s)	27.0	27.0	27.0	24.0	24.0	24.0	20.0	41.0	41.0	28.0	49.0	0.0
Total Split (%)	22.5%	22.5%	22.5%	20.0%	20.0%	20.0%	16.7%	34.2%	34.2%	23.3%	40.8%	0.0%
Maximum Green (s)	22.0	22.0	22.0	19.0	19.0	19.0	15.5	35.5	35.5	23.5	43.5	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.5	5.0	5.0	3.5	5.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5	0.5	1.0	0.5	
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lead	Lead	Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0	0		0	
Act Effct Green (s)	23.0	23.0	23.0	20.0	20.0	20.0	16.0	37.0	37.0	24.0	45.0	
Actuated g/C Ratio	0.19	0.19	0.19	0.17	0.17	0.17	0.13	0.31	0.31	0.20	0.38	
v/c Ratio	0.49	1.18	0.39	0.58	1.10	0.34	1.20	0.69	0.37	0.91	1.32	
Control Delay	25.9	112.7	5.2	50.8	129.0	10.4	145.1	39.0	17.7	77.4	178.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	25.9	112.7	5.2	50.8	129.0	10.4	145.1	39.0	17.7	77.4	178.1	
LOS	C	F	A	D	F	B	F	D	B	E	F	
Approach Delay		69.9			78.3			55.0			167.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS		E			E			E			F	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 112 (93%), Referenced to phase 2:NET and 6:SWT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.32
Intersection Signal Delay: 113.5 Intersection LOS: F
Intersection Capacity Utilization 101.4% ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 4: SW Roy Rogers Road & Highway 99W



HCM Signalized Intersection Capacity Analysis
4: SW Roy Rogers Road & Highway 99W

10/10/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.91	1.00	1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	4918	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	4918	
Volume (vph)	134	372	155	299	310	110	258	956	212	284	1782	502
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	146	404	168	325	337	120	280	1039	230	309	1937	546
RTOR Reduction (vph)	0	0	136	0	0	100	0	0	159	0	43	0
Lane Group Flow (vph)	146	404	32	325	337	20	280	1039	71	309	2441	0
Heavy Vehicles (%)	17%	6%	5%	4%	4%	5%	3%	6%	9%	6%	2%	2%
Turn Type	Split		Perm	Split		Perm	Prot		Perm	Prot		
Protected Phases	7	7		8	8		5	2		1	6	
Permitted Phases		7	7			8			2			
Actuated Green, G (s)	22.0	22.0	22.0	19.0	19.0	19.0	15.5	35.5	35.5	23.5	43.5	
Effective Green, g (s)	23.0	23.0	23.0	20.0	20.0	20.0	16.0	37.0	37.0	24.0	45.0	
Actuated g/C Ratio	0.19	0.19	0.19	0.17	0.17	0.17	0.13	0.31	0.31	0.20	0.38	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	4.5	5.5	5.5	4.5	5.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	296	343	295	561	305	256	234	1509	457	341	1844	
v/s Ratio Prot	0.09	c0.23		0.10	c0.18		c0.16	0.21		0.18	c0.50	
v/s Ratio Perm			0.02			0.01			0.05			
v/c Ratio	0.49	1.18	0.11	0.58	1.10	0.08	1.20	0.69	0.16	0.91	1.32	
Uniform Delay, d1	43.3	48.5	40.0	46.1	50.0	42.2	52.0	36.4	30.1	46.9	37.5	
Progression Factor	0.58	0.61	0.78	1.00	1.00	1.00	0.69	1.02	4.14	1.00	1.00	
Incremental Delay, d2	0.1	83.0	0.0	1.5	82.7	0.1	110.7	1.6	0.4	26.4	149.5	
Delay (s)	25.1	112.4	31.4	47.6	132.7	42.3	146.8	38.8	125.3	73.3	187.0	
Level of Service	C	F	C	D	F	D	F	D	F	E	F	
Approach Delay (s)		75.7			83.5			71.2			174.4	
Approach LOS		E			F			E			F	

Intersection Summary

HCM Average Control Delay	122.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	101.4%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
5: SW Edy Road & SW Elwert Road

10/10/2007

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.979			0.946			0.982			0.995	
Flt Protected		0.998			0.992			0.998			0.993	
Satd. Flow (prot)	0	1748	0	0	1769	0	0	1817	0	0	1847	0
Flt Permitted		0.998			0.992			0.998			0.993	
Satd. Flow (perm)	0	1748	0	0	1769	0	0	1817	0	0	1847	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1754			4157			1233			1513	
Travel Time (s)		39.9			94.5			28.0			34.4	
Volume (vph)	2	45	9	25	67	62	9	192	31	64	351	16
Confl. Peds. (#/hr)			1	1								
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	50%	3%	13%	0%	0%	2%	0%	3%	0%	0%	2%	0%
Adj. Flow (vph)	2	46	9	26	69	64	9	198	32	66	362	16
Lane Group Flow (vph)	0	57	0	0	159	0	0	239	0	0	444	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 60.8% ICU Level of Service B
Analysis Period (min) 15

ALL-WAY STOP CONTROL ANALYSIS

General Information		Site Information	
Analyst	GAJ	Intersection	Edy Rd/Elwert Rd
Agency/Co.	Lancaster Engineering	Jurisdiction	Sherwood
Date Performed	6/13/2007	Analysis Year	BK Cond
Analysis Time Period	PM Peak Hour		

Project ID 07038 - Pfeifer Zone Change

East/West Street: SW Edy Road | North/South Street: SW Elwert Road

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	2	45	9	25	67	62
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	9	192	31	64	351	16
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.97		0.97		0.97		0.97	
Flow Rate (veh/h)	57		157		237		442	
% Heavy Vehicles	6		1		2		1	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

	Eastbound L1	Eastbound L2	Westbound L1	Westbound L2	Northbound L1	Northbound L2	Southbound L1	Southbound L2
Prop. Left-Turns	0.0		0.2		0.0		0.1	
Prop. Right-Turns	0.2		0.4		0.1		0.0	
Prop. Heavy Vehicle	0.1		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.0		-0.2		-0.0		0.0	

Departure Headway and Service Time

	Eastbound L1	Eastbound L2	Westbound L1	Westbound L2	Northbound L1	Northbound L2	Southbound L1	Southbound L2
hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.05		0.14		0.21		0.39	
hd, final value (s)	5.94		5.52		5.10		4.89	
x, final value	0.09		0.24		0.34		0.60	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	3.9		3.5		3.1		2.9	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	307		407		487		692	
Delay (s/veh)	9.56		10.26		10.65		14.98	
LOS	A		B		B		B	
Approach: Delay (s/veh)	9.56		10.26		10.65		14.98	
LOS	A		B		B		B	
Intersection Delay (s/veh)	12.65							
Intersection LOS	B							

 HCS+™ Version 5.21 Generated: 10/11/2007 8:57 AM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.916			0.876			0.851	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1881	0	1805	1723	0	1805	1664	0	1787	1585	0
Flt Permitted	0.164			0.543			0.667			0.726		
Satd. Flow (perm)	305	1881	0	1032	1723	0	1267	1664	0	1366	1585	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					84			39			114	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		552			445			264			1271	
Travel Time (s)		12.5			10.1			6.0			28.9	
Volume (vph)	75	257	0	30	327	410	2	8	37	360	1	108
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	2%	1%	0%	0%	1%	1%	0%	0%	0%	1%	0%	2%
Adj. Flow (vph)	79	271	0	32	344	432	2	8	39	379	1	114
Lane Group Flow (vph)	79	271	0	32	776	0	2	47	0	379	115	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	70.0	70.0	0.0	70.0	70.0	0.0	50.0	50.0	0.0	50.0	50.0	0.0
Total Split (%)	58.3%	58.3%	0.0%	58.3%	58.3%	0.0%	41.7%	41.7%	0.0%	41.7%	41.7%	0.0%
Maximum Green (s)	66.0	66.0		66.0	66.0		46.0	46.0		46.0	46.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Min	C-Min		C-Min	C-Min	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	66.5	66.5		66.5	66.5		45.5	45.5		45.5	45.5	
Actuated g/C Ratio	0.55	0.55		0.55	0.55		0.38	0.38		0.38	0.38	
v/c Ratio	0.47	0.26		0.06	0.78		0.00	0.07		0.73	0.17	
Control Delay	26.0	14.2		7.3	18.8		24.5	10.0		48.3	10.7	
Queue Delay	0.0	0.0		0.0	22.3		0.0	0.0		0.0	0.0	
Total Delay	26.0	14.2		7.3	41.0		24.5	10.0		48.3	10.7	
LOS	C	B		A	D		C	A		D	B	
Approach Delay		16.9			39.7			10.6			39.5	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS		B			D			B			D	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.78
Intersection Signal Delay: 34.1 Intersection LOS: C
Intersection Capacity Utilization 83.1% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 6: SW Edy Road & SW Borchers Drive

ø2 50 s	ø4 70 s
ø6 50 s	ø8 70 s

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.92		1.00	0.88		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1881		1805	1724		1805	1664		1787	1586	
Flt Permitted	0.17	1.00		0.54	1.00		0.67	1.00		0.73	1.00	
Satd. Flow (perm)	312	1881		1033	1724		1267	1664		1366	1586	
Volume (vph)	75	257	0	30	327	410	2	8	37	360	1	108
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	79	271	0	32	344	432	2	8	39	379	1	114
RTOR Reduction (vph)	0	0	0	0	37	0	0	24	0	0	71	0
Lane Group Flow (vph)	79	271	0	32	739	0	2	23	0	379	44	0
Heavy Vehicles (%)	2%	1%	0%	0%	1%	1%	0%	0%	0%	1%	0%	2%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	66.5	66.5		66.5	66.5		45.5	45.5		45.5	45.5	
Effective Green, g (s)	66.5	66.5		66.5	66.5		45.5	45.5		45.5	45.5	
Actuated g/C Ratio	0.55	0.55		0.55	0.55		0.38	0.38		0.38	0.38	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	173	1042		572	955		480	631		518	601	
v/s Ratio Prot		0.14			c0.43			0.01			0.03	
v/s Ratio Perm	0.25			0.03			0.00			c0.28		
v/c Ratio	0.46	0.26		0.06	0.77		0.00	0.04		0.73	0.07	
Uniform Delay, d1	16.0	13.9		12.3	20.9		23.2	23.4		32.0	23.8	
Progression Factor	1.00	1.00		0.65	0.86		1.00	1.00		1.21	2.16	
Incremental Delay, d2	1.9	0.1		0.0	1.7		0.0	0.1		6.4	0.2	
Delay (s)	17.9	14.1		8.0	19.6		23.2	23.6		45.2	51.7	
Level of Service	B	B		A	B		C	C		D	D	
Approach Delay (s)		14.9			19.1			23.5			46.7	
Approach LOS		B			B			C			D	

Intersection Summary

HCM Average Control Delay	26.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

7: SW Langer Drive & N Sherwood Boulevard

10/10/2007

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.865			0.865		0.994			0.943	
Flt Protected							0.950			0.950		
Satd. Flow (prot)	0	0	1644	0	0	1611	1805	1889	0	1736	1697	0
Flt Permitted							0.950			0.950		
Satd. Flow (perm)	0	0	1644	0	0	1611	1805	1889	0	1736	1697	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		194			1023			539			367	
Travel Time (s)		4.4			23.3			12.3			8.3	
Volume (vph)	0	0	76	0	0	320	106	336	13	36	455	276
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	2%	0%	3%	2%	2%	0%	0%	0%	4%	9%	0%
Adj. Flow (vph)	0	0	81	0	0	340	113	357	14	38	484	294
Lane Group Flow (vph)	0	0	81	0	0	340	113	371	0	38	778	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 67.3% ICU Level of Service C
Analysis Period (min) 15

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	GAJ	Intersection	Langer Dr/Sherwood Blvd
Agency/Co.	Lancaster Engineering	Jurisdiction	Sherwood
Date Performed	6/13/2007	Analysis Year	
Analysis Time Period	PM Peak Hour		

Project Description 07038 - Pfeifer Zone Change
East/West Street: SW Langer Drive — North/South Street: SW Sherwood Boulevard
Intersection Orientation: North-South — Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	36	455	276	106	336	13
Peak-Hour Factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Hourly Flow Rate, HFR (veh/h)	37	469	284	109	346	13
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal		1			1	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			76			320
Peak-Hour Factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Hourly Flow Rate, HFR (veh/h)	0	0	78	0	0	329
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)	0			0		
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	1	0	0	1
Configuration			R			R

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L			R			R
v (veh/h)	37	109			329			78
C (m) (veh/h)	1208	792			549			795
v/c	0.03	0.14			0.60			0.10
95% queue length	0.09	0.48			3.93			0.33
Control Delay (s/veh)	8.1	10.3			20.9			10.0
LOS	A	B			C			B
Approach Delay (s/veh)	--	--	20.9			10.0		
Approach LOS	--	--	C			B		

HCS+™ Version 5.21 Generated: 10/11/2007 9:08 AM

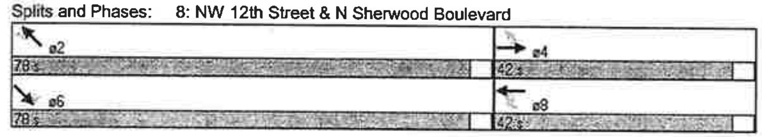
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.924			0.918			0.983			0.983	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	1738	0	1805	1735	0	1805	1835	0	1805	1835	0
Flt Permitted	0.533			0.630			0.258			0.496		
Satd. Flow (perm)	1013	1738	0	1197	1735	0	490	1835	0	942	1835	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		45			53			10			10	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		947			1090			367			1964	
Travel Time (s)		21.5			24.8			8.3			44.6	
Volume (vph)	111	62	63	387	85	104	54	300	39	27	602	77
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	2%	0%	0%	1%	0%	2%	0%	0%	2%	0%
Adj. Flow (vph)	116	65	66	403	89	108	56	312	41	28	627	80
Lane Group Flow (vph)	116	131	0	403	197	0	56	353	0	28	707	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Detector Phases	4	4		8	8		6	6		2	2	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	42.0	42.0	0.0	42.0	42.0	0.0	78.0	78.0	0.0	78.0	78.0	0.0
Total Split (%)	35.0%	35.0%	0.0%	35.0%	35.0%	0.0%	65.0%	65.0%	0.0%	65.0%	65.0%	0.0%
Maximum Green (s)	38.0	38.0		38.0	38.0		74.0	74.0		74.0	74.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	38.7	38.7		38.7	38.7		36.5	36.5		36.5	36.5	
Actuated g/C Ratio	0.46	0.46		0.46	0.46		0.44	0.44		0.44	0.44	
v/c Ratio	0.25	0.16		0.72	0.24		0.26	0.44		0.07	0.87	
Control Delay	19.1	12.0		31.1	13.2		17.0	16.7		12.4	33.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	19.1	12.0		31.1	13.2		17.0	16.7		12.4	33.0	
LOS	B	B		C	B		B	B		B	C	
Approach Delay		15.4			25.2			16.7			32.2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Approach LOS		B			C			B			C	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 83.4
Natural Cycle: 50
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 24.8 Intersection LOS: C
Intersection Capacity Utilization 81.6% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 8: NW 12th Street & N Sherwood Boulevard



Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92		1.00	0.92		1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1739		1805	1734		1805	1834		1805	1835	
Flt Permitted	0.61	1.00		0.67	1.00		0.11	1.00		0.44	1.00	
Satd. Flow (perm)	1159	1739		1279	1734		212	1834		833	1835	
Volume (vph)	111	62	63	387	85	104	54	300	39	27	602	77
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	116	65	66	403	89	108	56	312	41	28	627	80
RTOR Reduction (vph)	0	24	0	0	28	0	0	6	0	0	6	0
Lane Group Flow (vph)	116	107	0	403	169	0	56	347	0	28	701	0
Heavy Vehicles (%)	0%	0%	2%	0%	0%	1%	0%	2%	0%	0%	2%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	38.7	38.7		38.7	38.7		36.5	36.5		36.5	36.5	
Effective Green, g (s)	38.7	38.7		38.7	38.7		36.5	36.5		36.5	36.5	
Actuated g/C Ratio	0.47	0.47		0.47	0.47		0.44	0.44		0.44	0.44	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	539	809		595	807		93	805		365	805	
v/s Ratio Prot		0.06			0.10			0.19			c0.38	
v/s Ratio Perm	0.10			c0.32			0.26			0.03		
v/c Ratio	0.22	0.13		0.68	0.21		0.60	0.43		0.08	0.87	
Uniform Delay, d1	13.2	12.7		17.4	13.2		17.8	16.2		13.6	21.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.1		3.1	0.1		10.5	0.4		0.1	10.2	
Delay (s)	13.4	12.8		20.4	13.3		28.3	16.5		13.7	31.4	
Level of Service	B	B		C	B		C	B		B	C	
Approach Delay (s)		13.1			18.1			18.2			30.7	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM Average Control Delay	22.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	83.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

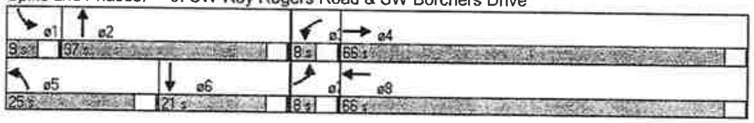
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.966			0.995			0.888			0.979	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1597	1681	0	1703	1837	0	1770	1687	0	1703	1860	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1597	1681	0	1703	1837	0	1770	1687	0	1703	1860	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		18			2			38			6	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2043			1110			1271			856	
Travel Time (s)		46.4			25.2			28.9			19.5	
Volume (vph)	11	804	237	23	947	30	361	12	35	22	39	6
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	13%	11%	3%	6%	3%	0%	2%	0%	0%	6%	0%	0%
Adj. Flow (vph)	12	884	260	25	1041	33	397	13	38	24	43	7
Lane Group Flow (vph)	12	1144	0	25	1074	0	397	51	0	24	50	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Detector Phases	7	4		3	8		5	2		1	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	8.0	20.0		8.0	20.0		8.0	20.0		8.0	20.0	
Total Split (s)	8.0	66.0	0.0	8.0	66.0	0.0	25.0	37.0	0.0	9.0	21.0	0.0
Total Split (%)	6.7%	55.0%	0.0%	6.7%	55.0%	0.0%	20.8%	30.8%	0.0%	7.5%	17.5%	0.0%
Maximum Green (s)	4.0	62.0		4.0	62.0		21.0	33.0		5.0	17.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Walk Time (s)		5.0			5.0			5.0			5.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	4.0	65.2		4.0	66.8		21.0	36.6		5.0	17.0	
Actuated g/C Ratio	0.03	0.54		0.03	0.56		0.18	0.30		0.04	0.14	
v/c Ratio	0.23	1.24		0.44	1.05		1.28	0.09		0.34	0.19	
Control Delay	66.6	144.8		69.7	50.6		180.0	12.8		68.9	43.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	66.6	144.8		69.7	50.6		180.0	12.8		68.9	43.0	
LOS	E	F		E	D		F	B		E	D	
Approach Delay		144.0			51.0			160.9			51.4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		F			D			F			D	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 98 (82%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.28
Intersection Signal Delay: 107.5 Intersection LOS: F
Intersection Capacity Utilization 90.1% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 9: SW Roy Rogers Road & SW Borchers Drive

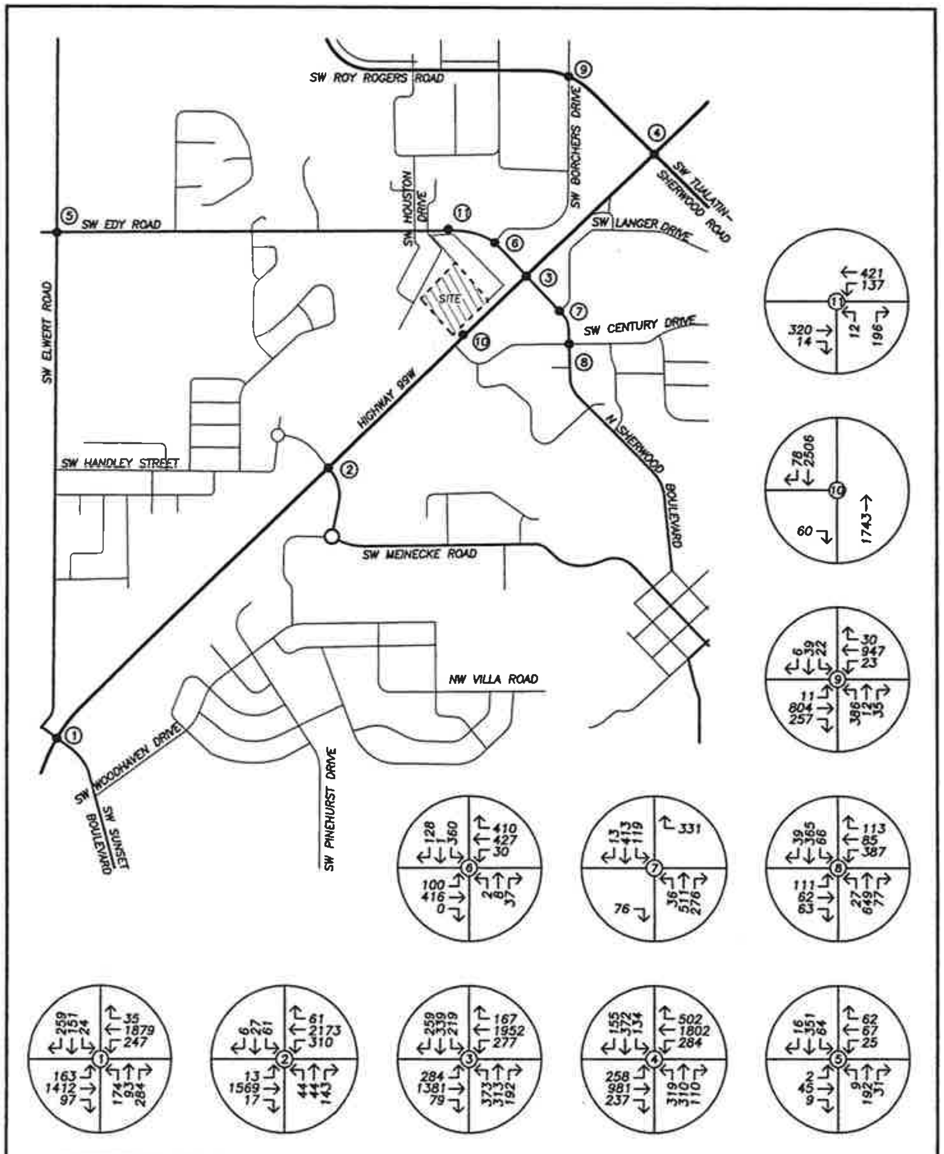


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.89		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1597	1681		1703	1838		1770	1688		1703	1860	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1597	1681		1703	1838		1770	1688		1703	1860	
Volume (vph)	11	804	237	23	947	30	361	12	35	22	39	6
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	12	884	260	25	1041	33	397	13	38	24	43	7
RTOR Reduction (vph)	0	8	0	0	1	0	0	28	0	0	5	0
Lane Group Flow (vph)	12	1136	0	25	1073	0	397	23	0	24	45	0
Heavy Vehicles (%)	13%	11%	3%	6%	3%	0%	2%	0%	0%	6%	0%	0%
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	1.6	66.0		2.4	66.8		21.0	32.6		3.0	14.6	
Effective Green, g (s)	1.6	66.0		2.4	66.8		21.0	32.6		3.0	14.6	
Actuated g/C Ratio	0.01	0.55		0.02	0.56		0.18	0.27		0.02	0.12	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	21	925		34	1023		310	459		43	226	
v/s Ratio Prot	0.01	c0.68		c0.01	0.58		c0.22	0.01		0.01	c0.02	
v/s Ratio Perm												
v/c Ratio	0.57	1.23		0.74	1.05		1.28	0.05		0.56	0.20	
Uniform Delay, d1	58.9	27.0		58.5	26.6		49.5	32.3		57.8	47.4	
Progression Factor	1.00	1.00		1.18	0.90		0.91	0.90		1.00	1.00	
Incremental Delay, d2	32.5	112.2		7.3	25.0		142.2	0.1		14.8	2.0	
Delay (s)	91.3	139.2		76.1	49.1		187.0	29.1		72.6	49.4	
Level of Service	F	F		E	D		F	C		E	D	
Approach Delay (s)		138.7			49.7			169.1			56.9	
Approach LOS		F			D			F			E	

Intersection Summary

HCM Average Control Delay	106.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	90.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group



TRAFFIC VOLUMES
15-year Background plus Site Trips Conditions
PM Peak Hour

no scale

FIGURE 7

PAGE 18

Lanes, Volumes, Timings
1: SW Elwert Road & Highway 99W

10/11/2007

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.993			0.968		0.950			0.950		
Satd. Flow (prot)	0	1871	1583	0	1809	1583	1736	3406	1599	3467	3505	1509
Flt Permitted		0.848			0.562		0.950			0.950		
Satd. Flow (perm)	0	1597	1583	0	1050	1583	1736	3406	1599	3467	3505	1509
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			156			175			96			25
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		3096			2452			1095			4015	
Travel Time (s)		70.4			55.7			24.9			91.3	
Volume (vph)	24	151	259	174	93	284	163	1412	97	247	1879	35
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	1%	2%	2%	1%	2%	4%	6%	1%	1%	3%	7%
Adj. Flow (vph)	25	157	270	181	97	296	170	1471	101	257	1957	36
Lane Group Flow (vph)	0	182	270	0	278	296	170	1471	101	257	1957	36
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		8			4		5	2		1	6	
Permitted Phases	8		8	4		4			2			6
Detector Phases	8	8	8	4	4	4	5	2	2	1	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	9.0	22.0	22.0	9.0	22.0	22.0
Total Split (s)	35.0	35.0	35.0	35.0	35.0	35.0	16.0	70.0	70.0	15.0	69.0	69.0
Total Split (%)	29.2%	29.2%	29.2%	29.2%	29.2%	29.2%	13.3%	58.3%	58.3%	12.5%	57.5%	57.5%
Maximum Green (s)	29.0	29.0	29.0	29.0	29.0	29.0	11.0	64.0	64.0	10.0	63.0	63.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	5.0	4.0	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	Max	Max	Max	Max	Max	Max	None	Max	Max	None	Max	Max
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0	0		0	0
Act Effct Green (s)		31.0	31.0		31.0	31.0	12.0	66.0	66.0	11.0	65.0	65.0
Actuated g/C Ratio		0.26	0.26		0.26	0.26	0.10	0.55	0.55	0.09	0.54	0.54
v/c Ratio		0.44	0.51		1.03	0.55	0.98	0.79	0.11	0.81	1.03	0.04
Control Delay		41.3	19.4		105.9	19.5	116.8	25.2	3.1	73.3	56.8	6.5
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		41.3	19.4		105.9	19.5	116.8	25.2	3.1	73.3	56.8	6.5
LOS		D	B		F	B	F	C	A	E	E	A
Approach Delay		28.2			61.3			32.9			57.9	

Lanes, Volumes, Timings
1: SW Elwert Road & Highway 99W

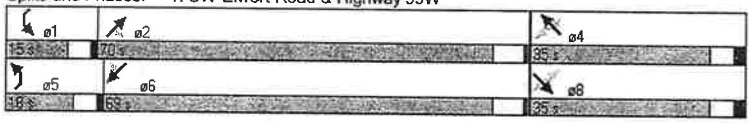
10/11/2007

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS		C			E			C			E	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.03
Intersection Signal Delay: 46.9
Intersection LOS: D
Intersection Capacity Utilization 98.1%
ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 1: SW Elwert Road & Highway 99W



HCM Signalized Intersection Capacity Analysis
1: SW Elwert Road & Highway 99W

10/11/2007

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.99	1.00		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1871	1583		1810	1583	1736	3406	1599	3467	3505	1509
Flt Permitted		0.85	1.00		0.56	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1597	1583		1051	1583	1736	3406	1599	3467	3505	1509
Volume (vph)	24	151	259	174	93	284	163	1412	97	247	1879	35
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	25	157	270	181	97	296	170	1471	101	257	1957	36
RTOR Reduction (vph)	0	0	116	0	0	130	0	0	43	0	0	11
Lane Group Flow (vph)	0	182	154	0	278	166	170	1471	58	257	1957	25
Heavy Vehicles (%)	0%	1%	2%	2%	1%	2%	4%	6%	1%	1%	3%	7%
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		8			4		5	2		1	6	
Permitted Phases	8		8	4		4			2			6
Actuated Green, G (s)		29.0	29.0		29.0	29.0	11.0	64.0	64.0	10.0	63.0	63.0
Effective Green, g (s)		31.0	31.0		31.0	31.0	12.0	66.0	66.0	11.0	65.0	65.0
Actuated g/C Ratio		0.26	0.26		0.26	0.26	0.10	0.55	0.55	0.09	0.54	0.54
Clearance Time (s)		6.0	6.0		6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		413	409		272	409	174	1873	879	318	1899	817
v/s Ratio Prot							c0.10	0.43		0.07	c0.56	
v/s Ratio Perm		0.11	0.10		c0.26	0.10			0.04			0.02
v/c Ratio		0.44	0.38		1.02	0.41	0.98	0.79	0.07	0.81	1.03	0.03
Uniform Delay, d1		37.2	36.6		44.5	36.9	53.9	21.4	12.6	53.5	27.5	12.8
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		3.4	2.6		60.4	3.0	60.8	3.4	0.1	14.0	28.9	0.1
Delay (s)		40.6	39.2		104.9	39.9	114.7	24.8	12.7	67.4	56.4	12.9
Level of Service		D	D		F	D	F	C	B	E	E	B
Approach Delay (s)		39.8			71.3			32.9			57.0	
Approach LOS		D			E			C			E	

Intersection Summary

HCM Average Control Delay	48.7	HCM Level of Service	D
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	98.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

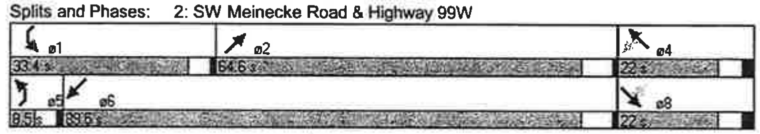
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	1792	1615	1752	1900	1615	1805	3471	1615	1787	3505	1615
Flt Permitted	0.726			0.738			0.950			0.950		
Satd. Flow (perm)	1379	1792	1615	1361	1900	1615	1805	3471	1615	1787	3505	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			6			152			7			18
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1172			2933			4015			1905	
Travel Time (s)		26.6			66.7			91.3			43.3	
Volume (vph)	61	27	6	44	44	143	13	1569	17	310	2173	61
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	6%	0%	3%	0%	0%	0%	4%	0%	1%	3%	0%
Adj. Flow (vph)	65	29	6	47	47	152	14	1669	18	330	2312	65
Lane Group Flow (vph)	65	29	6	47	47	152	14	1669	18	330	2312	65
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		8			4		5	2		1	6	
Permitted Phases	8		Free	4	4	Free			Free			Free
Detector Phases	8	8		4	4		5	2		1	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	22.0	22.0		22.0	22.0		8.5	22.0		8.5	22.0	
Total Split (s)	22.0	22.0	0.0	22.0	22.0	0.0	8.5	64.6	0.0	33.4	89.5	0.0
Total Split (%)	18.3%	18.3%	0.0%	18.3%	18.3%	0.0%	7.1%	53.8%	0.0%	27.8%	74.6%	0.0%
Maximum Green (s)	16.0	16.0		16.0	16.0		4.0	58.6		28.9	83.5	
Yellow Time (s)	4.0	4.0		4.0	4.0		3.5	5.0		3.5	5.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		1.0	1.0		1.0	1.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	None		None	None	
Walk Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0			11.0			11.0	
Pedestrian Calls (#/hr)	0	0		0	0			0			0	
Act Effct Green (s)	12.6	12.6	98.7	12.6	12.6	98.7	5.0	54.3	98.7	22.7	80.5	98.7
Actuated g/C Ratio	0.12	0.12	1.00	0.12	0.12	1.00	0.05	0.55	1.00	0.23	0.82	1.00
v/c Ratio	0.38	0.13	0.00	0.28	0.20	0.09	0.16	0.87	0.01	0.80	0.81	0.04
Control Delay	52.7	46.0	0.0	49.9	47.0	0.1	59.7	28.4	0.0	54.7	12.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.7	46.0	0.0	49.9	47.0	0.1	59.7	28.4	0.0	54.7	12.1	0.0
LOS	D	D	A	D	D	A	E	C	A	D	B	A
Approach Delay		47.6			18.6			28.4			17.0	

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS		D			B			C			B	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 98.7
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 21.8 Intersection LOS: C
Intersection Capacity Utilization 83.4% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 2: SW Meinecke Road & Highway 99W



HCM Signalized Intersection Capacity Analysis
2: SW Meinecke Road & Highway 99W

10/10/2007

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1792	1615	1752	1900	1615	1805	3471	1615	1787	3505	1615
Flt Permitted	0.73	1.00	1.00	0.74	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1380	1792	1615	1362	1900	1615	1805	3471	1615	1787	3505	1615
Volume (vph)	61	27	6	44	44	143	13	1569	17	310	2173	61
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	65	29	6	47	47	152	14	1669	18	330	2312	65
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	65	29	6	47	47	152	14	1669	18	330	2312	65
Heavy Vehicles (%)	0%	6%	0%	3%	0%	0%	0%	4%	0%	1%	3%	0%
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		8			4		5	2		1	6	
Permitted Phases	8		Free	4	4	Free			Free			Free
Actuated Green, G (s)	8.3	8.3	102.5	8.3	8.3	102.5	1.3	55.6	102.5	22.1	76.4	102.5
Effective Green, g (s)	10.3	10.3	102.5	10.3	10.3	102.5	1.8	57.6	102.5	22.6	78.4	102.5
Actuated g/C Ratio	0.10	0.10	1.00	0.10	0.10	1.00	0.02	0.56	1.00	0.22	0.76	1.00
Clearance Time (s)	6.0	6.0		6.0	6.0		4.5	6.0		4.5	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	139	180	1615	137	191	1615	32	1951	1615	394	2681	1615
v/s Ratio Prot		0.02			0.02		0.01	0.48		c0.18	c0.66	
v/s Ratio Perm	c0.05		0.00	0.03		0.09			0.01			0.04
v/c Ratio	0.47	0.16	0.00	0.34	0.25	0.09	0.44	0.86	0.01	0.84	0.86	0.04
Uniform Delay, d1	43.5	42.1	0.0	42.9	42.5	0.0	49.8	18.9	0.0	38.2	8.3	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.5	0.4	0.0	1.5	0.7	0.1	9.3	3.9	0.0	14.3	3.1	0.0
Delay (s)	46.0	42.6	0.0	44.4	43.2	0.1	59.1	22.9	0.0	52.5	11.4	0.0
Level of Service	D	D	A	D	D	A	E	C	A	D	B	A
Approach Delay (s)		42.2			16.8			22.9			16.2	
Approach LOS		D			B			C			B	

Intersection Summary			
HCM Average Control Delay	19.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	102.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	83.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
3: SW Edy Road & Highway 99W

10/10/2007

Lane Group	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↱	↱	↰	↰↑	↱	↰	↑↑↑↱		↰	↑↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	
Turning Speed (mph)	15	9	9	15	15	9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Frt		0.850	0.850			0.850		0.992			0.988	
Flt Protected	0.950			0.950	0.950		0.950			0.950		
Satd. Flow (prot)	1787	1599	1615	1698	1713	1553	1752	4908	0	1787	4987	0
Flt Permitted	0.950			0.950	0.950		0.950			0.950		
Satd. Flow (perm)	1787	1599	1615	1698	1713	1553	1752	4908	0	1787	4987	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			205			200		8			14	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)	30				30			30			30	
Link Distance (ft)	445				539			1905			1840	
Travel Time (s)	10.1				12.3			43.3			41.8	
Volume (vph)	219	339	259	373	313	192	284	1381	79	277	1952	167
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	1%	1%	0%	1%	0%	4%	3%	5%	2%	1%	3%	0%
Adj. Flow (vph)	228	353	270	389	326	200	296	1439	82	289	2033	174
Lane Group Flow (vph)	228	353	270	356	359	200	296	1521	0	289	2207	0
Turn Type	Split		Perm	Split		Perm	Prot			Prot		
Protected Phases	7	7		8	8		5	2		1	6	
Permitted Phases			7			8						
Detector Phases	7	7	7	8	8	8	5	2		1	6	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	8.5	21.5		8.5	21.5	
Total Split (s)	21.0	21.0	21.0	26.0	26.0	26.0	19.0	48.0	0.0	25.0	54.0	0.0
Total Split (%)	17.5%	17.5%	17.5%	21.7%	21.7%	21.7%	15.8%	40.0%	0.0%	20.8%	45.0%	0.0%
Maximum Green (s)	16.0	16.0	16.0	21.0	21.0	21.0	14.5	42.5		20.5	48.5	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.5	5.0		3.5	5.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5		1.0	0.5	
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0			5.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0		11.0			11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0			0	
Act Effct Green (s)	17.0	17.0	17.0	22.0	22.0	22.0	15.0	44.1		20.9	50.0	
Actuated g/C Ratio	0.14	0.14	0.14	0.18	0.18	0.18	0.12	0.37		0.17	0.42	
v/c Ratio	0.90	1.56	0.67	1.14	1.14	0.45	1.35	0.84		0.93	1.06	
Control Delay	73.8	297.9	18.1	140.3	139.6	9.2	225.5	39.8		51.2	80.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	66.9	0.0		0.0	0.2	
Total Delay	73.8	297.9	18.1	140.3	139.6	9.2	292.4	39.8		51.2	80.8	
LOS	E	F	B	F	F	A	F	D		D	F	
Approach Delay	149.1				111.4			81.0			77.4	

Lanes, Volumes, Timings
3: SW Edy Road & Highway 99W

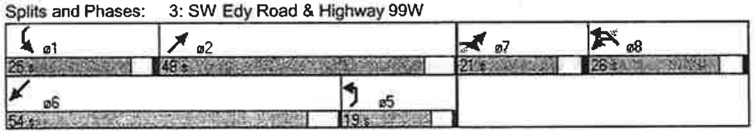
10/10/2007

Lane Group	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS	F				F			F			E	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 2 (2%), Referenced to phase 2:NET and 6:SWT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.56
Intersection Signal Delay: 93.6 Intersection LOS: F
Intersection Capacity Utilization 101.6% ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 3: SW Edy Road & Highway 99W



HCM Signalized Intersection Capacity Analysis
3: SW Edy Road & Highway 99W

10/10/2007

Movement	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	0.85	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	1599	1615	1698	1713	1553	1752	4908		1787	4988	
Flt Permitted	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1787	1599	1615	1698	1713	1553	1752	4908		1787	4988	
Volume (vph)	219	339	259	373	313	192	284	1381	79	277	1952	167
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	228	353	270	389	326	200	296	1439	82	289	2033	174
RTOR Reduction (vph)	0	0	176	0	0	163	0	5	0	0	8	0
Lane Group Flow (vph)	228	353	94	356	359	37	296	1516	0	289	2199	0
Heavy Vehicles (%)	1%	1%	0%	1%	0%	4%	3%	5%	2%	1%	3%	0%
Turn Type	Split		Perm	Split		Perm	Prot			Prot		
Protected Phases	7	7		8	8		5	2		1	6	
Permitted Phases			7			8						
Actuated Green, G (s)	16.0	16.0	16.0	21.0	21.0	21.0	14.5	42.6		20.4	48.5	
Effective Green, g (s)	17.0	17.0	17.0	22.0	22.0	22.0	15.0	44.1		20.9	50.0	
Actuated g/C Ratio	0.14	0.14	0.14	0.18	0.18	0.18	0.12	0.37		0.17	0.42	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	4.5	5.5		4.5	5.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	253	227	229	311	314	285	219	1804		311	2078	
v/s Ratio Prot	0.13	c0.22		c0.21	0.21		c0.17	0.31		0.16	c0.44	
v/s Ratio Perm			0.06			0.02						
v/c Ratio	0.90	1.56	0.41	1.14	1.14	0.13	1.35	0.84		0.93	1.06	
Uniform Delay, d1	50.7	51.5	46.9	49.0	49.0	41.0	52.5	34.7		48.8	35.0	
Progression Factor	0.81	0.81	0.82	1.00	1.00	1.00	1.00	1.00		0.91	1.63	
Incremental Delay, d2	27.5	266.8	1.0	96.1	95.4	0.2	185.2	4.9		5.1	27.5	
Delay (s)	68.8	308.7	39.7	145.1	144.4	41.2	237.7	39.6		49.7	84.6	
Level of Service	E	F	D	F	F	D	F	D		D	F	
Approach Delay (s)	159.0				122.1			71.9			80.6	
Approach LOS	F				F			E			F	

Intersection Summary

HCM Average Control Delay	95.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	101.6%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCS+™ DETAILED REPORT

General Information		Site Information	
Analyst	GAJ	Intersection	Hwy 99W/Edy Rd
Agency or Co.	Lancaster Engineering	Area Type	All other areas
Date Performed	6/22/2007	Jurisdiction	ODOT
Time Period	PM Peak Hour	Analysis Year	BK + ST Cond
		Project ID	07038 - Pfeifer Zone Change

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N_1	1	3	0	1	3	0	1	1	1	1	1	1
Lane Group	L	TR		L	TR		L	LT	R	L	T	R
Volume, V (vph)	284	1381	79	277	1952	167	373	313	192	219	339	259
% Heavy Vehicles, %HV	3	5	2	1	3	0	1	1	4	1	1	0
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, l_1	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green, e	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Arrival Type, AT	3	3		3	3		3	3	3	3	3	3
Unit Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Filtering/Metering, I	1.000	1.000		1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Initial Unmet Demand, Q_b	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N_m												
Buses Stopping, N_B	0	0		0	0		0	0	0	0	0	0
Min. Time for Pedestrians, G_p	3.2			3.2			3.2			3.2		

Phasing	WB Only	Thru & RT	EB Only	04	SB Only	NB Only	07	08
Timing	G = 20.5	G = 23.5	G = 13.5	G =	G = 16.0	G = 21.0	G =	G =
	Y = 4.5	Y = 5.5	Y = 5.5	Y =	Y = 5	Y = 5	Y =	Y =
Duration of Analysis, T = 0.25						Cycle Length, C = 120.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	296	1521		289	2207		389	326	200	228	353	270
Lane Group Capacity, c	197	1734		305	2012		313	329	272	238	251	215
v/c Ratio, X	1.50	0.88		0.95	1.10		1.24	0.99	0.74	0.96	1.41	1.26
Total Green Ratio, g/C	0.11	0.35		0.17	0.40		0.17	0.17	0.17	0.13	0.13	0.13
Uniform Delay, d_1	53.3	36.3		49.2	35.8		49.5	49.4	46.9	51.7	52.0	52.0
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Delay Calibration, k	0.50	0.40		0.46	0.50		0.50	0.49	0.29	0.47	0.50	0.50
Incremental Delay, d_2	250.8	5.5		37.7	52.1		133.4	47.0	10.0	46.5	205.0	147.2
Initial Queue Delay, d_3	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay	304.0	41.8		86.9	87.8		182.9	96.4	56.8	98.2	257.0	199.2
Lane Group LOS	F	D		F	F		F	F	E	F	F	F
Approach Delay	84.5			87.7			124.5			196.1		
Approach LOS	F			F			F			F		
Intersection Delay	107.5			X_c = 1.23			Intersection LOS			F		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑	↱	↰↰	↑	↱	↰	↑↑↑	↱	↰	↑↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.91	1.00	1.00	0.91	0.91
Frt			0.850			0.850			0.850		0.967	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	4917	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	4917	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			168			120			258		67	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1110			2115			1840			1741	
Travel Time (s)		25.2			48.1			41.8			39.6	
Volume (vph)	134	372	155	319	310	110	258	981	237	284	1802	502
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	17%	6%	5%	4%	4%	5%	3%	6%	9%	6%	2%	2%
Adj. Flow (vph)	146	404	168	347	337	120	280	1066	258	309	1959	546
Lane Group Flow (vph)	146	404	168	347	337	120	280	1066	258	309	2505	0
Turn Type	Split		Perm	Split		Perm	Prot		Perm	Prot		
Protected Phases	7	7		8	8		5	2		1	6	
Permitted Phases		7	7			8			2			
Detector Phases	7	7	7	8	8	8	5	2	2	1	6	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	8.5	21.5	21.5	8.5	21.5	
Total Split (s)	27.0	27.0	27.0	24.0	24.0	24.0	20.0	41.0	41.0	28.0	49.0	0.0
Total Split (%)	22.5%	22.5%	22.5%	20.0%	20.0%	20.0%	16.7%	34.2%	34.2%	23.3%	40.8%	0.0%
Maximum Green (s)	22.0	22.0	22.0	19.0	19.0	19.0	15.5	35.5	35.5	23.5	43.5	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.5	5.0	5.0	3.5	5.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5	0.5	1.0	0.5	
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lead	Lead	Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0	0		0	
Act Effct Green (s)	23.0	23.0	23.0	20.0	20.0	20.0	16.0	37.0	37.0	24.0	45.0	
Actuated g/C Ratio	0.19	0.19	0.19	0.17	0.17	0.17	0.13	0.31	0.31	0.20	0.38	
v/c Ratio	0.49	1.18	0.39	0.62	1.10	0.34	1.20	0.71	0.41	0.91	1.33	
Control Delay	25.9	112.7	5.2	51.9	129.0	10.4	143.5	38.5	17.3	77.4	183.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	25.9	112.7	5.2	51.9	129.0	10.4	143.5	38.5	17.3	77.4	183.1	
LOS	C	F	A	D	F	B	F	D	B	E	F	
Approach Delay		69.9			78.0			53.4			171.5	

Lanes, Volumes, Timings
4: SW Roy Rogers Road & Highway 99W

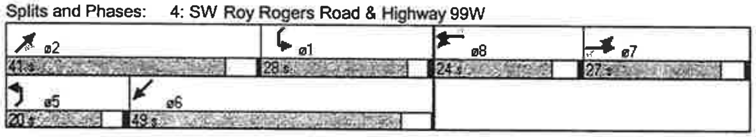
10/10/2007

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS		E			E			D			F	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 112 (93%), Referenced to phase 2:NET and 6:SWT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.33
Intersection Signal Delay: 114.7 — Intersection LOS: F
Intersection Capacity Utilization 102.3% — ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 4: SW Roy Rogers Road & Highway 99W



HCM Signalized Intersection Capacity Analysis
4: SW Roy Rogers Road & Highway 99W

10/10/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.91	1.00	1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	4919	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	4919	
Volume (vph)	134	372	155	319	310	110	258	981	237	284	1802	502
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	146	404	168	347	337	120	280	1066	258	309	1959	546
RTOR Reduction (vph)	0	0	136	0	0	100	0	0	178	0	42	0
Lane Group Flow (vph)	146	404	32	347	337	20	280	1066	80	309	2463	0
Heavy Vehicles (%)	17%	6%	5%	4%	4%	5%	3%	6%	9%	6%	2%	2%
Turn Type	Split		Perm	Split		Perm	Prot		Perm	Prot		
Protected Phases	7	7		8	8		5	2		1	6	
Permitted Phases		7	7			8			2			
Actuated Green, G (s)	22.0	22.0	22.0	19.0	19.0	19.0	15.5	35.5	35.5	23.5	43.5	
Effective Green, g (s)	23.0	23.0	23.0	20.0	20.0	20.0	16.0	37.0	37.0	24.0	45.0	
Actuated g/C Ratio	0.19	0.19	0.19	0.17	0.17	0.17	0.13	0.31	0.31	0.20	0.38	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	4.5	5.5	5.5	4.5	5.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	296	343	295	561	305	256	234	1509	457	341	1845	
v/s Ratio Prot	0.09	c0.23		0.10	c0.18		c0.16	0.22		0.18	c0.50	
v/s Ratio Perm			0.02			0.01			0.05			
v/c Ratio	0.49	1.18	0.11	0.62	1.10	0.08	1.20	0.71	0.17	0.91	1.34	
Uniform Delay, d1	43.3	48.5	40.0	46.5	50.0	42.2	52.0	36.7	30.3	46.9	37.5	
Progression Factor	0.58	0.60	0.78	1.00	1.00	1.00	0.68	1.00	4.22	1.00	1.00	
Incremental Delay, d2	0.1	83.0	0.0	2.0	82.7	0.1	109.8	1.6	0.5	26.4	154.6	
Delay (s)	25.0	112.3	31.4	48.5	132.7	42.3	144.9	38.2	128.5	73.3	192.1	
Level of Service	C	F	C	D	F	D	F	D	F	E	F	
Approach Delay (s)		75.6			82.9			71.3			179.0	
Approach LOS		E			F			E			F	

Intersection Summary

HCM Average Control Delay	124.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.24		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	102.3%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.979			0.946			0.982			0.995	
Flt Protected		0.998			0.992			0.998			0.993	
Satd. Flow (prot)	0	1748	0	0	1769	0	0	1817	0	0	1847	0
Flt Permitted		0.998			0.992			0.998			0.993	
Satd. Flow (perm)	0	1748	0	0	1769	0	0	1817	0	0	1847	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1754			4157			1233			1513	
Travel Time (s)		39.9			94.5			28.0			34.4	
Volume (vph)	2	45	9	25	67	62	9	192	31	64	351	16
Confl. Peds. (#/hr)			1	1								
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	50%	3%	13%	0%	0%	2%	0%	3%	0%	0%	2%	0%
Adj. Flow (vph)	2	46	9	26	69	64	9	198	32	66	362	16
Lane Group Flow (vph)	0	57	0	0	159	0	0	239	0	0	444	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 60.8% ICU Level of Service B
Analysis Period (min) 15

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst: GAJ
Agency/Co: Lancaster Engineering
Date Performed: 6/13/2007
Analysis Time Period: PM Peak Hour

Site Information

Intersection: Edy Rd/Elwert Rd
Jurisdiction: Sherwood
Analysis Year: BK + ST Cond

Project ID 07038 - Pfeifer Zone Change

East/West Street: SW Edy Road
North/South Street: SW Elwert Road

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	2	45	9	25	67	62
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	9	192	31	64	351	16
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.97		0.97		0.97		0.97	
Flow Rate (veh/h)	57		157		237		442	
% Heavy Vehicles	6		1		2		1	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

	Eastbound L1	Eastbound L2	Westbound L1	Westbound L2	Northbound L1	Northbound L2	Southbound L1	Southbound L2
Prop. Left-Turns	0.0		0.2		0.0		0.1	
Prop. Right-Turns	0.2		0.4		0.1		0.0	
Prop. Heavy Vehicle	0.1		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.0		-0.2		-0.0		0.0	

Departure Headway and Service Time

	Eastbound L1	Eastbound L2	Westbound L1	Westbound L2	Northbound L1	Northbound L2	Southbound L1	Southbound L2
hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.05		0.14		0.21		0.39	
hd, final value (s)	5.94		5.52		5.10		4.89	
x, final value	0.09		0.24		0.34		0.60	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	3.9		3.5		3.1		2.9	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	307		407		487		692	
Delay (s/veh)	9.56		10.26		10.65		14.98	
LOS	A		B		B		B	
Approach: Delay (s/veh)	9.56		10.26		10.65		14.98	
LOS	A		B		B		B	
Intersection Delay (s/veh)	12.65							
Intersection LOS	B							

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.926			0.876			0.851	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1881	0	1805	1742	0	1805	1664	0	1787	1585	0
Flt Permitted	0.093			0.405			0.640			0.726		
Satd. Flow (perm)	173	1881	0	770	1742	0	1216	1664	0	1366	1585	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					64			39			135	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		552			445			264			1271	
Travel Time (s)		12.5			10.1			6.0			28.9	
Volume (vph)	100	416	0	30	427	410	2	8	37	360	1	128
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	2%	1%	0%	0%	1%	1%	0%	0%	0%	1%	0%	2%
Adj. Flow (vph)	105	438	0	32	449	432	2	8	39	379	1	135
Lane Group Flow (vph)	105	438	0	32	881	0	2	47	0	379	136	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	70.0	70.0	0.0	70.0	70.0	0.0	50.0	50.0	0.0	50.0	50.0	0.0
Total Split (%)	58.3%	58.3%	0.0%	58.3%	58.3%	0.0%	41.7%	41.7%	0.0%	41.7%	41.7%	0.0%
Maximum Green (s)	66.0	66.0		66.0	66.0		46.0	46.0		46.0	46.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Min	C-Min		C-Min	C-Min	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	73.8	73.8		73.8	73.8		38.2	38.2		38.2	38.2	
Actuated g/C Ratio	0.62	0.62		0.62	0.62		0.32	0.32		0.32	0.32	
v/c Ratio	0.98	0.38		0.07	0.80		0.01	0.08		0.87	0.23	
Control Delay	112.8	13.7		7.0	13.7		24.5	10.1		61.7	10.8	
Queue Delay	0.0	0.0		0.0	43.4		0.0	0.0		0.0	0.0	
Total Delay	112.8	13.7		7.0	57.1		24.5	10.1		61.7	10.8	
LOS	F	B		A	E		C	B		E	B	
Approach Delay		32.9			55.4			10.7			48.2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS		C			E			B			D	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 46.4 Intersection LOS: D
Intersection Capacity Utilization 89.7% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 6: SW Edy Road & SW Borchers Drive

ø2	ø4
50 s	70 s
ø6	ø8
50 s	70 s

HCM Signalized Intersection Capacity Analysis

6: SW Edy Road & SW Borchers Drive

10/10/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.93		1.00	0.88		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1881		1805	1743		1805	1664		1787	1586	
Flt Permitted	0.15	1.00		0.43	1.00		0.62	1.00		0.73	1.00	
Satd. Flow (perm)	285	1881		824	1743		1184	1664		1366	1586	
Volume (vph)	100	416	0	30	427	410	2	8	37	360	1	128
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	105	438	0	32	449	432	2	8	39	379	1	135
RTOR Reduction (vph)	0	0	0	0	25	0	0	27	0	0	92	0
Lane Group Flow (vph)	105	438	0	32	856	0	2	20	0	379	44	0
Heavy Vehicles (%)	2%	1%	0%	0%	1%	1%	0%	0%	0%	1%	0%	2%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	73.8	73.8		73.8	73.8		38.2	38.2		38.2	38.2	
Effective Green, g (s)	73.8	73.8		73.8	73.8		38.2	38.2		38.2	38.2	
Actuated g/C Ratio	0.62	0.62		0.62	0.62		0.32	0.32		0.32	0.32	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	175	1157		507	1072		377	530		435	505	
v/s Ratio Prot		0.23			c0.49			0.01			0.03	
v/s Ratio Perm	0.37			0.04			0.00			c0.28		
v/c Ratio	0.60	0.38		0.06	0.80		0.01	0.04		0.87	0.09	
Uniform Delay, d1	14.1	11.6		9.3	17.5		27.9	28.2		38.6	28.7	
Progression Factor	1.00	1.00		0.62	0.69		1.00	1.00		1.22	2.33	
Incremental Delay, d2	5.7	0.2		0.0	0.4		0.0	0.1		14.8	0.2	
Delay (s)	19.8	11.8		5.7	12.5		28.0	28.4		61.9	66.9	
Level of Service	B	B		A	B		C	C		E	E	
Approach Delay (s)		13.3			12.3			28.3			63.2	
Approach LOS		B			B			C			E	

Intersection Summary

HCM Average Control Delay	25.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	89.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings

7: SW Langer Drive & N Sherwood Boulevard

10/10/2007

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.865			0.865		0.995			0.947	
Flt Protected							0.950			0.950		
Satd. Flow (prot)	0	0	1644	0	0	1611	1805	1890	0	1736	1700	0
Flt Permitted							0.950			0.950		
Satd. Flow (perm)	0	0	1644	0	0	1611	1805	1890	0	1736	1700	0
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		194			1023			539			367	
Travel Time (s)		4.4			23.3			12.3			8.3	
Volume (vph)	0	0	76	0	0	331	119	413	13	36	511	276
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	2%	0%	3%	2%	2%	0%	0%	0%	4%	9%	0%
Adj. Flow (vph)	0	0	81	0	0	352	127	439	14	38	544	294
Lane Group Flow (vph)	0	0	81	0	0	352	127	453	0	38	838	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 70.9% ICU Level of Service C
Analysis Period (min) 15

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	GAJ	Intersection	Langer Dr/Sherwood Blvd
Agency/Co.	Lancaster Engineering	Jurisdiction	Sherwood
Date Performed	6/13/2007	Analysis Year	
Analysis Time Period	PM Peak Hour		
Project Description	07038 - Pfeifer Zone Change		
East/West Street:	SW Langer Drive	North/South Street:	SW Sherwood Boulevard
Intersection Orientation:	North-South	Study Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	36	511	276	119	413	13
Peak-Hour Factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Hourly Flow Rate, HFR (veh/h)	37	526	284	122	425	13
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal		1			1	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			76			331
Peak-Hour Factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Hourly Flow Rate, HFR (veh/h)	0	0	78	0	0	341
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	1	0	0	1
Configuration			R			R

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L			R			R
v (veh/h)	37	122			341			78
C (m) (veh/h)	1115	742			493			715
v/c	0.03	0.16			0.69			0.11
95% queue length	0.10	0.59			5.27			0.37
Control Delay (s/veh)	8.3	10.8			27.1			10.7
LOS	A	B			D			B
Approach Delay (s/veh)	--	--	27.1			10.7		
Approach LOS	--	--	D			B		

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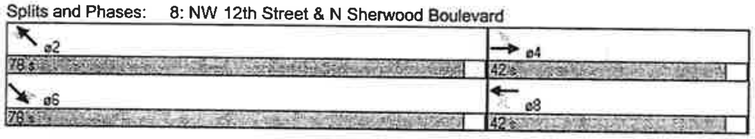
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.924			0.914			0.985			0.984	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	1738	0	1805	1727	0	1805	1838	0	1805	1837	0
Flt Permitted	0.518			0.630			0.229			0.446		
Satd. Flow (perm)	984	1738	0	1197	1727	0	435	1838	0	847	1837	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		45			58			8			9	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		947			1090			367			1964	
Travel Time (s)		21.5			24.8			8.3			44.6	
Volume (vph)	111	62	63	387	85	113	66	365	39	27	649	77
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	2%	0%	0%	1%	0%	2%	0%	0%	2%	0%
Adj. Flow (vph)	116	65	66	403	89	118	69	380	41	28	676	80
Lane Group Flow (vph)	116	131	0	403	207	0	69	421	0	28	756	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Detector Phases	4	4		8	8		6	6		2	2	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	42.0	42.0	0.0	42.0	42.0	0.0	78.0	78.0	0.0	78.0	78.0	0.0
Total Split (%)	35.0%	35.0%	0.0%	35.0%	35.0%	0.0%	65.0%	65.0%	0.0%	65.0%	65.0%	0.0%
Maximum Green (s)	38.0	38.0		38.0	38.0		74.0	74.0		74.0	74.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	38.9	38.9		38.9	38.9		40.3	40.3		40.3	40.3	
Actuated g/C Ratio	0.45	0.45		0.45	0.45		0.46	0.46		0.46	0.46	
v/c Ratio	0.26	0.16		0.76	0.26		0.34	0.49		0.07	0.89	
Control Delay	21.7	13.5		35.1	14.6		19.0	17.3		11.9	33.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	21.7	13.5		35.1	14.6		19.0	17.3		11.9	33.6	
LOS	C	B		D	B		B	B		B	C	
Approach Delay		17.3			28.2			17.5			32.9	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Approach LOS		B			C			B			C	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 87.3
Natural Cycle: 50
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 26.2 Intersection LOS: C
Intersection Capacity Utilization 84.4% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 8: NW 12th Street & N Sherwood Boulevard



Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92		1.00	0.91		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1739		1805	1728		1805	1839		1805	1837	
Flt Permitted	0.59	1.00		0.67	1.00		0.10	1.00		0.38	1.00	
Satd. Flow (perm)	1124	1739		1279	1728		189	1839		731	1837	
Volume (vph)	111	62	63	387	85	113	66	365	39	27	649	77
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	116	65	66	403	89	118	69	380	41	28	676	80
RTOR Reduction (vph)	0	25	0	0	32	0	0	4	0	0	5	0
Lane Group Flow (vph)	116	106	0	403	175	0	69	417	0	28	751	0
Heavy Vehicles (%)	0%	0%	2%	0%	0%	1%	0%	2%	0%	0%	2%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	38.8	38.8		38.8	38.8		40.3	40.3		40.3	40.3	
Effective Green, g (s)	38.8	38.8		38.8	38.8		40.3	40.3		40.3	40.3	
Actuated g/C Ratio	0.45	0.45		0.45	0.45		0.46	0.46		0.46	0.46	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	501	775		570	770		87	851		338	850	
v/s Ratio Prot		0.06			0.10			0.23			c0.41	
v/s Ratio Perm	0.10			c0.32			0.37			0.04		
v/c Ratio	0.23	0.14		0.71	0.23		0.79	0.49		0.08	0.88	
Uniform Delay, d1	14.9	14.3		19.5	14.9		19.9	16.3		13.1	21.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.1		4.0	0.2		37.6	0.4		0.1	10.8	
Delay (s)	15.2	14.3		23.5	15.1		57.5	16.7		13.2	32.1	
Level of Service	B	B		C	B		E	B		B	C	
Approach Delay (s)		14.7			20.7			22.4			31.4	
Approach LOS		B			C			C			C	

Intersection Summary

HCM Average Control Delay	24.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	87.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	84.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

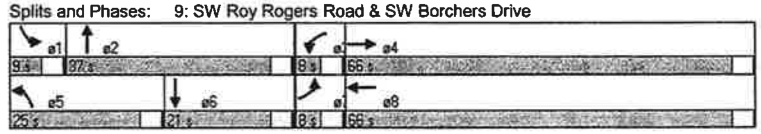
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50		50	50		50	50		50	50	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.964			0.995			0.888			0.979	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1597	1679	0	1703	1837	0	1770	1687	0	1703	1860	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1597	1679	0	1703	1837	0	1770	1687	0	1703	1860	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		20			2			38			6	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2043			1110			1271			856	
Travel Time (s)		46.4			25.2			28.9			19.5	
Volume (vph)	11	804	257	23	947	30	386	12	35	22	39	6
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	13%	11%	3%	6%	3%	0%	2%	0%	0%	6%	0%	0%
Adj. Flow (vph)	12	884	282	25	1041	33	424	13	38	24	43	7
Lane Group Flow (vph)	12	1166	0	25	1074	0	424	51	0	24	50	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Detector Phases	7	4		3	8		5	2		1	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	8.0	20.0		8.0	20.0		8.0	20.0		8.0	20.0	
Total Split (s)	8.0	66.0	0.0	8.0	66.0	0.0	25.0	37.0	0.0	9.0	21.0	0.0
Total Split (%)	6.7%	55.0%	0.0%	6.7%	55.0%	0.0%	20.8%	30.8%	0.0%	7.5%	17.5%	0.0%
Maximum Green (s)	4.0	62.0		4.0	62.0		21.0	33.0		5.0	17.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Walk Time (s)		5.0			5.0			5.0			5.0	
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	4.0	65.2		4.0	66.8		21.0	36.6		5.0	17.0	
Actuated g/C Ratio	0.03	0.54		0.03	0.56		0.18	0.30		0.04	0.14	
v/c Ratio	0.23	1.27		0.44	1.05		1.37	0.09		0.34	0.19	
Control Delay	66.6	154.8		69.5	50.6		216.7	13.4		68.9	43.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	66.6	154.8		69.5	50.6		216.7	13.4		68.9	43.0	
LOS	E	F		E	D		F	B		E	D	
Approach Delay		153.9			51.0			194.9			51.4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		F			D			F			D	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 98 (82%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.37
Intersection Signal Delay: 118.1 Intersection LOS: F
Intersection Capacity Utilization 92.7% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 9: SW Roy Rogers Road & SW Borchers Drive



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	1.00		1.00	0.89		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1597	1679		1703	1838		1770	1688		1703	1860	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1597	1679		1703	1838		1770	1688		1703	1860	
Volume (vph)	11	804	257	23	947	30	386	12	35	22	39	6
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	12	884	282	25	1041	33	424	13	38	24	43	7
RTOR Reduction (vph)	0	9	0	0	1	0	0	28	0	0	5	0
Lane Group Flow (vph)	12	1157	0	25	1073	0	424	23	0	24	45	0
Heavy Vehicles (%)	13%	11%	3%	6%	3%	0%	2%	0%	0%	6%	0%	0%
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	1.6	66.0		2.4	66.8		21.0	32.6		3.0	14.6	
Effective Green, g (s)	1.6	66.0		2.4	66.8		21.0	32.6		3.0	14.6	
Actuated g/C Ratio	0.01	0.55		0.02	0.56		0.18	0.27		0.02	0.12	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	21	923		34	1023		310	459		43	226	
v/s Ratio Prot	0.01	c0.69		c0.01	0.58		c0.24	0.01		0.01	c0.02	
v/s Ratio Perm												
v/c Ratio	0.57	1.25		0.74	1.05		1.37	0.05		0.56	0.20	
Uniform Delay, d1	58.9	27.0		58.5	26.6		49.5	32.3		57.8	47.4	
Progression Factor	1.00	1.00		1.17	0.90		1.08	0.94		1.00	1.00	
Incremental Delay, d2	32.5	123.0		7.3	25.0		176.3	0.1		14.8	2.0	
Delay (s)	91.3	150.0		75.9	49.0		230.0	30.6		72.6	49.4	
Level of Service	F	F		E	D		F	C		E	D	
Approach Delay (s)		149.4			49.7			208.5			56.9	
Approach LOS		F			D			F			E	

Intersection Summary			
HCM Average Control Delay	118.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.12		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	92.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	GAJ	Intersection	Highway 99W/Site Access
Agency/Co.	Lancaster Engineering	Jurisdiction	Sherwood
Date Performed	6/13/2007	Analysis Year	BK + ST Cond
Analysis Time Period	PM Peak Hour		

Project Description 07038 - Pfeifer Zone Change

East/West Street: | North/South Street: Highway 99W

Intersection Orientation: North-South | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		1743			2506	78
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR (veh/h)	0	1815	0	0	2610	81
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	2	0	0	2	1
Configuration		T			T	R
Upstream Signal		0			1	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			60			
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR (veh/h)	0	0	62	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	1	0	0	0
Configuration			R			

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration								R
v (veh/h)								62
C (m) (veh/h)								537
v/c								0.12
95% queue length								0.39
Control Delay (s/veh)								12.6
LOS								B
Approach Delay (s/veh)	--	--				12.6		
Approach LOS	--	--				B		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	GAJ	Intersection	Edy Road Site Access
Agency/Co.	Lancaster Engineering	Jurisdiction	Sherwood
Date Performed	6/13/2007	Analysis Year	BK + ST Cond
Analysis Time Period	PM Peak Hour		

Project Description 07038 - Pfeifer Zone Change

East/West Street: SW Edy Road	North/South Street: Site Access
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		320	14	137	421	
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR (veh/h)	0	336	14	144	443	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			1	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	12		196			
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR (veh/h)	12	0	206	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	2
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
v (veh/h)		144		218				
C (m) (veh/h)		1220		621				
v/c		0.12		0.35				
95% queue length		0.40		1.57				
Control Delay (s/veh)		8.3		13.9				
LOS		A		B				
Approach Delay (s/veh)	--	--	13.9					
Approach LOS	--	--	B					

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Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.993		0.950	0.977		0.950			0.950		
Satd. Flow (prot)	0	1871	1583	1681	1738	1583	1736	3406	1599	3467	3505	1509
Flt Permitted		0.940		0.518	0.658		0.950			0.950		
Satd. Flow (perm)	0	1771	1583	917	1170	1583	1736	3406	1599	3467	3505	1509
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			156			175			96			25
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		3096			2452			1095			4015	
Travel Time (s)		70.4			55.7			24.9			91.3	
Volume (vph)	24	151	259	174	93	284	163	1412	97	247	1879	35
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	1%	2%	2%	1%	2%	4%	6%	1%	1%	3%	7%
Adj. Flow (vph)	25	157	270	181	97	296	170	1471	101	257	1957	36
Lane Group Flow (vph)	0	182	270	94	184	296	170	1471	101	257	1957	36
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		8			4		5	2		1	6	
Permitted Phases	8		8	4		4			2			6
Detector Phases	8	8	8	4	4	4	5	2	2	1	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	9.0	22.0	22.0	9.0	22.0	22.0
Total Split (s)	35.0	35.0	35.0	35.0	35.0	35.0	16.0	70.0	70.0	15.0	69.0	69.0
Total Split (%)	29.2%	29.2%	29.2%	29.2%	29.2%	29.2%	13.3%	58.3%	58.3%	12.5%	57.5%	57.5%
Maximum Green (s)	29.0	29.0	29.0	29.0	29.0	29.0	11.0	64.0	64.0	10.0	63.0	63.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	5.0	4.0	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	Max	Max	Max	Max	Max	Max	None	Max	Max	None	Max	Max
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0	0		0	0
Act Effct Green (s)		31.0	31.0	31.0	31.0	31.0	12.0	66.0	66.0	11.0	65.0	65.0
Actuated g/C Ratio		0.26	0.26	0.26	0.26	0.26	0.10	0.55	0.55	0.09	0.54	0.54
v/c Ratio		0.40	0.51	0.40	0.61	0.55	0.98	0.79	0.11	0.81	1.03	0.04
Control Delay		39.9	19.4	42.8	49.1	19.5	116.8	25.2	3.1	73.3	56.8	6.5
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		39.9	19.4	42.8	49.1	19.5	116.8	25.2	3.1	73.3	56.8	6.5
LOS		D	B	D	D	B	F	C	A	E	E	A
Approach Delay		27.7			32.8			32.9			57.9	

Lanes, Volumes, Timings
1: SW Elwert Road & Highway 99W

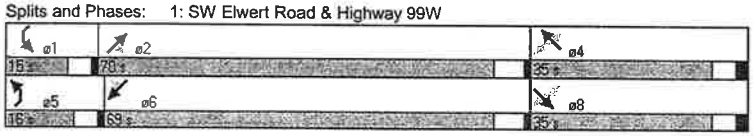
10/11/2007

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS		C			C			C			E	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.03
Intersection Signal Delay: 43.6 — Intersection LOS: D
Intersection Capacity Utilization 90.8% — ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 1: SW Elwert Road & Highway 99W



HCM Signalized Intersection Capacity Analysis
1: SW Elwert Road & Highway 99W

10/11/2007

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.99	1.00	0.95	0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1871	1583	1681	1738	1583	1736	3406	1599	3467	3505	1509
Flt Permitted		0.94	1.00	0.52	0.66	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1771	1583	917	1171	1583	1736	3406	1599	3467	3505	1509
Volume (vph)	24	151	259	174	93	284	163	1412	97	247	1879	35
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	25	157	270	181	97	296	170	1471	101	257	1957	36
RTOR Reduction (vph)	0	0	116	0	0	130	0	0	43	0	0	11
Lane Group Flow (vph)	0	182	154	94	184	166	170	1471	58	257	1957	25
Heavy Vehicles (%)	0%	1%	2%	2%	1%	2%	4%	6%	1%	1%	3%	7%
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		8			4		5	2		1	6	
Permitted Phases	8		8	4		4			2			6
Actuated Green, G (s)		29.0	29.0	29.0	29.0	29.0	11.0	64.0	64.0	10.0	63.0	63.0
Effective Green, g (s)		31.0	31.0	31.0	31.0	31.0	12.0	66.0	66.0	11.0	65.0	65.0
Actuated g/C Ratio		0.26	0.26	0.26	0.26	0.26	0.10	0.55	0.55	0.09	0.54	0.54
Clearance Time (s)		6.0	6.0	6.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		458	409	237	303	409	174	1873	879	318	1899	817
v/s Ratio Prot							c0.10	0.43		0.07	c0.56	
v/s Ratio Perm		0.10	0.10	0.10	c0.16	0.10			0.04			0.02
v/c Ratio		0.40	0.38	0.40	0.61	0.41	0.98	0.79	0.07	0.81	1.03	0.03
Uniform Delay, d1		36.8	36.6	36.8	39.1	36.9	53.9	21.4	12.6	53.5	27.5	12.8
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		2.6	2.6	4.9	8.8	3.0	60.8	3.4	0.1	14.0	28.9	0.1
Delay (s)		39.3	39.2	41.7	47.9	39.9	114.7	24.8	12.7	67.4	56.4	12.9
Level of Service		D	D	D	D	D	F	C	B	E	E	B
Approach Delay (s)		39.3			42.7			32.9			57.0	
Approach LOS		D			D			C			E	

Intersection Summary

HCM Average Control Delay	45.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

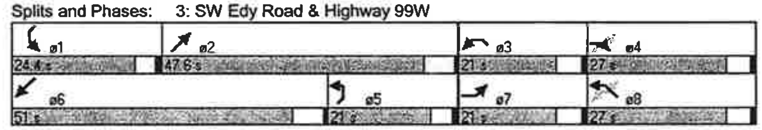
Lane Group	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↱	↱	↰↰	↰	↱	↰	↑↑↑↱		↰	↑↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	
Turning Speed (mph)	15	9	9	15	15	9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Frt		0.850	0.850			0.850		0.992			0.988	
Flt Protected	0.950			0.950	0.950		0.950			0.950		
Satd. Flow (prot)	1787	1599	1615	3467	1805	1553	1752	4908	0	1787	4987	0
Flt Permitted	0.174			0.174	0.950		0.950			0.950		
Satd. Flow (perm)	327	1599	1615	635	1805	1553	1752	4908	0	1787	4987	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			246			200		8			14	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)	30				30			30			30	
Link Distance (ft)	445				539			1905			1840	
Travel Time (s)	10.1				12.3			43.3			41.8	
Volume (vph)	219	339	259	373	313	192	284	1381	79	277	1952	167
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	1%	1%	0%	1%	0%	4%	3%	5%	2%	1%	3%	0%
Adj. Flow (vph)	228	353	270	389	326	200	296	1439	82	289	2033	174
Lane Group Flow (vph)	228	353	270	389	326	200	296	1521	0	289	2207	0
Turn Type	pm+pt		Perm	pm+pt		Perm	Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8						
Detector Phases	7	4	4	3	8	8	5	2		1	6	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	8.5	21.5		8.5	21.5	
Total Split (s)	21.0	27.0	27.0	21.0	27.0	27.0	21.0	47.6	0.0	24.4	51.0	0.0
Total Split (%)	17.5%	22.5%	22.5%	17.5%	22.5%	22.5%	17.5%	39.7%	0.0%	20.3%	42.5%	0.0%
Maximum Green (s)	16.0	22.0	22.0	16.0	22.0	22.0	16.5	42.1		19.9	45.5	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.5	5.0		3.5	5.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5		1.0	0.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0			5.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0		11.0			11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0			0	
Act Effct Green (s)	40.9	24.6	24.6	39.1	23.7	23.7	17.0	43.6		20.4	47.0	
Actuated g/C Ratio	0.34	0.20	0.20	0.33	0.20	0.20	0.14	0.36		0.17	0.39	
v/c Ratio	0.74	1.08	0.51	0.68	0.92	0.43	1.19	0.85		0.95	1.12	
Control Delay	38.4	110.4	12.6	34.1	78.4	8.7	164.1	40.6		68.4	110.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	60.2	0.0		0.0	0.3	
Total Delay	38.4	110.4	12.6	34.1	78.4	8.7	224.3	40.6		68.4	110.3	
LOS	D	F	B	C	E	A	F	D		E	F	
Approach Delay	60.1				44.3			70.6			105.4	

Lane Group	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS	E				D			E			F	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 2 (2%), Referenced to phase 2:NET and 6:SWT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.19
Intersection Signal Delay: 79.5 Intersection LOS: E
Intersection Capacity Utilization 100.0% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 3: SW Edy Road & Highway 99W



HCM Signalized Intersection Capacity Analysis
3: SW Edy Road & Highway 99W

10/11/2007

Movement	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	0.85	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	1599	1615	3467	1805	1553	1752	4908		1787	4988	
Flt Permitted	0.16	1.00	1.00	0.17	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	306	1599	1615	616	1805	1553	1752	4908		1787	4988	
Volume (vph)	219	339	259	373	313	192	284	1381	79	277	1952	167
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	228	353	270	389	326	200	296	1439	82	289	2033	174
RTOR Reduction (vph)	0	0	196	0	0	161	0	5	0	0	9	0
Lane Group Flow (vph)	228	353	74	389	326	40	296	1516	0	289	2198	0
Heavy Vehicles (%)	1%	1%	0%	1%	0%	4%	3%	5%	2%	1%	3%	0%
Turn Type	pm+pt		Perm	pm+pt		Perm	Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8						
Actuated Green, G (s)	38.9	23.6	23.6	37.1	22.7	22.7	16.5	42.1		19.9	45.5	
Effective Green, g (s)	40.9	24.6	24.6	39.1	23.7	23.7	17.0	43.6		20.4	47.0	
Actuated g/C Ratio	0.34	0.20	0.20	0.33	0.20	0.20	0.14	0.36		0.17	0.39	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	4.5	5.5		4.5	5.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	305	328	331	567	356	307	248	1783		304	1954	
v/s Ratio Prot	c0.10	c0.22		0.09	0.18		c0.17	0.31		0.16	c0.44	
v/s Ratio Perm	0.15		0.05	0.14		0.03						
v/c Ratio	0.75	1.08	0.22	0.69	0.92	0.13	1.19	0.85		0.95	1.13	
Uniform Delay, d1	31.6	47.7	39.8	32.4	47.2	39.6	51.5	35.2		49.3	36.5	
Progression Factor	0.89	0.93	1.32	1.00	1.00	1.00	1.00	1.00		0.92	1.58	
Incremental Delay, d2	8.0	66.8	0.3	3.4	27.3	0.2	119.7	5.3		20.7	59.3	
Delay (s)	36.2	111.2	52.8	35.8	74.5	39.8	171.2	40.5		66.3	116.8	
Level of Service	D	F	D	D	E	D	F	D		E	F	
Approach Delay (s)	72.6				50.5			61.8			111.0	
Approach LOS	E				D			E			F	

Intersection Summary

HCM Average Control Delay	81.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	100.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCS+™ DETAILED REPORT

General Information

Analyst	GAJ
Agency or Co.	Lancaster Engineering
Date Performed	6/22/2007
Time Period	PM Peak Hour

Site Information

Intersection	Hwy 99W/Edy Rd
Area Type	All other areas
Jurisdiction	ODOT
Analysis Year	BK + ST Cond
Project ID	07038 - Pfeifer Zone Change

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N_1	1	3	0	1	3	0	2	1	1	1	1	1
Lane Group	L	TR		L	TR		L	T	R	L	T	R
Volume, V (vph)	284	1381	79	277	1952	167	373	313	192	219	339	259
% Heavy Vehicles, %HV	3	5	2	1	3	0	1	1	4	1	1	0
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, l_1	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green, e	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Arrival Type, AT	3	3		3	3		3	3	3	3	3	3
Unit Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Filtering/Metering, I	1.000	1.000		1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Initial Unmet Demand, Q_b	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N_m												
Buses Stopping, N_B	0	0		0	0		0	0	0	0	0	0
Min. Time for Pedestrians, G_p		3.2			3.2			3.2			3.2	

Phasing	Excl. Left	Thru & RT	03	04	Excl. Left	NB Only	Thru & RT	08
Timing	G = 11.0	G = 47.0	G =	G =	G = 9.0	G = 6.0	G = 22.0	G =
	Y = 4.5	Y = 5.5	Y =	Y =	Y = 5	Y = 5	Y = 5	Y =

Duration of Analysis, T = 0.25 — Cycle Length, C = 120.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	296	1521		289	2207		389	326	200	228	353	270
Lane Group Capacity, c	161	1918		164	1949		579	517	427	134	345	296
v/c Ratio, X	1.84	0.79		1.76	1.13		0.67	0.63	0.47	1.70	1.02	0.91
Total Green Ratio, g/C	0.09	0.39		0.09	0.39		0.17	0.28	0.28	0.08	0.18	0.18
Uniform Delay, d_1	54.5	32.2		54.5	36.5		46.9	38.2	36.2	55.5	49.0	48.1
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Delay Calibration, k	0.50	0.34		0.50	0.50		0.24	0.21	0.11	0.50	0.50	0.43
Incremental Delay, d_2	400.4	2.4		366.7	66.6		3.0	2.5	0.8	345.4	54.5	30.7
Initial Queue Delay, d_3	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay	454.9	34.6		421.2	103.1		50.0	40.6	37.0	400.9	103.5	78.7
Lane Group LOS	F	C		F	F		D	D	D	F	F	E
Approach Delay		103.1			140.0			43.8			175.3	
Approach LOS		F			F			D			F	
Intersection Delay		119.4			X_c = 1.10			Intersection LOS			F	

HCS+™ Version 5.21 Generated: 10/17/2007 1:07 PM

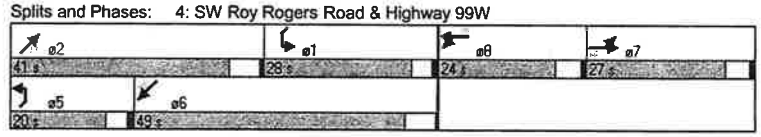
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	5085	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	5085	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			168			120			258			402
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1110			2115			1840			1741	
Travel Time (s)		25.2			48.1			41.8			39.6	
Volume (vph)	134	372	155	319	310	110	258	981	237	284	1802	502
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	17%	6%	5%	4%	4%	5%	3%	6%	9%	6%	2%	2%
Adj. Flow (vph)	146	404	168	347	337	120	280	1066	258	309	1959	546
Lane Group Flow (vph)	146	404	168	347	337	120	280	1066	258	309	1959	546
Turn Type	Split		Perm	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	7		8	8		5	2		1	6	
Permitted Phases		7	7			8			2			6
Detector Phases	7	7	7	8	8	8	5	2	2	1	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	8.5	21.5	21.5	8.5	21.5	21.5
Total Split (s)	27.0	27.0	27.0	24.0	24.0	24.0	20.0	41.0	41.0	28.0	49.0	49.0
Total Split (%)	22.5%	22.5%	22.5%	20.0%	20.0%	20.0%	16.7%	34.2%	34.2%	23.3%	40.8%	40.8%
Maximum Green (s)	22.0	22.0	22.0	19.0	19.0	19.0	15.5	35.5	35.5	23.5	43.5	43.5
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.5	5.0	5.0	3.5	5.0	5.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5	0.5	1.0	0.5	0.5
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lead	Lead	Lag	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0	0		0	0
Act Effct Green (s)	23.0	23.0	23.0	20.0	20.0	20.0	16.0	37.0	37.0	24.0	45.0	45.0
Actuated g/C Ratio	0.19	0.19	0.19	0.17	0.17	0.17	0.13	0.31	0.31	0.20	0.38	0.38
v/c Ratio	0.49	1.18	0.39	0.62	1.10	0.34	1.20	0.71	0.41	0.91	1.03	0.65
Control Delay	25.9	112.7	5.2	51.9	129.0	10.4	143.5	38.5	17.3	77.4	65.1	11.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.9	112.7	5.2	51.9	129.0	10.4	143.5	38.5	17.3	77.4	65.1	11.7
LOS	C	F	A	D	F	B	F	D	B	E	E	B
Approach Delay		69.9			78.0			53.4			56.1	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Approach LOS		E			E			D			E	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 112 (93%), Referenced to phase 2:NET and 6:SWT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.20
Intersection Signal Delay: 60.0 Intersection LOS: E
Intersection Capacity Utilization 91.1% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 4: SW Roy Rogers Road & Highway 99W



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑	↱	↰↰	↑	↱	↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	5085	1583
Volume (vph)	134	372	155	319	310	110	258	981	237	284	1802	502
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	146	404	168	347	337	120	280	1066	258	309	1959	546
RTOR Reduction (vph)	0	0	136	0	0	100	0	0	178	0	0	251
Lane Group Flow (vph)	146	404	32	347	337	20	280.	1066	80	309	1959	295
Heavy Vehicles (%)	17%	6%	5%	4%	4%	5%	3%	6%	9%	6%	2%	2%
Turn Type	Split		Perm	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	7		8	8		5	2		1	6	
Permitted Phases		7	7			8			2			6
Actuated Green, G (s)	22.0	22.0	22.0	19.0	19.0	19.0	15.5	35.5	35.5	23.5	43.5	43.5
Effective Green, g (s)	23.0	23.0	23.0	20.0	20.0	20.0	16.0	37.0	37.0	24.0	45.0	45.0
Actuated g/C Ratio	0.19	0.19	0.19	0.17	0.17	0.17	0.13	0.31	0.31	0.20	0.38	0.38
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	4.5	5.5	5.5	4.5	5.5	5.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	296	343	295	561	305	256	234	1509	457	341	1907	594
v/s Ratio Prot	0.09	c0.23		0.10	c0.18		c0.16	0.22		0.18	c0.39	
v/s Ratio Perm			0.02			0.01			0.05			0.19
v/c Ratio	0.49	1.18	0.11	0.62	1.10	0.08	1.20	0.71	0.17	0.91	1.03	0.50
Uniform Delay, d1	43.3	48.5	40.0	46.5	50.0	42.2	52.0	36.7	30.3	46.9	37.5	28.8
Progression Factor	0.58	0.60	0.78	1.00	1.00	1.00	0.68	1.00	4.22	1.00	1.00	1.00
Incremental Delay, d2	0.1	83.0	0.0	2.0	82.7	0.1	109.8	1.6	0.5	26.4	27.9	2.9
Delay (s)	25.0	112.3	31.4	48.5	132.7	42.3	144.9	38.2	128.5	73.3	65.4	31.7
Level of Service	C	F	C	D	F	D	F	D	F	E	E	C
Approach Delay (s)		75.6			82.9			71.3			59.7	
Approach LOS		E			F			E			E	

Intersection Summary

HCM Average Control Delay	67.9	HCM Level of Service	E
HCM Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	91.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

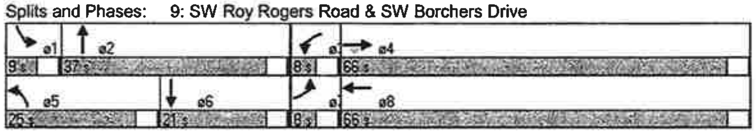
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱		↰	↑↱		↰	↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50		50	50		50	50	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.995			0.888			0.979	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1597	1712	1568	1703	1837	0	1770	1687	0	1703	1860	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1597	1712	1568	1703	1837	0	1770	1687	0	1703	1860	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			218		2			38			6	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2043			1110			1271			856	
Travel Time (s)		46.4			25.2			28.9			19.5	
Volume (vph)	11	804	257	23	947	30	386	12	35	22	39	6
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	13%	11%	3%	6%	3%	0%	2%	0%	0%	6%	0%	0%
Adj. Flow (vph)	12	884	282	25	1041	33	424	13	38	24	43	7
Lane Group Flow (vph)	12	884	282	25	1074	0	424	51	0	24	50	0
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Detector Phases	7	4	4	3	8		5	2		1	6	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	8.0	20.0	20.0	8.0	20.0		8.0	20.0		8.0	20.0	
Total Split (s)	8.0	66.0	66.0	8.0	66.0	0.0	25.0	37.0	0.0	9.0	21.0	0.0
Total Split (%)	6.7%	55.0%	55.0%	6.7%	55.0%	0.0%	20.8%	30.8%	0.0%	7.5%	17.5%	0.0%
Maximum Green (s)	4.0	62.0	62.0	4.0	62.0		21.0	33.0		5.0	17.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Walk Time (s)		5.0	5.0		5.0			5.0			5.0	
Flash Dont Walk (s)		11.0	11.0		11.0			11.0			11.0	
Pedestrian Calls (#/hr)		0	0		0			0			0	
Act Effct Green (s)	4.0	65.2	65.2	4.0	66.8		21.0	36.6		5.0	17.0	
Actuated g/C Ratio	0.03	0.54	0.54	0.03	0.56		0.18	0.30		0.04	0.14	
v/c Ratio	0.23	0.95	0.30	0.44	1.05		1.37	0.09		0.34	0.19	
Control Delay	66.6	47.1	4.9	71.5	67.9		216.8	13.3		68.9	43.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	66.6	47.1	4.9	71.5	67.9		216.8	13.3		68.9	43.0	
LOS	E	D	A	E	E		F	B		E	D	
Approach Delay		37.2			68.0			195.0			51.4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		D			E			F			D	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 98 (82%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.37
Intersection Signal Delay: 76.1 Intersection LOS: E
Intersection Capacity Utilization 86.4% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 9: SW Roy Rogers Road & SW Borchers Drive



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.89		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1597	1712	1568	1703	1838		1770	1688		1703	1860	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1597	1712	1568	1703	1838		1770	1688		1703	1860	
Volume (vph)	11	804	257	23	947	30	386	12	35	22	39	6
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	12	884	282	25	1041	33	424	13	38	24	43	7
RTOR Reduction (vph)	0	0	98	0	1	0	0	28	0	0	5	0
Lane Group Flow (vph)	12	884	184	25	1073	0	424	23	0	24	45	0
Heavy Vehicles (%)	13%	11%	3%	6%	3%	0%	2%	0%	0%	6%	0%	0%
Turn Type	Prot		Perm	Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4									
Actuated Green, G (s)	1.6	66.0	66.0	2.4	66.8		21.0	32.6		3.0	14.6	
Effective Green, g (s)	1.6	66.0	66.0	2.4	66.8		21.0	32.6		3.0	14.6	
Actuated g/C Ratio	0.01	0.55	0.55	0.02	0.56		0.18	0.27		0.02	0.12	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	21	942	862	34	1023		310	459		43	226	
v/s Ratio Prot	0.01	0.52		c0.01	c0.58		c0.24	0.01		0.01	c0.02	
v/s Ratio Perm			0.12									
v/c Ratio	0.57	0.94	0.21	0.74	1.05		1.37	0.05		0.56	0.20	
Uniform Delay, d1	58.9	25.1	13.8	58.5	26.6		49.5	32.3		57.8	47.4	
Progression Factor	1.00	1.00	1.00	1.08	1.38		1.09	0.93		1.00	1.00	
Incremental Delay, d2	32.5	16.3	0.1	27.4	32.2		176.3	0.1		14.8	2.0	
Delay (s)	91.3	41.4	13.9	90.7	69.0		230.1	30.3		72.6	49.4	
Level of Service	F	D	B	F	E		F	C		E	D	
Approach Delay (s)		35.3			69.5			208.7			56.9	
Approach LOS		D			E			F			E	

Intersection Summary

HCM Average Control Delay	78.3	HCM Level of Service	E
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

APPLICATION FOR
COMPREHENSIVE PLAN MAP AMENDMENT & ZONE CHANGE

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PROPOSAL:	**Amend the Comprehensive Plan and Zoning Maps from Medium Density Residential (MDRL) to Retail Commercial (RC).**	
LOCATION:	**21305 SW Pacific Highway; Tax Lot: 2S130D001200**	
ZONING:	**Medium Density Residential (MDRL)**	
DATE:	**ORIGINALLY FILED:**	**May 20, 2006**
	FIRST REVISION FILED:	**July 24, 2006**
	SECOND REVISION FILED:	**August 27, 2006**

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NARRATIVE

Site Description & Neighboring Properties

The site is located at 21305 SW Pacific Highway. As shown on Map 1: Vicinity Map, the site is approximately ½ mile southwest of the intersection of Tualatin-Sherwood Highway and Pacific Highway (Hwy 99W). The site is 5.74 acres in area, flat, and currently has no mobile home residents. There is a single-family home on the site, which was used as a residence and office for the park manager. The site has internal road and utility infrastructure appropriate to a mobile home park. The site has two driveway accesses onto Pacific Highway.

The site was originally developed in 1964 as a mobile home park with 41 single-wide spaces. At that time, it was surrounded on three sides by vacant fields. The Sherwood Comprehensive Plan was acknowledged in 1981, and assigned the MDRL plan designation to the site in accordance with its use. The City approved a zone change from HDR to MDRL in 1988, to allow an expansion of the park for which a conditional use permit was approved in 1989.

As shown on Map 2: Zoning/Plan Map, properties to the northeast along Pacific Highway are planned and zoned predominantly RC to the intersection of Tualatin-Sherwood Highway, with one Mixed Use Employment (MUE) parcel. To the southwest, properties are primarily General Commercial (GC) for another ¾ mile, with a sizeable High Density Residential (HDR) parcel. Across Pacific Highway, properties are primarily RC to the northeast, and a mix of GC, RC, HDR, MUE, and MDRL to the southwest.

Immediately adjacent to the northeast is the List property, planned and zoned RC, currently in use for small scale retail and storage. The property immediately adjacent to the southwest is planned and zoned GC, and currently is applying for development of a hotel. Behind the subject site, to the northwest, is a parcel designated HDR that is developed with apartments. The property immediately across Pacific Highway to the southeast is zoned GC and developed for highway retail.

In summary, the site is an unused former mobile home park, in what is now Sherwood's busiest commercial area, located along a highway, between two commercially-zoned lots, across the street from a commercially-zoned lot.

Proposal

The proposal is to amend the Sherwood Comprehensive Plan and Zoning Map from Medium Density Residential (MDRL) to Retail Commercial (RC) on the 5.7-acre site. The reasons for this proposal are:

1) The mobile home park is no longer a viable use for the property owner. The park is vacant and outdated as it was originally constructed for single-wide homes. The infrastructure investment to retrofit the park for the current standard of double-wide homes is not financially feasible.

2) The surrounding area has changed and continues to change. Adjacent properties along the Pacific Highway are zoned for commercial uses. Traffic has increased dramatically, creating substantial noise concerns for residential dwellings.

3) The property was zoned to allow an existing use to continue and expand. The site is located between RC and GC zoned properties, and would be more consistent with adjacent uses and zoning if designated as a commercial property.

4) Amending the Comprehensive Plan and Zoning Designations for the site is in accordance with the City's economic and commercial objectives and policies.

5) Discussions with City Planning Staff indicated that the Retail Commercial designation was the most appropriate commercial designation for the site, as a somewhat lower intensity commercial zone adjacent to a residential use (apartments).

PLAN & ZONE AMENDMENT STANDARDS

4.203.02 Map Amendment

An amendment to the City Zoning Map may be granted, provided that the proposal satisfies all applicable requirements of the adopted Sherwood Comprehensive Plan, the Transportation System Plan and this Code, and that:

A. The proposed amendment is consistent with the goals and policies of the Comprehensive Plan and the Transportation System Plan.

Response: The Goals and Policies of the Sherwood Comprehensive Plan (SCP) and Transportation System Plan (TSP) are provided in this application, as well as responses to each standard, goal, and policy.

B. There is an existing and demonstrable need for the particular uses and zoning proposed, taking into account the importance of such uses to the economy of the City, the existing market demand for any goods or services which such uses will provide, the presence or absence and location of other such uses or similar uses in the area, and the general public good.

Response: The City of Sherwood, working with Cogan Owens Cogan, completed its Economic Opportunities Analysis (EOA) in early 2007. The EOA found that the City of Sherwood had only 13 acres of vacant commercial land left, including just 6 lots zoned for RC.

The EOA concluded that Sherwood would need to add 27 additional acres to its UGB for new commercial development, under the preferred "medium growth scenario". This qualifies as a demonstrated need for commercial land within the City.

The EOA also included new Commercial Policies. The subject site is clearly consistent with Policies 1-3, and does not conflict with Old Town Revitalization planning:

- ***Policy 1. Commercial activities will be located so as to most conveniently service customers.***

The subject site is associated with the large, established "Six Corners" commercial area, making it very convenient to the customers who already use the area, as well as the large volume of traffic that passes through this area.

- ***Policy 2. Commercial uses will be developed so as to complement rather than detract from adjoining uses.***

Development of a commercial use on this site would *better* complement the adjacent commercial land and uses than a mobile home park or the single-family / duplex uses allowed under the current MDRL zoning.

- ***Policy 3. Highway 99W is an appropriate location for commercial development at the highway's intersections with City arterial and major collector roadways.***

  The site is located along Highway 99W, near several major intersections.

- ***Policy 4. The 1983 "Sherwood Old Town Revitalization Plan" and its guidelines and strategies are adopted as a part of the Sherwood Comprehensive Plan.***

The site is not part of Old Town, and the Revitalization Plan is not applicable.

The City of Sherwood's ***Urban Renewal Plan*** also includes the goal:

To promote private development, redevelopment, and rehabilitation in both Old Town and Six Corners to help create jobs, tax revenues, and self-sustaining, vital, and vibrant commercial districts.

Amending the Comprehensive Plan and Zoning designation for the subject site would increase the vitality of the Six Corners area, by replacing a defunct mobile home park site with a commercial area consistent and compatible with surrounding zoning.

C. The proposed amendment is timely, considering the pattern of development in the area, surrounding land uses, any changes which may have occurred in the neighborhood or community to warrant the proposed amendment, and the availability of utilities and services to serve all potential uses in the proposed zoning district.

Response: As discussed above, the mobile home park use was originally developed before Sherwood's Comprehensive Plan was adopted, at a time when there was comparatively very little commercial development in the Six Corners area, and no development on adjacent properties. Now, the site is an unused former mobile home park zoned for medium density residential, between two commercial parcels, in Sherwood's busiest commercial area. The proposed amendment is both timely and consistent with the area's land use pattern.

Other lands in the City already zoned for the proposed uses are either unavailable or unsuitable for immediate development due to location, size or other factors.

Response: As discussed above, the City of Sherwood's EOA indicates a demonstrated need for additional commercial land. The subject site is the only property zoned MDRL along Pacific Highway between Tualatin-Sherwood Highway and Meineke Parkway, a stretch of nearly a mile.

COMPREHENSIVE PLAN GOALS AND POLICIES

Residential Goals and Policies

Policy 1. Residential areas will be developed in a manner which will insure that the integrity of the community is preserved and strengthened.

Response: The proposed amendment will result in zoning consistent with adjacent properties along Pacific Highway. The Retail Commercial designation is intended to be compatible with residential development, and will serve as a buffer between heavy traffic along Pacific Highway and the HDR development behind the subject site.

Policy 2. The City will insure that an adequate distribution of housing styles and tenures are available.

Policy 3. The City will insure the availability of affordable housing and locational choice for all income groups.

Response: This application proposes to rezone 5.7 acres of MDRL land. According to Chapter 4 of the City of Sherwood's Comprehensive Plan, the City provides an excess of land capable of meeting the needs of manufactured housing:

"As illustrated in Table IV-4, there are 743 acres zoned VLDR and LDR for strictly conventional housing, and 151 acres zoned MDRL, for conventional or manufactured housing. This indicates a shortage of 64

acres available in the MDRL zone for manufactured housing. Therefore, the City permits manufactured homes on individual lots in the MDRH zone, of which there are 172 buildable acres (Table IV-4). The City then exceeds the requirements for meeting the needs of manufactured housing."

However, the housing needs section of the Comprehensive Plan appears to be dated to 1990. Metro Title 1 also addresses housing needs for cities within the Metro area. Consistency with Title 1 requirements would indicate the City is remaining in compliance with these policies. Title 1 requirements are addressed in the Title 1 section of this application.

Given the unsuitability of the site for its current use and zoning, a demonstrated need for additional employment/commercial land within Sherwood, suitability of the site for commercial, and compliance with all other standards, it is clear the site is more in compliance with the comprehensive plan as commercial than as residential.

Policy 4. The City shall provide housing and special care opportunities for the elderly, disadvantaged and children.

Policy 5. The City shall encourage government assisted housing for low to moderate income families.

Policy 6. The City will create, designate and administer five residential zones specifying the purpose and standards of each consistent with the need for a balance in housing densities, styles, prices and tenures.

Response: These policies do not apply to this application.

Commercial Goals and Policies

Policy 1. The City will coordinate on-going economic development planning with involved public and private agencies at the state, regional, county and local level.

Response: The City has recently completed an EOA, which responds to regional and local economic development coordination concerns.

Policy 2. The City will encourage economic growth that is consistent with the management and use of its environmental resources.

Response: The subject site has already been developed, and has no identified environmental resources.

Policy 3. The City will direct public expenditures toward the realization of community development goals by assuring the adequacy of community services and facilities for existing and future economic development.

Response: The City has taken steps toward meeting this policy by developing an EOA. As discussed above, the proposed plan amendment helps meet the economic goals and policies of the EOA.

Policy 4. The City will seek to improve regional access to the urban area as a means to encourage local economic development.

Response: This policy deals with regional access to Sherwood and is inapplicable to this plan amendment application. However, the proposed plan amendment would increase Sherwood's commercial land supply near two major transportation routes, as it lies along Pacific Highway, and about ¼ from the Tualatin-Sherwood Highway. This would benefit the City's efforts to increase access to local businesses.

Policy 5. The City will seek to diversify and expand commercial and industrial development in order to provide nearby job opportunities, and expand the tax base.

Response: Providing additional employment land within Sherwood's most active commercial hub is consistent with a policy of providing nearby job opportunities and expanding the tax base.

Policy 6. The City will seek funding through EDA or HUD for the rehabilitation of the Old Town and Washington Hill neighborhoods.

Response: The site is not within Old Town or Washington Hill; the policy does not apply to this application.

Commercial Policies

Policy 1. Commercial activities will be located so as to most conveniently service customers.

Policy 2. Commercial uses will be developed so as to complement rather than detract from adjoining uses.

Policy 3. Highway 99W is an appropriate location for commercial development at the highway's intersections with City arterial and major collector roadways.

Policy 4. The 1983 "Sherwood Old Town Revitalization Plan" and its guidelines and strategies are adopted as a part of the Sherwood Comprehensive Plan.

Response: These policies were addressed earlier in this application, in response to Map Amendment standard 4.203.02(B). The proposed plan amendment is highly supportive of Policies 1-3, and does not conflict with Policy 4.

Transportation Goals and Policies

Comprehensive Plan Chapter 6 Goals and Policies, Statewide Planning Goal 12, and Transportation Planning Rule Consistency.

Response: Lancaster Engineering has coordinated closely with the City and ODOT throughout the application process. Lancaster Engineering has prepared a Traffic Analysis, attached as Exhibit A. The Sherwood Municipal Code requires an analysis of transportation impacts, consistent with the Transportation Planning Rule (OAR 660-012-0060), as implemented by SMC 16.80.030.3:

3. Transportation Planning Rule Consistency

A. Review of plan and text amendment applications for effect on transportation facilities. Proposals shall be reviewed to determine whether it significantly affects a transportation facility, in accordance with OAR 660-12-0060 (the TPR). Review is required when a development application includes a proposed amendment to the Comprehensive Plan or changes to land use regulations.

B. "Significant" means that the transportation facility would change the functional classification of an existing or planned transportation facility, change the standards implementing a functional classification, allow types of land use, allow types or levels of land use that would result in levels of travel or access that are inconsistent with the functional classification of a transportation facility, or would reduce the level of service of the facility below the minimum level identified on the Transportation System Plan.

C. Per OAR 660-12-0060, Amendments to the Comprehensive Plan or changes to land use regulations which significantly affect a transportation facility shall assure that allowed land uses are consistent with the function, capacity, and level of service of the facility identified in the Transportation System Plan. This shall be accomplished by one of the following:

1. Limiting allowed uses to be consistent with the planned function of the transportation facility.

2. Amending the Transportation System Plan to ensure that existing, improved, or new transportation facilities are adequate to support the proposed land uses.

3. Altering land use designations, densities or design requirements to reduce demand for automobile travel and meet travel needs through other modes.

The Lancaster TIS notes that the weekday site trips increases from 602 under the present MDRL zoning to 4,767, an increase of 4,165 daily trips. While the trip generation calculation is based upon "worst case" development scenarios under both existing and proposed zoning designations, there unquestionably will be a large increase under the proposed RC designation.

The Lancaster TIS does not conclude that the proposed zone change will have a "significant impact" on the surrounding roadways, as defined by the SMC and TPR. This is because the Tualatin-Sherwood Road/Highway 99W and Edy Road/Highway 99W intersections are projected to exceed LOS standards even with no change in zoning for this site. However, the Lancaster TIS does recommend improvements at these intersections that will have the effect of bringing operating conditions to slightly better than background conditions (see Lancaster TIS, "Conclusions", page 24).

No condition of approval should be imposed at this time, as the Lancaster TIS is based upon the "worst case" development, in other words, the highest potential trip generators among all possible future uses. The actual uses that occur on the site will most likely generate less traffic. Mitigation is appropriately required at the time of development, consistent with the level of impact that will be confirmed by an analysis of traffic from a specific building proposal.

Based on the Lancaster TIS, the zoning change proposed will be consistent with the SMC 16.80.030.3 and the TPR, with mitigation required through future development review.

STATEWIDE PLANNING GOALS

Statewide Planning Goal 9 (Economic Development)

To provide adequate opportunities throughout the state for a variety of economic activities vital to the health, welfare, and prosperity of Oregon's citizens.

Comprehensive plans and policies shall contribute to a stable and healthy economy in all regions of the state. Such plans shall be based on inventories of areas suitable for increased economic growth and activity after taking into consideration the health of the current economic base; materials and energy availability and cost; labor market factors; educational and technical training programs; availability of key public facilities; necessary support facilities; current market forces; location relative to markets; availability of renewable and non-renewable resources; availability of land; and pollution control requirements.

Oregon Administrative Rule 660-009 (Economic Development) implements Goal 9. OAR 660-009 requires that Cities and Counties prepare Economic Opportunities Analyses in accordance with the directions in the Rule. It also requires that Cities provide an adequate supply of land to meet identified employment needs.

As discussed above, Sherwood adopted an EOA earlier this year. As discussed above, the proposed plan amendment helps meet some of the commercial land need identified in the EOA. As discussed above, the proposed plan amendment meets economic goals and policies found in the EOA, the City's Comprehensive Plan, and the City's Economic Development Strategy.

The proposed plan amendment is consistent with the requirements of Goal 9 and its Administrative Rule.

Statewide Planning Goal 10 (Housing)

To provide for the housing needs of citizens of the state.

Buildable lands for residential use shall be inventoried and plans shall encourage the availability of adequate numbers of needed housing units at price ranges and rent levels which are commensurate with the financial capabilities of Oregon households and allow for flexibility of housing location, type and density.

Statewide Planning Goal 10 is implemented in the Metro region by OAR 660-007 (Metropolitan Housing). OAR 660-007 provides density standards and methodology for land need and supply comparisons. Metro Title 1 responds to the requirements of the Metropolitan Housing Rule. By complying with Metro Title 1, Sherwood complies with OAR 660-007 as well as Statewide Planning Goal 10. Title 1 is discussed below.

METRO TITLE 1: REQUIREMENTS FOR HOUSING AND EMPLOYMENT ALLOCATION

Metro Title 1 applies dwelling unit and job capacity to each city within the Metro area. These numbers are found in Table 3.07-1 of Metro's Urban Growth Management Functional Plan. Sherwood's capacity requirements are 5,216 dwelling units and 9,518 jobs.

Housing

The 5.74-acre site was developed with spaces for 41 manufactured homes and could, under the MDRL Zone, be developed with as many as 63 single family residences under the most optimistic development scenario (based upon the Lancaster TIS "worst case", page 11). Even if 63 dwellings were possible, accounting for street right of way, design constraints, access, etc., the site would represent only 1.2% of the City's assigned total dwelling units.

To remain in compliance with Title 1, the City must show that the target of 5,216 dwelling units remains possible, even with a loss of dwelling potential for this site. There are several factors the demonstrate compliance will remain possible:

1. Residential development is possible in the RC Zone, at High Density Residential dimensional standards as a PUD process (SMC 2,109.02.M).

2. The Brookman Road UGB expansion will add nearly 250 acres to the City of Sherwood, with approximately 1/3 of the area devoted to residential uses at Metro's target of 10 dwellings per acre. Allowing for roads and other constraints, 1/3 of the area could net between 50 to 60 acres for new residential development. This would add the possibility of 500 to 600 new dwellings, so that Sherwood could remain in compliance with its Metro target of 5,216 dwellings even with the loss of 41 for the manufactured home park.

3. The SMC requires new residential development, including subdivisions, to meet a standard of 80% of maximum density. The housing target can be met with development at 80%. Therefore, any additional units beyond the "80%" potentially exceed the Metro target.

While projections and comparisons are not necessarily despositive, what can be safely concluded is that the present zoning allows as many as 63 dwellings, with a likely population density of 160.65 persons[1] (assuming 2.55 persons/dwelling). With the possibility of residential development in the RC Zone and the Brookman Road UGB expansion, the City of Sherwood will be likely to remain in compliance with Metro's Title 1 target for housing.

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1 City of Sherwood Staff Report: File No. PA 00-04 2040 Title 1 Plan & Code Amendments, December 6, 2000, Exhibit A, page 8 of 14.

Housing: Density Analysis

Subdivisions approved by the City of Sherwood since 2000 have created lots in all zones at 136.2% of the minimum density and 83.7% of the maximum density. For the Very Low Density Residential, Low Density Residential, and Medium Density Residential Low Zones, platting has occurred at 135.9% of the minimum density and 97.7% of the maximum density allowed. The City of Sherwood has exceeded its minimum density standard by 76 lots.

Background and Limitations for Subdivisions Surveyed

The City of Sherwood provided decisions and information for a total of 39 approved subdivisions, as shown in Exhibit B: City of Sherwood Subdivisions, 1999-2006. The method of calculating density appears to have changed after 2000, following adoption of amendments designed to ensure compliance with Metro's housing target. For that reason, only subdivisions approved from 2001 to 2006 were included in the calculations in the following summary table, "Subdivision Density Analysis". Several projects, as noted in Exhibit B, were not included due to previous approvals (PUD overlays) or insufficient information. In all, seventeen subdivisions were used for the calculations.

Subdivision Density Analysis

2001-2006 Approved Subdivisions	Total Lots Platted	Minimum Density	Percentage of Minimum	Maximum Density	Percentage of Maximum
VLDR, LDR & MDRL Zones	180 lots	132.42 dwellings	135.9%	184.25 dwellings	97.7%
MDRH Zone	108 lots	79 dwellings	136.8%	160 dwellings	67.5%
Summary	288 lots	211.42	136.2%	344.25 dwellings	83.7%

Note: Density was calculated differently prior to 2001 and information for prior subdivisions is not provided in the decision documents.

The seventeen subdivisions that served as the basis for the density calculations in Table B ranged from large (45 lots on 11.20 acres) to small (4 to 5 lots on 0.63 to 0.76 acres).

Subdivisions were separated into two categories by zoning district, VLDR, LDR, and MDRL as one category and MDRH as the second. The categories seemed necessary as the very wide density range allowed in the MDRH skewed the calculations.

For the eleven VLDR, LDR and MDRL subdivisions for which the numbers were clear, the gross land area involved was 37.54 acres and the net area was 29.104 acres, or 77.5%. For the three MDRH subdivisions, gross land area was 22.3 acres and net area was 14.62 acres, or 65% developable land. Combined, the 73% of the gross land area was developed for housing. Deductions to arrive at net area included street rights of way and physical constraints, such as wetlands.

Even with the limitations on the data and cautions about generalizations for the reasons discussed, the trend is interesting: Most VLDR, LDR, and MDRL subdivisions are platted at or near maximum density.

Employment

Employment density is not as easy to determine, owing to the widely varying numbers of employees by business type. Based upon the Lancaster TIS "worst case" for commercial development, the site could be developed with 11,000 square feet of Medical Office Building, 77,000 square feet of Shopping Center, and 4,500 square feet of Drive-in Bank.

Employment densities are the subject of Metro's "2002-2022 Urban Growth Report: An Employment Land Need Analysis, Table 2 (page 13), reproduced in part here:

Regional Average Densities by Building Type

	Office	Retail	Medical/Government
Square feet/job	300	350	400
Floor Area Ratio	0.60	0.44	0.34

Using Lancaster's numbers, the following employment generation might be expected:

Site Employment Projection

Building type	Area	Employment
Medical Office Building	11,000 square feet	27.5 jobs
Shopping Center	77,000 square feet	220 jobs
Drive-in Bank (office/retail)	4,500 square feet	15 office or 12.9 retail jobs (Average: 14 jobs)
	92,500 square feet	231.5 jobs

This analysis must be taken with due consideration for the basis of the assumptions: Lancaster's "worst case" development scenario and Metro's regional averages. Neither may apply directly to the site, which is unlikely to be developed to worst case build-out and which may have more—or less—employees per square foot of building area.

What can be safely concluded is that the present zoning allows no employment and the RC would offer the possibility of new jobs. The estimate of 231.5 jobs would represent an increase in population (employment) density under the proposed RC zoning.

CONCLUSION

This narrative explains how the applicable criteria are satisfied, including City of Sherwood requirements as well as Metro's Title 1 targets for housing and employment. For these reasons, the request for Comprehensive Plan and Zoning Map change should be approved and the site designated "RC" to allow for future development consistent with adjacent properties and the City's Goals and Policies for the area.

PDX_DOCS:398828.1 [36370-00100]

EXHIBIT A: Transportation Impact Study under Separate Cover

Exhibit B: City of Sherwood Subdivisions
1999 - 2006

Name	Zone	Acreage	Dwellings/Lots	Density
*SUB 06-04 Noble Fir	MDRL	.90 acres (net 0.76)	5 lots	4 to 6
SUB 06-03	MDRH & LDR with PUD overlay	7.38 acres	7 lots (6 dwellings)	LDR – consistent with previous PUD approval; MDRH – to remain ball fields
*SUB 06-02 Parkway Plaza	MDRL & GC	.84 acre/37,598 sq. ft. MDRL & 22,264 sq. ft. GC	6 lots/MDRL	4 to 6
*SUB 06-01 Rosewood Estates	LDR	1.32 acres (net 1.11 acres)	6 lots (reduced to 5)	4 to 5
SUB 05-04 Sky Ridge Estates	LDR with PUD overlay	1.5 acres	10 lots	Approved with PUD
SUB 05-02 Copper Ridge				
**SUB 04-09 Timber Crossing at Woodhaven No. 2	MDRH	8.7 acres (net 6.35)	48 lots	35 to 70
*SUB 04-08 Katrina III	MDRL	1.71 acres (net 1.51)	11 lots	12 maximum
SUB 04-07 Richen Meadows	LDR & MDRH	9 acres LDR net 6.19 acres MDRH net .7 acres	39 lots	LDR 22 to 30.95 (35 proposed) MDRH 3.85 -7.7 app'd for 39
*SUB 04-06 Maryhaven	LDR	1.31 acres (net 1.25 acres)	6 lots	6.25 max.
SUB 04-05 Arbor Terrace	HDR + PUD			Final dev. Review; density previously considered
*SUB 04-04 Middleton Heights	LDR	3.97 acres (net 3.40 acres)	16 or 17 lots	17 max.
*SUB 04-03 Blue Spruce Crossing	MDRL	0.74 acres (net 0.63 acres)	5 lots	3.5 to 5

*SUB 04-02 Darlakay Court	no information			
*SUB 04-01 Ironwood Acres	VLDR (site constraints)	7.05 acres (net 4.404)	4 lots	3 to 4.4
*SUB 03-05 Copper Meadows	LDR	11.20 (net 9.03 acres)	45 lots	31 to 45
*SUB 03-04 Quail Meadows	LDR	4.35 acres (net 3.21 acres)	16 lots	11.2 to 16
SUB 03-03 Conzelmann Farm (notice of decision only)			57 lots	
*SUB 03-02 Timber Crossing at Woodhaven	MDRL	2.79 acres (net 2.0 acres)	16 lots	11.2 to 16
*SUB 03-01 Timbrel Lane	LDR	Net 0.86 acres	4 lots	3 to 4
SUB 02-03 Cannery at Sherwood	RC & HDR + Old Town Overlay		7 lots	
**SUB 02-02 Renaisance at Cedar Creek East	MDRH	4.82 acres (net 3.01 acres)	22 lots	16 to 33
**SUB 02-01 Renaisance at Cedar Creek West	MDRH	8.78 acres (net 5.26 acres)	38 lots	28 to 57
*SUB 01-03 LaVons Hidden Meadows	LDR	Net 5.52 acres	27 lots	19.32 to 27.60
*SUB 01-02 Sherwood Townhomes	no information			
SUB 01-01 Lady Marion	MDRL	2.20 acres (net 1.8 acres)	13 lots	10 to 14
SUB 00-07 Langer Marketplace			4 lots	
SUB 00-06 Nottingham Phase II	MDRH & GC	9.72 acres (site = 2.75 acres)	7 lots for SFR; one GC + MDRH	no information
SUB 00-05 Woodhaven Phase 9	LDR and Woodhaven PUD	6.68 acres	45 lots	Set with PUD at 65 units
SUB 00-04 Pinehurst	LDR	13.84 acres	68 lots	Max. 5

Estates			4.9 dwgs/acre	dwgs./acre
SUB 00-03 Orchard Hill			56 lots SFR + 1 lot commercial	
SUB 00-02	MDRL	2.09 acres	13 lots (6.5 dwgs/acre)	Max. 8 dwgs/acre
SUB 00-01	MDRH	3.2 acres	17 lots	
SUB 99-8 Nottingham	MDRH & GC	10. 5 acres MDRH 19,556 sq. ft. GC	50 lots (inc. one large future res. & one large future commercial)	
SUB 99-7			10 lots	
SUB 99-4 Oregon Trail No. 4			18 lots	
SUB 99-3 Woodhaven Phase 8C (denied)				
SUB 99-2 Sherwood Springs	MDRL			
SUB 99-1 Edy Village			28 lots	

*Subdivisions used in density calculations in the VLDR, LDR, and MDRL Zones.
**Subdivisions used in density calculations in the MDRH Zone.

First American Title Insurance Company
National Commercial Services
200 SW Market Street, Suite 250
Portland, Oregon 97201

Title Officer: **Steve Manome**
Phone: **(503)219-8742**
Fax: **(503)795-7614**
E-mail **smanome@firstam.com**

File No: **NCS-284631-OR1**

Escrow Officer: **Lori E. Weber**
Phone: **(503)795-7616**
Fax: **(503)795-7614**
E-mail **leweber@firstam.com**

File No: **NCS-284631-OR1**

PRELIMINARY TITLE REPORT

ALTA Owners Standard Coverage	Liability	$		Premium	$	
ALTA Owners Extended Coverage	Liability	$		Premium	$	
ALTA Lenders Standard Coverage	Liability	$		Premium	$	
ALTA Lenders Extended Coverage	Liability	$	TBD	Premium	$	TBD
ALTA Leasehold Standard Coverage	Liability	$		Premium	$	
ALTA Leasehold Extended Coverage	Liability	$		Premium	$	
Endorsements	Liability	$		Premium	$	
Govt Service Charge				Cost	$	50.00
Other					$	

We are prepared to issue Title Insurance Policy or Policies in the form and amount shown above, insuring title to the following described land:

The land referred to in this report is described in Exhibit "A" attached hereto.

and as of **03/13/2007** at **8:00 a.m.**, title vested in:

Donald V. Pfeifer and Virginia E. Pfeifer as Trustee of the Donald V. Pfeifer Trust, executed the 30 day of April, 1992 and Virginia E. Pfeifer and Donald V. Pfeifer as Trustee of the Virginia E. Pfeifer Trust, excuted the 30 day of April, 1992, each as to an undivided one-half interest as tenants in common.

Subject to the exceptions, exclusions, and stipulations which are ordinarily part of such Policy form and the following:

11. Any lien, or right to a lien, for services, labor or material theretofore or hereafter furnished, imposed by law and not shown by the public records.

12. Any rights, interests, or claims of parties in possession of the land not shown by the public records.

-END OF EXCEPTIONS-

1. Taxes for the year 2006-2007

Tax Amount:	17,200.77
Unpaid Balance:	17,200.77, plus interest, if any
Code No.:	088.10
Map & Tax Lot No.:	2S1W30D-01200
Property ID/Key No.:	R548866

2. City liens, if any, for the city of Sherwood.
Note: An inquiry has NOT been made concerning the actual status of such liens.

3. These premises are within the boundaries of the Clean Water Services District and are subject to the levies and assessments thereof.

4. Limited access provisions contained in Deed to the State of Oregon, by and through its State Highway Commission recorded February 07, 1956 in Book 362, Page 0480 Deed Records, which provides that no right of easement or right of access to, from or across the State Highway other than expressly therein provided for shall attach to the abutting property.

   Document(s) declaring modifications thereof recorded April 15, 1965 in Book 548, Page 0595 of Official Records.

5. Restrictive Covenant to Waive Remonstrance, pertaining to public improvements including the terms and provisions thereof Recorded: February 07, 1989 as Fee No. 89005628

6. The terms, provisions and easement(s) contained in the document entitled "MDU Broadband Services Agreement and Memorandum of Easement" recorded March 27, 2002 as Fee No. 2002-035561 of Official Records.

7. A Deed of Trust to secure an original indebtedness of $750,000.00 recorded January 06, 2003 as Fee No. 2003-001716 of Official Records.

Dated:	December 16, 2002
Trustor:	The Donald V. Pfeifer Trust, Donald V. Pfeifer and Virginia E. Pfeifer Trustees as executed on the 30th day of April 1992 and the Virginia E. Pfeifer Trust, Virginia E. Pfeifer and Donald V. Pfeifer Trustees as executed on the 30th day of April 1992
Trustee:	First American Title Insurance Company of Oregon
Beneficiary:	Washington Federal Savings, a United States Corporation

8. Terms, provisions, conditions of the Trust Agreement of Donald V. Pfeifer Trust dated April 30, 1992, and any subsequent modifications, a copy of which should be submitted to this office for inspection.

9. Terms, provisions, conditions of the Trust Agreement of Virginia E. Pfeifer Trust dated April 30, 1992, and any subsequent modifications, a copy of which should be submitted to this office for inspection.

10. Unrecorded leases or periodic tenancies, if any.

Exhibit "A"

Real property in the County of Washington , State of Oregon, described as follows:

BEGINNING AT THE NORTHWESTERLY RIGHT OF WAY LINE OF THE WEST LINE OF PACIFIC HIGHWAY IN SECTION 30, TOWNSHIP 2 SOUTH, RANGE 1 WEST OF THE WILLAMETTE MERIDIAN, IN THE CITY OF SHERWOOD, COUNTY OF WASHINGTON AND STATE OF OREGON, AT THE INTERSECTION OF SAID NORTHWESTERLY LINE OF THE CERTAIN TRACT OF LAND CONVEYED TO CLAUS BORCHERS BY DEED RECORDED IN BOOK 136, PAGE 188, DEED RECORDS, WHICH BEGINNING POINT IS APPROXIMATELY 753.6 FEET SOUTH AND 864.3 FEET WEST OF THE QUARTER CORNER ON THE EAST LINE OF SAID SECTION 30;
THENCE FROM THE DESCRIBED POINT OF BEGINNING SOUTHWESTERLY ALONG SAID NORTHWESTERLY BOUNDARY OF THE WEST SIDE OF PACIFIC HIGHWAY, BEING THE NORTHWESTERLY LINE OF A TRACT OF LAND DESCRIBED IN BOOK 142, PAGE 220, DEED RECORDS, A DISTANCE OF 500 FEET TO THE NORTHEASTERLY CORNER OF THAT TRACT OF LAND CONVEYED TO JOHN H. FREDERICK ET UX BY DEED RECORDED IN BOOK 582, PAGE 575, DEED RECORDS;
THENCE NORTHWESTERLY AND PARALLEL TO THE SOUTHWESTERLY LINE OF THE ABOVE-MENTIONED CLAUS BORCHERS TRACT 522.0 FEET;
THENCE NORTHEASTERLY 500 FEET TO A POINT ON THE SOUTHWESTERLY LINE OF SAID BORCHERS TRACT;
THENCE SOUTHEASTERLY 522.0 FEET TO THE POINT OF BEGINNING.

EXCEPTING THEREFROM THAT PORTION CONVEYED TO THE STATE OF OREGON, BY AND THROUGH ITS STATE HIGHWAY COMMISSION BY WARRANTY DEED RECORDED FEBRUARY 7, 1956 IN BOOK 362, PAGE 480.

First American Title Insurance Company of Oregon

SCHEDULE OF EXCLUSIONS FROM COVERAGE

ALTA LOAN POLICY (10/17/92)

The following matters are expressly excluded from the coverage of this policy and the Company will not pay loss or damage, costs, attorneys' fees or expenses which arise by reason of:

1. (a) Any law, ordinance or governmental regulation (including but not limited to building and zoning laws, ordinances, or regulations) restricting, regulating, prohibiting or relating to (i) the occupancy, use, or enjoyment of the land; (ii) the character, dimensions or location of any improvement now or hereafter erected on the land; (iii) a separation in ownership or a change in the dimensions or area of the land or any parcel of which the land is or was a part; or (iv) environmental protection, or the effect of any violation of these laws, ordinances or governmental regulations, except to the extent that a notice of the enforcement thereof or a notice of a defect, lien or encumbrance resulting from a violation or alleged violation affecting the land has been recorded in the public records at Date of Policy.
   (b) Any governmental police power not excluded by (a) above, except to the extent that a notice of the exercise thereof or a notice of a defect, lien or encumbrance resulting from a violation or alleged violation affecting the land has been recorded in the public records at Date of Policy.
2. Rights of eminent domain unless notice of the exercise thereof has been recorded in the public records at Date of Policy, but not excluding from coverage any taking which has occurred prior to Date of Policy which would be binding on the rights of a purchaser for value without knowledge.
3. Defects, liens, encumbrances, adverse claims, or other matters:
   (a) created, suffered, assumed or agreed to by the insured claimant;
   (b) not known to the Company, not recorded in the public records at Date of Policy, but known to the insured claimant and not disclosed in writing to the Company by the insured claimant prior to the date the insured claimant became an insured under this policy;
   (c) resulting in no loss or damage to the insured claimant;
   (d) attaching or created subsequent to Date of Policy (except to the extent that this policy insures the priority of the lien of the insured mortgage over any statutory lien for services, labor or material or the extent insurance is afforded herein as to assessments for street improvements under construction or completed at date of policy); or
   (e) resulting in loss or damage which would not have been sustained if the insured claimant had paid value for the insured mortgage.
4. Unenforceability of the lien of the insured mortgage because of the inability or failure of the insured at Date of Policy, or the inability or failure of any subsequent owner of the indebtedness, to comply with the applicable "doing business" laws of the state in which the land is situated.
5. Invalidity or unenforceability of the lien of the insured mortgage, or claim thereof, which arises out of the transaction evidenced by the insured mortgage and is based upon usury or any consumer credit protection or truth in lending law.
6. Any statutory lien for services, labor or materials (or the claim of priority of any statutory lien for services, labor or materials over the lien of the insured mortgage) arising from an improvement or work related to the land which is contracted for and commenced subsequent to Date of Policy and is not financed in whole or in part by proceeds of the indebtedness secured by the insured mortgage which at Date of Policy the insured has advanced or is obligated to advance.
7. Any claim, which arises out of the transaction creating the interest of the mortgagee insured by this policy, by reason of the operation of federal bankruptcy, state insolvency, or similar creditors' rights laws, that is based on:
   (i) the transaction creating the interest of the insured mortgagee being deemed a fraudulent conveyance or fraudulent transfer; or
   (ii) the subordination of the interest of the insured mortgagee as a result of the application of the doctrine of equitable subordination; or
   (iii) the transaction creating the interest of the insured mortgagee being deemed a preferential transfer except where the preferential transfer results from the failure:
      (a) to timely record the instrument of transfer; or
      (b) of such recordation to impart notice to a purchaser for value or a judgment or lien creditor.

ALTA OWNER'S POLICY (10/17/92)

The following matters are expressly excluded from the coverage of this policy and the Company will not pay loss or damage, costs, attorneys' fees or expenses which arise by reason of:

1. (a) Any law, ordinance or governmental regulation (including but not limited to building and zoning laws, ordinances, or regulations) restricting, regulating, prohibiting or relating to (i) the occupancy, use, or enjoyment of the land; (ii) the character, dimensions or location of any improvement now or hereafter erected on the land; (iii) a separation in ownership or a change in the dimensions or area of the land or any parcel of which the land is or was a part; or (iv) environmental protection, or the effect of any violation of these laws, ordinances or governmental regulations, except to the extent that a notice of the enforcement thereof or a notice of a defect, lien or encumbrance resulting from a violation or alleged violation affecting the land has been recorded in the public records at Date of Policy.
   (b) Any governmental police power not excluded by (a) above, except to the extent that a notice of the exercise thereof or a notice of a defect, lien or encumbrance resulting from a violation or alleged violation affecting the land has been recorded in the public records at Date of Policy.
2. Rights of eminent domain unless notice of the exercise thereof has been recorded in the public records at Date of Policy, but not excluding from coverage any taking which has occurred prior to Date of Policy which would be binding on the rights of a purchaser for value without knowledge.
3. Defects, liens, encumbrances, adverse claims, or other matters:
   (a) created, suffered, assumed or agreed to by the insured claimant;
   (b) not known to the Company, not recorded in the public records at Date of Policy, but known to the insured claimant and not disclosed in writing to the Company by the insured claimant prior to the date the insured claimant became an insured under this policy;
   (c) resulting in no loss or damage to the insured claimant;
   (d) attaching or created subsequent to Date of Policy; or
   (e) resulting in loss or damage which would not have been sustained if the insured claimant had paid value for the estate or interest insured by this policy.
4. Any claim, which arises out of the transaction vesting in the insured the estate or interest insured by this policy, by reason of the operation of federal bankruptcy, state insolvency, or similar creditors' rights laws, that is based on:
   (i) the transaction creating the estate or interest insured by this policy being deemed a fraudulent conveyance or fraudulent transfer; or
   (ii) the transaction creating the estate or interest insured by this policy being deemed a preferential transfer except where the preferential transfer results from the failure:
      (a) to timely record the instrument of transfer; or
      (b) of such recordation to impart notice to a purchaser for value or a judgment or lien creditor.

SCHEDULE OF STANDARD EXCEPTIONS

The ALTA standard policy form will contain in Schedule B the following standard exceptions to coverage:

1. Taxes or assessments which are not shown as existing liens by the records of any taxing authority that levies taxes or assessments on real property or by the public records; proceeding by a public agency which may result in taxes or assessments, or notice of such proceedings, whether or not shown by the records of such agency or by the public records.
2. Facts, rights, interests, or claims which are not shown by the public records but which could be ascertained by an inspection of said land or by making inquiry of persons in possession thereof.
3. Easements or claims of easement, not shown by the public records; reservations or exceptions in patents or in Acts authorizing the issuance thereof; water rights, claims or title to water.
4. Any encroachment (of existing improvements located on the subject land onto adjoining land or of existing improvements located on adjoining land onto the subject land), encumbrance, violation, variation, or adverse circumstance affecting the title that would be disclosed by an accurate and complete land survey of the subject land.
5. Any lien, or right to a lien, for services, labor, material, equipment rental or workers compensation heretofore or hereafter furnished, imposed by law or not shown by the public records.

NOTE: A SPECIMEN COPY OF THE POLICY FORM (OR FORMS) WILL BE FURNISHED UPON REQUEST

TI 149 Rev. 6-06

Exhibit "A"

Real property in the County of Washington , State of Oregon, described as follows:

BEGINNING AT THE NORTHWESTERLY RIGHT OF WAY LINE OF THE WEST LINE OF PACIFIC HIGHWAY IN SECTION 30, TOWNSHIP 2 SOUTH, RANGE 1 WEST OF THE WILLAMETTE MERIDIAN, IN THE CITY OF SHERWOOD, COUNTY OF WASHINGTON AND STATE OF OREGON, AT THE INTERSECTION OF SAID NORTHWESTERLY LINE OF THE CERTAIN TRACT OF LAND CONVEYED TO CLAUS BORCHERS BY DEED RECORDED IN BOOK 136, PAGE 188, DEED RECORDS, WHICH BEGINNING POINT IS APPROXIMATELY 753.6 FEET SOUTH AND 864.3 FEET WEST OF THE QUARTER CORNER ON THE EAST LINE OF SAID SECTION 30;
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PFEIFER ZONE CHANGE

TRAFFIC IMPACT STUDY

SHERWOOD, OREGON

PREPARED BY
LANCASTER ENGINEERING

JULY 2007

LANCASTER
engineering

PFEIFER ZONE CHANGE

Traffic Impact Study

Sherwood, Oregon

REGISTERED PROFESSIONAL ENGINEER
74680PE
OREGON
JULY 12, 2005
GEOFFREY A. JUDD
7/20/07
EXPIRES: 06/30/09

Prepared By

TODD E. MOBLEY, P.E., P.T.O.E.

GEOFFREY A. JUDD, P.E.

July, 2007

321 SW 4th Avenue, Suite 400 ▪ Portland, OR 97204 ▪ Phone 503.248.0313 ▪ Fax 503.248.9251

TABLE OF CONTENTS

EXECUTIVE SUMMARY

1. A parcel in Sherwood, Oregon is proposed for a change in the zoning. The site is located on the northwestern side of Highway 99W, south of Edy Road. The site was assumed to have a right-in/right-out access to Highway 99W and a full access to the north to Edy Road.

2. The site is expected to generate a net increase of 175 new trips during the morning peak hour, 431 new trips during the evening peak hour, and 4,165 new trips daily.

3. All of the study intersections have been mitigated with the funded and planned improvements listed in the City of Sherwood's Transportation System Plan. There are two intersections that are forecast to operate with a v/c ratio above capacity and would require further mitigations.

4. The intersections of Edy Road at Highway 99W and Tualatin-Sherwood Road at Highway 99W would require mitigations. The mitigations have been described in detail in the body of this report. With the mitigations in place, the intersections will operate better than under background conditions and no further mitigations are necessary.

5. The queuing was evaluated at the study intersections for the background plus net increase in site trips conditions. It was determined that the estimated queues will be accommodated within the existing and proposed striped storages. Therefore, no queuing related mitigations are necessary.

INTRODUCTION

A parcel in Sherwood, Oregon has been proposed for a change in the zoning and Comprehensive Plan amendment. The site was assumed to have a right-in/right-out access to Highway 99W and a full access to the north to Edy Road. The current zoning of the site is Medium Density Residential Low (MDRL) and the proposed zoning will be Retail Commercial (RC).

The purpose of this study is to assess the traffic impact of the proposed zone change on the nearby street system and to recommend any required mitigative measures. The analysis will include level of service calculations and detailed discussion of trip generation for the site.

Detailed information on traffic counts, trip generation calculations, and level of service calculations is included in the appendix to this report.

LOCATION DESCRIPTION

A parcel in Sherwood, Oregon has been proposed for a change in the zoning and Comprehensive Plan amendment. The site is located on the northwestern side of Highway 99W, south of Edy Road. The site was assumed to have a right-in/right-out access to Highway 99W and a full access to the north to Edy Road. A vicinity map showing the existing lane configurations at the study area intersections is shown on page nine.

The City of Sherwood and the Oregon Department of Transportation (ODOT) requires a study of the following intersections:

- Elwert Road/Highway 99W
- Meinecke Road/Highway 99W
- Edy Road/Highway 99W
- Tualatin-Sherwood Road/Highway 99W
- Elwert Road/Edy Road
- Borchers Drive/Edy Road
- Langer Drive/Sherwood Boulevard
- Century Drive/Sherwood Boulevard
- Borchers Drive/Roy Rogers Road
- Site Access/Highway 99W
- Site Access/Edy Road

The following tables describe the study roadways and study intersections.

Study Roadways					
Roadway Names	*Functional Classification*	*# of Lanes*	*Posted Speed (mph)*	*Sidewalk*	*Bike Lane*
Highway 99W	Statewide Highway[1] Arterial[2] Major Arterial[3]	5-6	45	With Development	With Development
Edy Road	Collector[2] Major Collector[3]	2-3	40	With Development	With Development
Elwert Road	Arterial[2] Major Collector[3]	2	Not Posted	No	No
Meinecke Road	Collector[2] Minor Arterial[3]	2	Not Posted	Yes	No
Tualatin-Sherwood Road	Arterial[2] Major Arterial[3]	5-6	45	Yes	Yes
Borchers Drive	Collector[2] Major Collector[3]	2-3	25	Yes	Yes
Langer Drive	Collector[2] Major Collector[3]	2-3	Not Posted	Yes	No
Century Drive	Arterial[2] Major Collector[3]	2	25	Yes	No
12th Street	Collector[2] Major Collector[3]	2	Not Posted	Yes	No
Sherwood Boulevard	Arterial[2] Minor Arterial[3]	2	25	Yes	Yes
Roy Rogers Road	Arterial[2] Major Arterial[3]	3-4	35	Yes	Yes

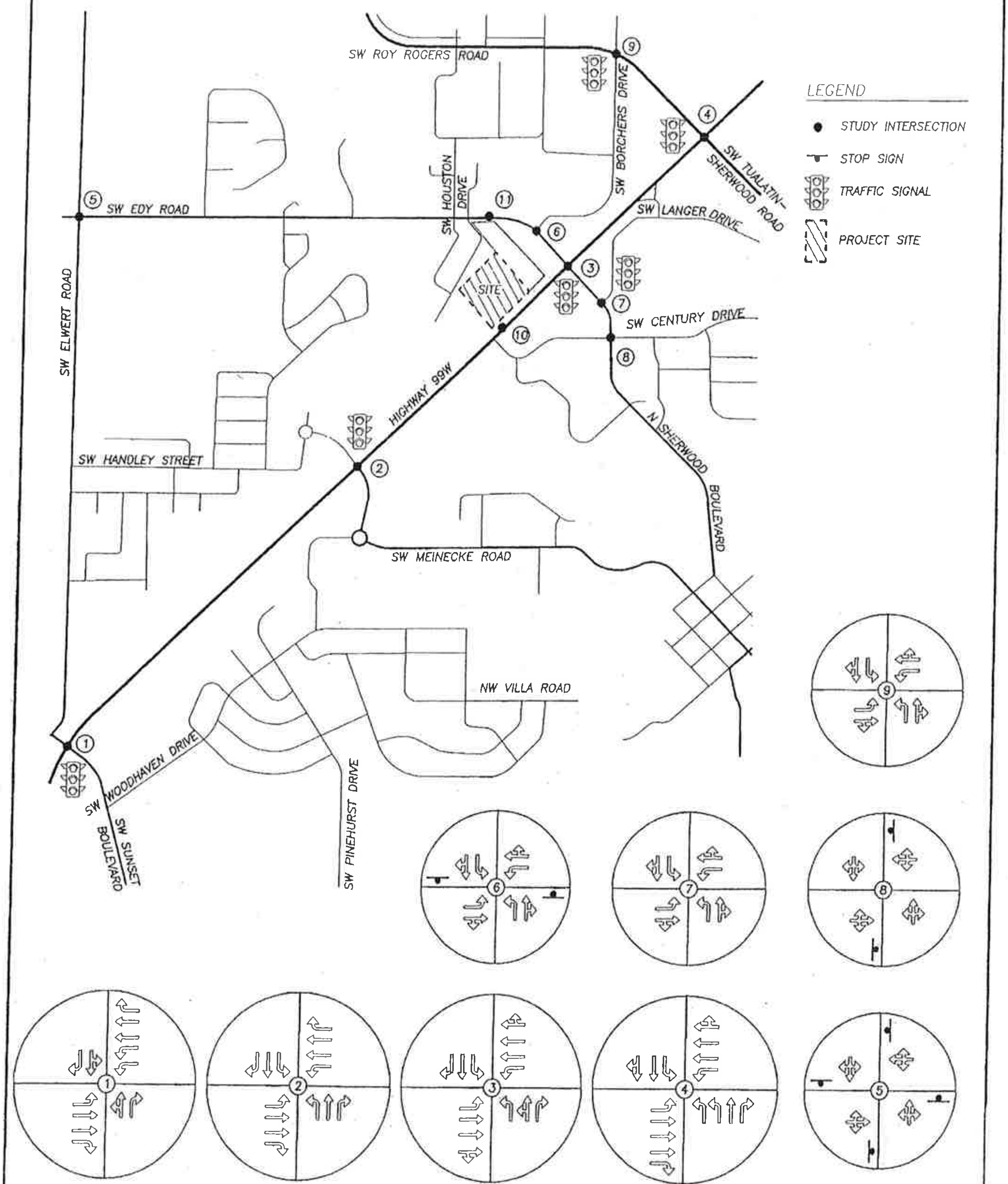
[1] Oregon Department of Transportation (ODOT)
[2] Washington County
[3] City of Sherwood

Study Intersections		
Intersections	*Control*	*Description*
Elwert Road/Highway 99W	Signal	Northbound and Southbound left-turn lanes
Meinecke Road/Highway 9(W	Signal	Left-turn lanes on all approaches
Edy Road/Highway 9(W	Signal	Left-turn lanes on all approaches, Left-turn/Through lane on Sherwood Boulevard
Tualatin-Sherwood Road/Highway 99W	Signal	Left-turn lanes on all approaches, Dual left-turn lanes on Tualatin-Sherwood Boulevard
Elwert Road/Edy Road	AWSC	All approaches are single lane approaches
Borchers Drive/Edy Road	TWSC	Left-turn lanes on all approaches
Langer Drive/Sherwood Boulevard	Signal	Left-turn lanes on all approaches
Century Drive/Sherwood Boulevard	TWSC	All approaches are single lane approaches
Borchers Drive/Roy Rogers Road	Signal	Left-turn lanes on all approaches
AWCS: All-Way Stop Controlled intersection TWSC: Two-Way Stop Controlled intersection		

Transit services provided by Tri-Met in the study area includes routes #12 – Barbur Boulevard and #94 – Sherwood/Pacific Highway Express. Both services operate between

Sherwood City Hall and Portland City Center with 15-minute headways. Route #12 operates between approximately 4:30 a.m. to 12:30 a.m. everyday of the week. Route #94 operates only during the weekdays, between 5:50 to 8:30 a.m. towards Portland and between 3:00 and 7:00 p.m. towards Sherwood.

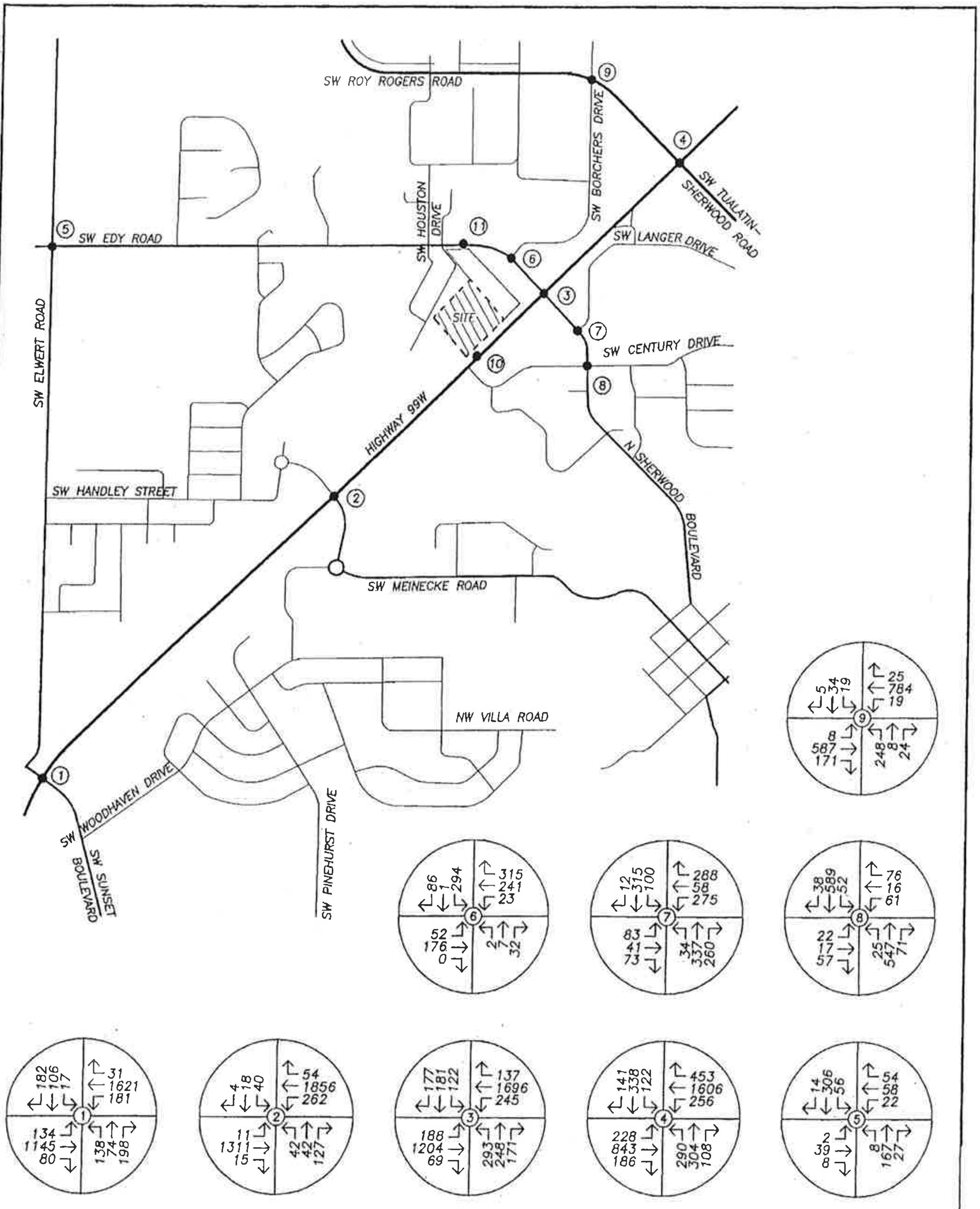
Manual turning movement counts were made at the study intersections during May 2007 from 4:00 to 6:00 p.m. The peak hours typically occur from about 7:05 to 8:05 a.m. and from about 4:30 to 5:30 p.m. The traffic volumes were seasonally adjusted according to the methodology prepared by ODOT. The volumes for the evening peak hour are shown in the traffic flow diagrams on page ten.



VICINITY MAP
Existing Lane Configurations
& Traffic Control Devices

no scale

FIGURE 1



TRAFFIC VOLUMES
Existing Conditions
PM Peak Hour

no scale

FIGURE 2

TRIP GENERATION

When a zone change is proposed, a reasonable worst-case development from a trip generation standpoint under the current zoning is typically compared to a reasonable worst-case development under the proposed zoning. The current Comprehensive Plan predicts transportation needs based on current Comprehensive Plan designations. When that designation is changed, there is a potential for additional traffic impacts if the new zoning is more traffic-intensive.

Under the current zoning (MDRL, Medium Density Residential Low), the worst-case development is 63 single-family detached houses. The worst-case development under the proposed zoning (RC, Retail Commercial) is 11,000 square feet of Medical Office Building, 77,000 square feet of Shopping Center, and 4,500 square feet of Drive-in Bank.

To estimate the number of trips that could potentially be generated by the proposed zone change, trip rates from *TRIP GENERATION*, Seventh Edition, published by the Institute of Transportation Engineers (ITE), were used. Trip rates used were for land-use codes 210, *Single-Family Detached Housing*, 720, *Medical Office Building*, 820, *Shopping Center*, and 912, *Drive-In Bank*.

In order to represent a reasonable worst-case scenario, no transit or multi-modal reduction factor was applied to the trip generation estimates for the proposed zone change.

Under the current zoning designation, the worst-case development is an origin or destination for trips and no reduction was taken for pass-by trips. For the proposed zoning, there are some retail uses. Pass-by trips are trips that leave an adjacent roadway to patronize a land use and then continue in their original direction of travel, for example, stopping by a store on the way home from work. The percentage of pass-by trips was derived based on data in the *TRIP GENERATION HANDBOOK*, published by the Institute of Transportation Engineers (ITE) as a companion to *TRIP GENERATION*. According to the handbook, the Shopping Center land use has an average pass-by trip percentage of 34-percent and the Drive-In Bank land use has an average pass-by trip percentage of 47-percent.

The trip generation calculations indicate that there will be an estimated net increase of 175 trips generated by the proposed zone change during the morning peak hour and 434 trips during the evening peak hour. A net increase of 4,165 weekday trips is expected with the proposed zone change.

A summary of the trip generation calculations for the proposed zone change is shown in the following table. The pass-by reductions have been taken prior to entry in this table. Detailed trip generation calculations are attached to this letter.

TRIP GENERATION SUMMARY

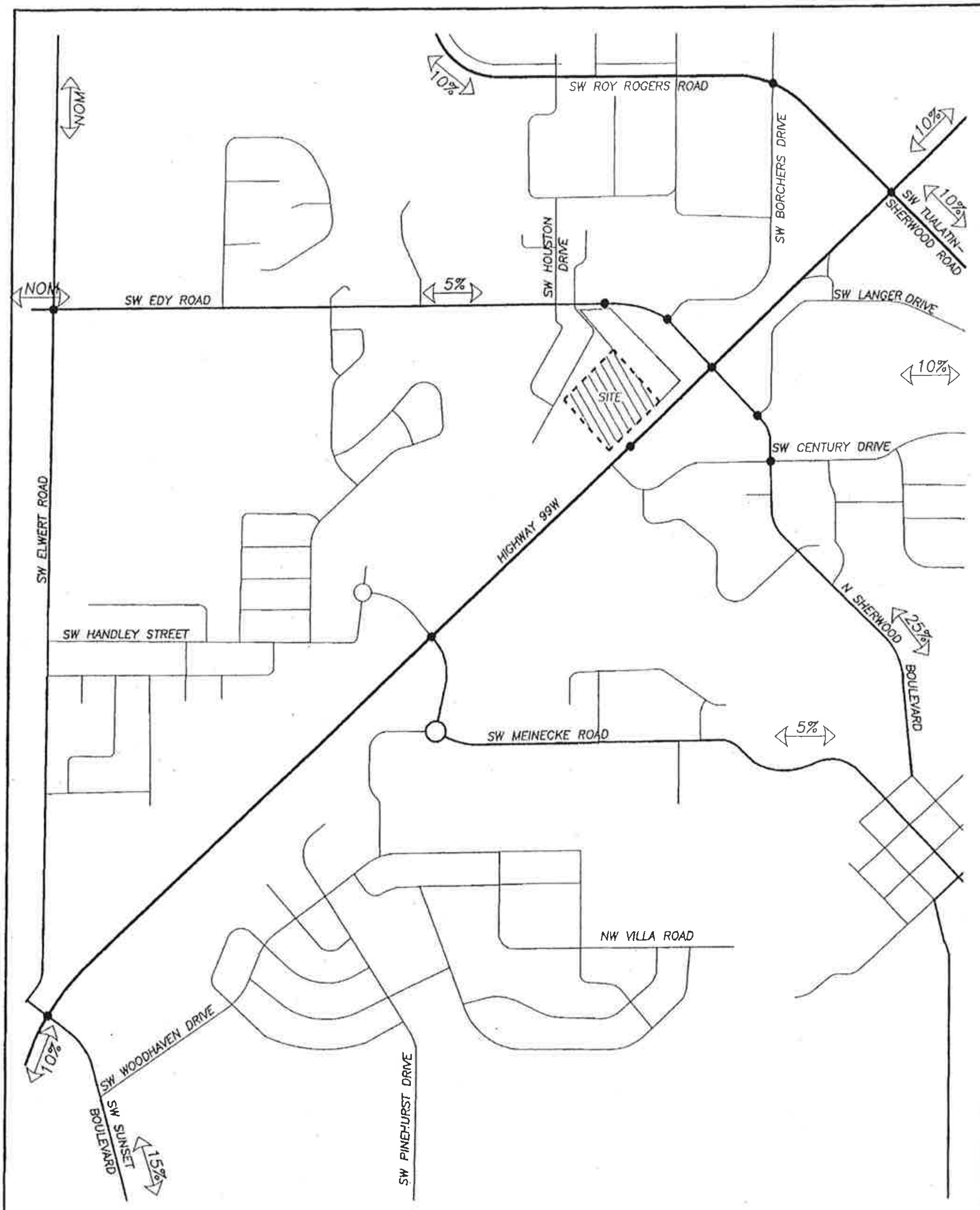
	Entering Trips	Exiting Trips	Total Trips
Current Zoning			
AM Peak Hour	12	35	47
PM Peak Hour	40	24	64
Weekday	301	301	602
Proposed Zoning			
AM Peak Hour	149	73	222
PM Peak Hour	229	269	498
Weekday	2,384	2,384	4,767
Net Increase in Site Trips			
AM Peak Hour	137	38	175
PM Peak Hour	189	245	434
Weekday	2,083	2,083	4,165

TRIP DISTRIBUTION

The existing traffic counts at the study intersection were used to determine the directional distribution of the worst-case development site trips under both the current and proposed zoning designations. The site is located along Highway 99W, which has very high traffic volumes along it and is a commuter route between Sherwood and Portland, and the proposed zone change will likely not impact the distribution of trips.

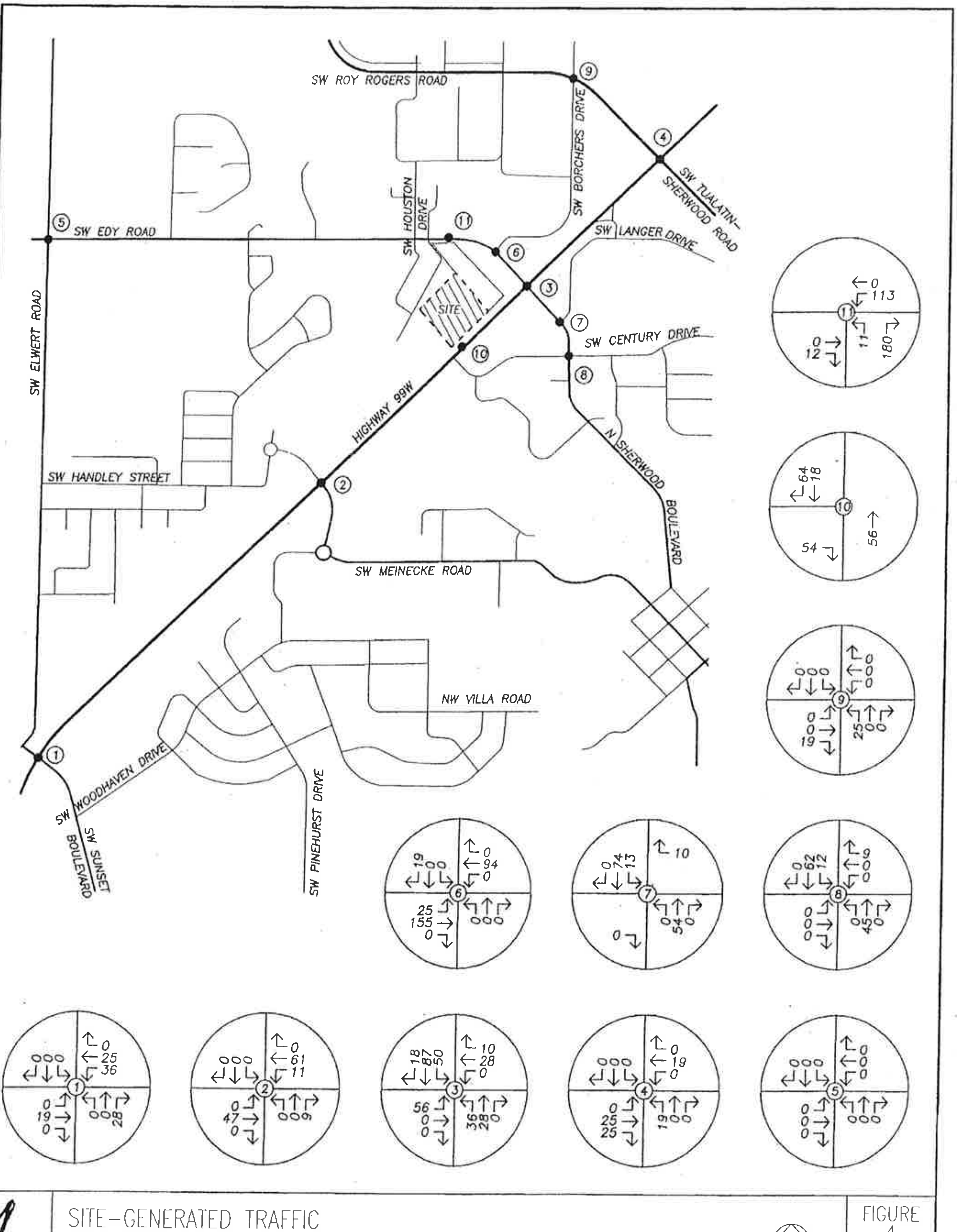
The pass-by trips were assigned using the same trip distribution as the net new trips.

The traffic flow diagram on page 14 shows the distribution of the site trips from the site. The traffic flow diagram on page 15 shows the assignment of the site trips to the roadway network during the evening peak hour.



SITE TRIP DISTRIBUTION
Inbound & Outbound Percentages
PM Peak Hour

FIGURE 3



SITE-GENERATED TRAFFIC
Net Increase in Site Trips
PM Peak Hour

no scale

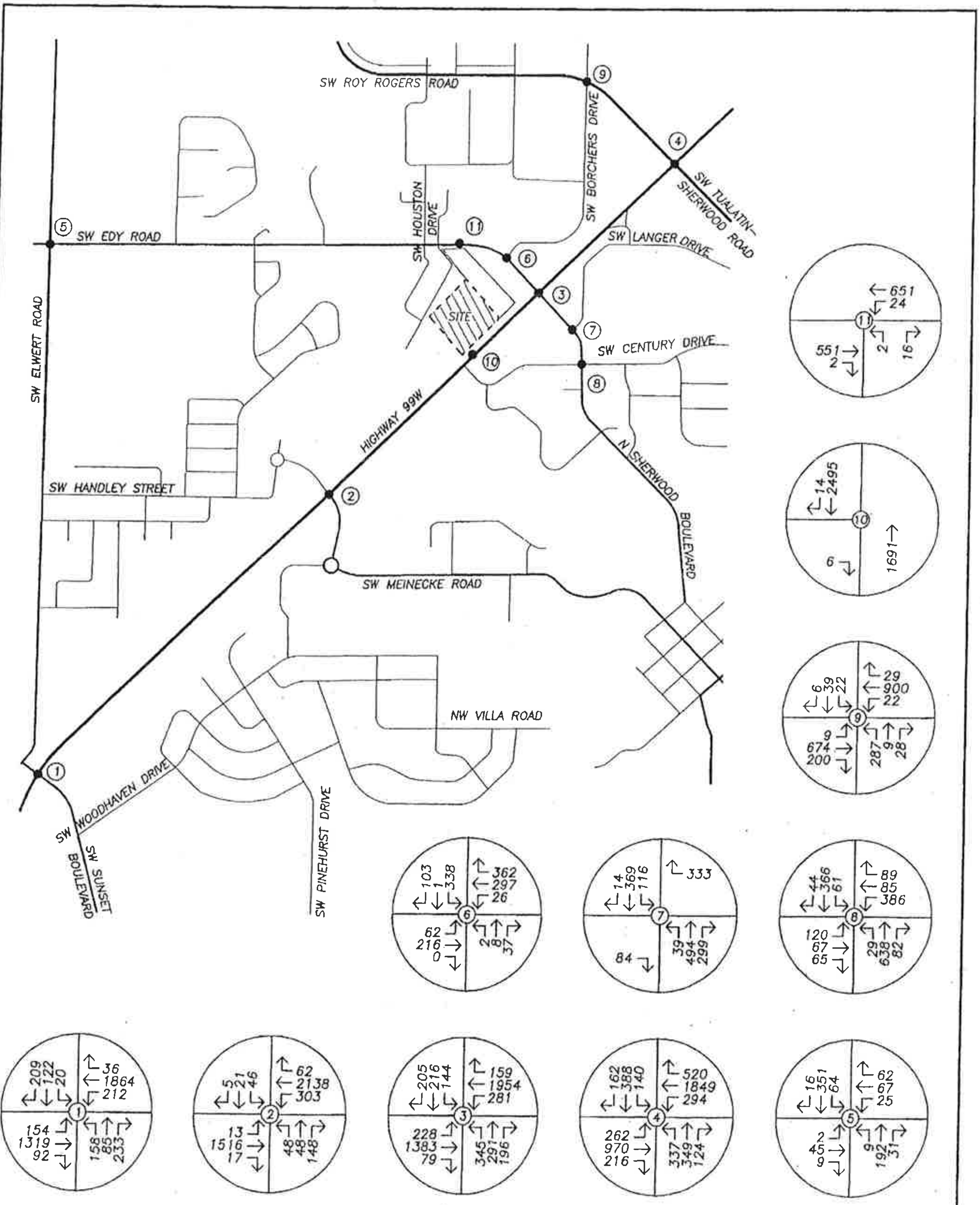
FIGURE 4

OPERATIONAL ANALYSIS

Background Traffic

To account for growth in traffic in the study area between the time of the traffic counts and fifteen years from the counts, traffic volumes were factored up using the Future Volumes Table prepared by the Oregon Department of Transportation (ODOT). The future volumes represent the conditions at the planning horizon for the City of Sherwood. Worksheets showing the growth rate are included in the appendix to this report.

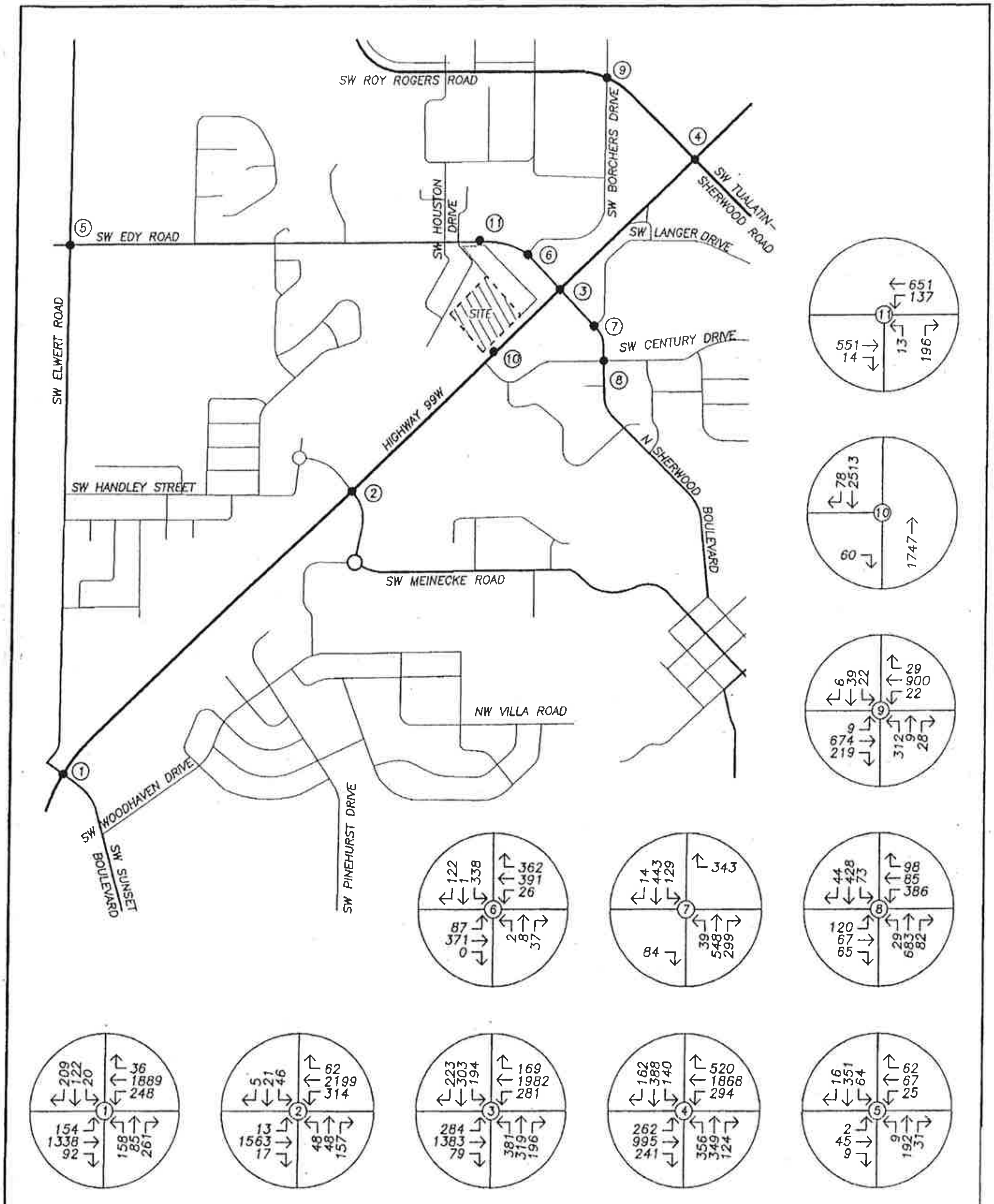
The background traffic volumes comprise the existing traffic volumes with the growth rate applied. Traffic flow diagrams showing the background traffic volumes during the evening peak hours are given on page 17. Traffic flow diagrams showing the background traffic with the site trips added is given on page 18.



TRAFFIC VOLUMES
15-year Background Traffic Conditions
PM Peak Hour

no scale

FIGURE 5



TRAFFIC VOLUMES
15-year Background plus Site Trips Conditions
PM Peak Hour

FIGURE 7

Capacity Analysis

To determine the level of service at the study intersections, a capacity analysis was conducted. The study intersections were analyzed using the signalized and unsignalized intersection analysis method in the *2000 HIGHWAY CAPACITY MANUAL (HCM2000)*, published by the Transportation Research Board. The level of service can range from A, which indicates very little or no delay, to level F, which indicates a high degree of congestion and delay.

The analysis was made for the existing, background, and background plus site conditions during the evening peak hours. Four of the study intersections are under the jurisdiction of the Oregon Department of Transportation (ODOT) and must operate according to the *1999 OREGON HIGHWAY PLAN*. The four intersections located along Highway 99W are under ODOT jurisdiction. One of the intersections in under the jurisdiction of Washington County, and requires a v/c ratio of 0.99. The remaining intersections are under the jurisdiction of the City of Sherwood and therefore must operate at level of service D or better.

There are two intersections shown to operate above capacity under the existing conditions. This is a result of the seasonal adjustments made to the existing traffic volume count data. The two intersections are Edy Road at Borchers Drive and Century Drive at Sherwood Boulevard. All of the other intersections are operating acceptably during the evening peak hour.

In the future, two of the study intersections are forecast to operate with a v/c ratio greater than 1.0, even with the inclusion of the funded transportation improvements listed in the City of Sherwood's Transportation System Plan (TSP). With the proposed zone change these two intersections will continue operate above capacity during the evening peak hour.

The mitigations for the two intersections are listed in the tables below and shown in detail in the analysis worksheets in the appendix to this report. With these mitigations in place, the intersections will operate better than under background conditions. Therefore, no further mitigations are required with the proposed zone change.

The remaining study intersections will operate acceptably wither with or without the proposed zone change in place. The two site access intersections will operate acceptably during the evening peak hour.

The results of the capacity analysis, along with the Levels of Service (LOS) and delay are shown in the following table. Tables showing the relationships between delay and level of service are included in the appendix to this report.

LEVEL OF SERVICE SUMMARY

	PM Peak Hour V/C	Mitigation
Elwert Road/Highway 99W		
Existing Conditions	0.84	
Background Conditions	0.98	
Background + Site Trips	0.98	None Required
Meinecke Road/Highway 99W		
Existing Conditions	0.89	
Background Conditions	0.87	
Background + Site Trips	0.91	None Required
Edy Road/Highway 99W		
Existing Conditions	0.95	
Background Conditions	1.11	
Background + Site Trips	1.23	
Background + Site Trips[1]	1.10	NWB LTL and Through Lane
Tualatin-Sherwood Road/Highway 99W		
Existing Conditions	0.93	
Background Conditions	1.23	
Background + Site Trips	1.24	
Background + Site Trips[1]	1.04	SWB RTL

[1] Mitigated

NWB = Northwestbound

SWB = Southwestbound

LTL = Left-turn lane

RTL = Right-turn lane

LOS = Level of Service

Delay = Average Delay per Vehicle in Seconds

V/C = Volume-to-Capacity ratio

1e

LEVEL OF SERVICE SUMMARY

	PM Peak Hour LOS	Delay	V/C	Mitigation
Elwert Road/Edy Road				
Existing Conditions	B	11	0.51	
Background Conditions	B	13	0.59	
Background + Site Trips	B	13	0.59	None Required
Borchers Drive/Edy Road				
Existing Conditions[1]	F	101	1.04	
Background Conditions[2]	C	26	0.72	
Background + Site Trips[2]	C	31	0.82	None Required
Langer Drive/Sherwood Boulevard				
Existing Conditions	E	58	0.90	
Background Conditions[2]	D	29	0.71	
Background + Site Trips[2]	E	39	0.80	None Required
Century Drive/Sherwood Boulevard				
Existing Conditions[1]	F	283	1.37	
Background Conditions[2]	C	26	0.80	
Background + Site Trips[2]	C	26	0.83	None Required
Borchers Drive/Roy Rogers Road				
Existing Conditions	D	47	0.82	
Background Conditions[2]	C	35	0.62	
Background + Site Trips[2]	D	35	0.65	None Required

LOS = Level of Service
Delay = Average Delay per Vehicle in Seconds NWB = Northwestbound
V/C = Volume-to-Capacity ratio
[1] Existing traffic volumes seasonally adjusted
[2] Funded Transportation System Plan mitigations in place

LEVEL OF SERVICE SUMMARY

	PM Peak Hour		
	LOS	Delay	V/C
Highway 99W/Site Access			
Background + Site Trips[1]	C	20	0.21
Edy Road/Site Access			
Background + Site Trips	C	22	0.51

LOS = Level of Service
Delay = Average Delay per Vehicle in Seconds
V/C = Volume-to-Capacity ratio
[1] Operations estimated due to limitations in analysis tools

1e

SAFETY ANALYSIS

Queuing Analysis

An analysis of the queuing at the study intersections was conducted for the background plus site trips scenario evening peak hour conditions. The queue length for the signalized intersection was calculated from the Poisson distribution of the traffic volumes for each of the lane groups at the intersection. The 95th percentile of the distribution is used to estimate queue length for the traffic movements. This means that 95-percent of the time, the queue length will be less than or equal to what is calculated.

The queue lengths for the unsignalized intersections were based upon the ITE Journal article "Estimation of Maximum Queue Lengths at Unsignalized Intersections," from the November 2001 issue. John T. Gard prepared this methodology for the estimation of queue lengths at unsignalized intersections.

The queue worksheets for all of the study intersections are included in the appendix to this report. A review of the turn lane distances versus the required queuing predicted by the methodologies has indicated that there will be no queues larger than the existing striped storage. Further, with the planned improvements at several of the study intersections, the queue storage may be modified to accommodate the mitigations. Therefore, no additional mitigations are recommended with the proposed zone change for the site.

CONCLUSIONS

The proposed zone change will require mitigations above what is currently listed as funded in the City of Sherwood's Transportation System Plan. Most of these mitigations will only bring the intersections to operating better than the background conditions and not to acceptable levels of operation. With the mitigations shown in the traffic study implemented, the site can have the proposed change in zoning.

APPENDIX

1e

LEVEL OF SERVICE

Level of service is used to describe the quality of traffic flow. Levels of service A to C are considered good, and rural roads are usually designed for level of service C. Urban streets and signalized intersections are typically designed for level of service D. Level of service E is considered to be the limit of acceptable delay. For unsignalized intersections, level of service E is generally considered acceptable. Here is a more complete description of levels of service:

Level of service A: Very low delay at intersections, with all traffic signal cycles clearing and no vehicles waiting through more than one signal cycle. On highways, low volume and high speeds, with speeds not restricted by other vehicles.

Level of service B: Operating speeds beginning to be affected by other traffic; short traffic delays at intersections. Higher average intersection delay than for level of service A resulting from more vehicles stopping.

Level of service C: Operating speeds and maneuverability closely controlled by other traffic; higher delays at intersections than for level of service B due to a significant number of vehicles stopping. Not all signal cycles clear the waiting vehicles. This is the recommended design standard for rural highways.

Level of service D: Tolerable operating speeds; long traffic delays occur at intersections. The influence of congestion is noticeable. At traffic signals many vehicles stop, and the proportion of vehicles not stopping declines. The number of signal cycle failures, for which vehicles must wait through more than one signal cycle, are noticeable. This is typically the design level for urban signalized intersections.

Level of service E: Restricted speeds, very long traffic delays at traffic signals, and traffic volumes near capacity. Flow is unstable so that any interruption, no matter how minor, will cause queues to form and service to deteriorate to level of service F. Traffic signal cycle failures are frequent occurrences. For unsignalized intersections, level of service E or better is generally considered acceptable.

Level of service F: Extreme delays, resulting in long queues which may interfere with other traffic movements. There may be stoppages of long duration, and speeds may drop to zero. There may be frequent signal cycle failures. Level of service F will typically result when vehicle arrival rates are greater than capacity. It is considered unacceptable by most drivers.

1e

LEVEL OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (Seconds)
A	< 10
B	10-20
C	20-35
D	35-55
E	55-80
F	> 80

LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (Seconds)
A	< 10
B	10-15
C	15-25
D	25-35
E	35-50
F	> 50

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

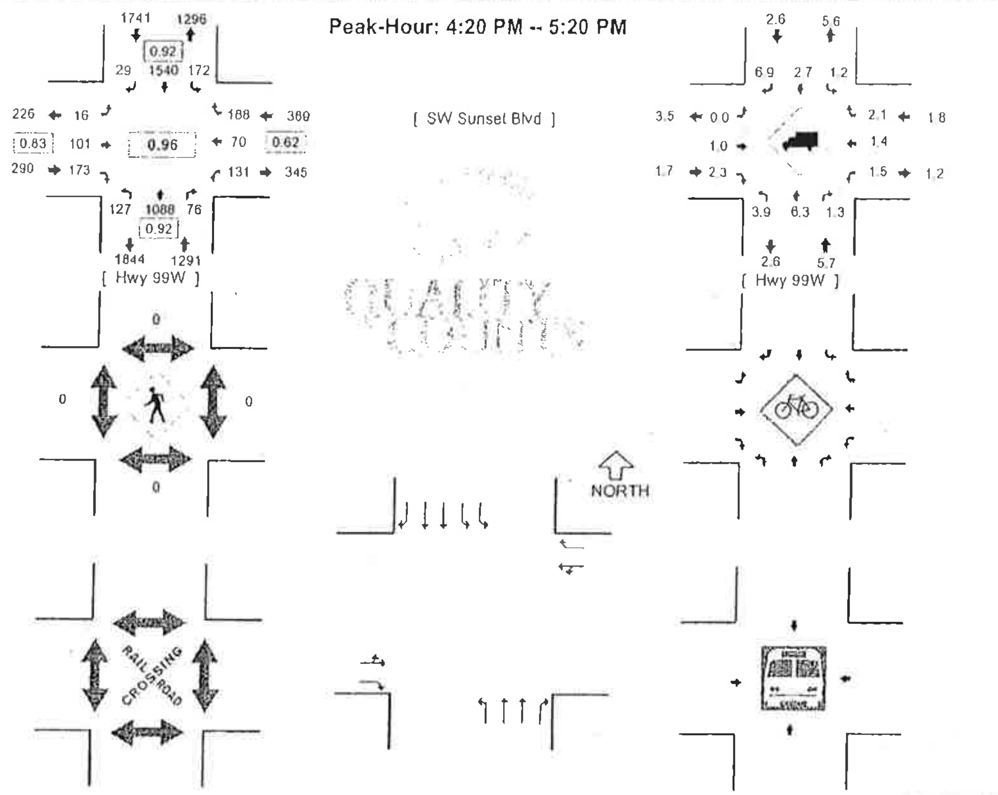
INTERSECTION: Hwy 99W--SW Sunset Blvd

WEATHER:

QC JOB #: 10256103

DATE: 5/17/2007

Peak-Hour: 4:20 PM -- 5:20 PM



*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	Hwy 99W (Northbound) Left	Thru	Right	U	Hwy 99W (Southbound) Left	Thru	Right	U	SW Sunset Blvd (Eastbound) Left	Thru	Right	U	SW Sunset Blvd (Westbound) Left	Thru	Right	U	TOTAL	HOURLY TOTALS
4:00 PM	4	51	4	0	17	103	6	0	2	2	8	0	8	4	14	0	223	
4:05 PM	10	75	10	0	12	112	2	0	3	6	13	0	15	5	11	0	274	
4:10 PM	8	92	3	0	17	147	4	0	0	7	12	0	5	4	7	0	306	
4:15 PM	8	72	11	0	20	122	2	0	1	13	10	0	13	6	10	0	288	
4:20 PM	10	114	8	0	13	152	1	0	0	2	14	0	11	7	4	0	336	
4:25 PM	10	103	7	0	16	122	3	0	0	6	16	0	6	4	22	0	315	
4:30 PM	5	83	4	0	8	135	1	1	2	10	11	0	11	8	14	0	293	
4:35 PM	8	101	6	0	19	130	6	0	0	11	13	0	5	5	11	0	315	
4:40 PM	8	83	3	0	10	103	3	1	1	9	25	0	5	3	10	0	264	
4:45 PM	11	80	8	0	9	133	0	0	1	4	18	0	9	6	86	0	365	
4:50 PM	14	88	10	0	13	125	6	0	3	10	10	0	22	13	4	0	318	
4:55 PM	9	87	7	0	12	121	3	0	1	6	21	0	11	1	8	0	287	3584
5:00 PM	9	88	7	0	27	99	0	0	1	9	15	0	12	7	5	0	279	3640
5:05 PM	15	85	2	0	13	152	2	1	4	10	3	0	13	0	5	0	305	3671
5:10 PM	17	101	7	0	14	105	2	0	2	15	16	0	16	11	12	0	318	3683
5:15 PM	11	75	7	0	14	163	2	1	1	9	11	0	10	5	7	0	316	3711
5:20 PM	10	111	3	0	21	136	2	0	0	9	23	0	11	6	4	0	336	3711
5:25 PM	4	102	5	0	19	119	5	0	0	19	17	0	8	9	4	0	311	3707
5:30 PM	10	105	6	0	13	115	0	0	1	14	14	0	6	6	5	0	295	3709
5:35 PM	6	80	7	0	20	111	0	0	0	16	16	0	15	7	13	0	291	3685
5:40 PM	7	96	6	0	20	118	1	0	1	4	9	0	7	8	7	0	284	3705
5:45 PM	11	88	3	0	19	68	3	0	2	18	19	0	13	9	6	0	259	3599
5:50 PM	6	74	2	0	20	138	2	0	0	6	17	0	15	6	2	0	288	3569
5:55 PM	4	75	9	0	24	100	4	2	2	10	29	0	10	8	8	0	285	3567

PEAK 15-MIN FLOW RATES	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	TOTAL
All Vehicles	136	1020	100	0	136	1516	36	0	20	80	196	0	168	80	392	0	3880
Heavy Trucks	0	68	4		0	44	0		0	0	8		0	0	8		132
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

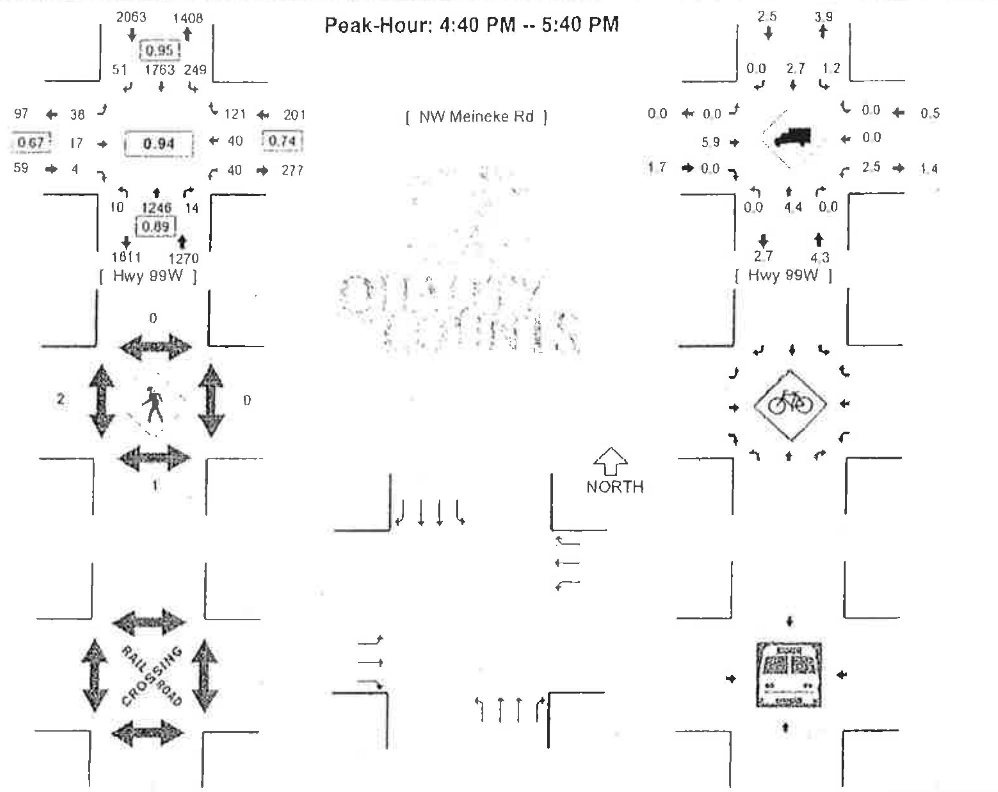
INTERSECTION: Hwy 99W--NW Meineke Rd

WEATHER:

QC JOB #: 10256101

DATE: 5/17/2007

Peak-Hour: 4:40 PM -- 5:40 PM



*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	Hwy 99W (Northbound)				Hwy 99W (Southbound)				NW Meineke Rd (Eastbound)				NW Meineke Rd (Westbound)				TOTAL	HOURLY TOTALS
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	113	3	0	17	129	2	3	2	1	0	0	7	3	12	0	292	
4:05 PM	0	101	0	1	6	127	3	0	1	2	2	0	4	2	11	0	260	
4:10 PM	1	87	1	1	13	117	0	0	2	1	2	0	5	3	9	0	242	
4:15 PM	1	97	2	0	15	163	2	0	1	2	2	0	3	6	11	0	305	
4:20 PM	1	108	3	1	16	156	4	1	2	1	1	0	6	0	11	0	311	
4:25 PM	0	93	4	0	12	160	3	0	2	1	0	0	2	2	10	0	289	
4:30 PM	0	118	4	1	19	122	4	1	3	2	0	0	3	1	5	0	283	
4:35 PM	1	93	0	0	14	153	2	0	3	0	0	0	7	0	9	0	282	
4:40 PM	1	89	1	1	18	136	4	0	2	1	0	0	1	5	7	0	266	
4:45 PM	0	92	0	2	22	147	8	2	5	1	0	0	1	1	10	0	291	
4:50 PM	0	111	0	0	19	146	3	0	4	0	2	0	2	2	11	0	300	
4:55 PM	0	99	1	0	23	124	0	0	4	1	0	0	4	3	11	0	270	3391
5:00 PM	0	102	2	0	15	159	5	0	1	0	0	0	3	1	17	0	305	3404
5:05 PM	0	82	1	0	21	128	3	0	1	2	0	0	7	8	16	0	269	3413
5:10 PM	1	119	1	0	12	181	4	0	3	4	1	0	4	6	11	0	347	3518
5:15 PM	3	105	3	0	22	154	3	0	2	0	0	0	6	1	5	0	304	3517
5:20 PM	0	123	0	1	16	141	3	0	5	2	1	0	5	6	6	0	309	3515
5:25 PM	0	112	0	0	28	149	2	0	3	3	0	0	3	3	7	0	310	3536
5:30 PM	1	110	2	0	27	143	9	0	5	3	0	0	1	4	7	0	312	3565
5:35 PM	0	102	3	0	23	155	7	1	3	0	0	0	3	0	13	0	310	3593
5:40 PM	1	87	0	0	23	117	3	1	1	0	1	0	9	4	5	0	252	3579
5:45 PM	0	69	0	0	16	127	8	0	3	1	2	0	4	0	12	0	242	3530
5:50 PM	0	88	4	0	19	150	6	1	3	3	1	0	3	4	10	0	292	3522
5:55 PM	0	92	2	0	17	144	4	1	3	1	1	0	2	4	15	0	286	3538

PEAK 15-MIN FLOW RATES	Northbound				Southbound				Eastbound				Westbound				TOTAL
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	16	1388	16	4	200	1904	40	0	40	24	8	0	60	52	88	0	3840
Heavy Trucks	0	52	0		4	56	0		0	4	0		0	0	0		116
Pedestrians		0				0				4				0			4
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

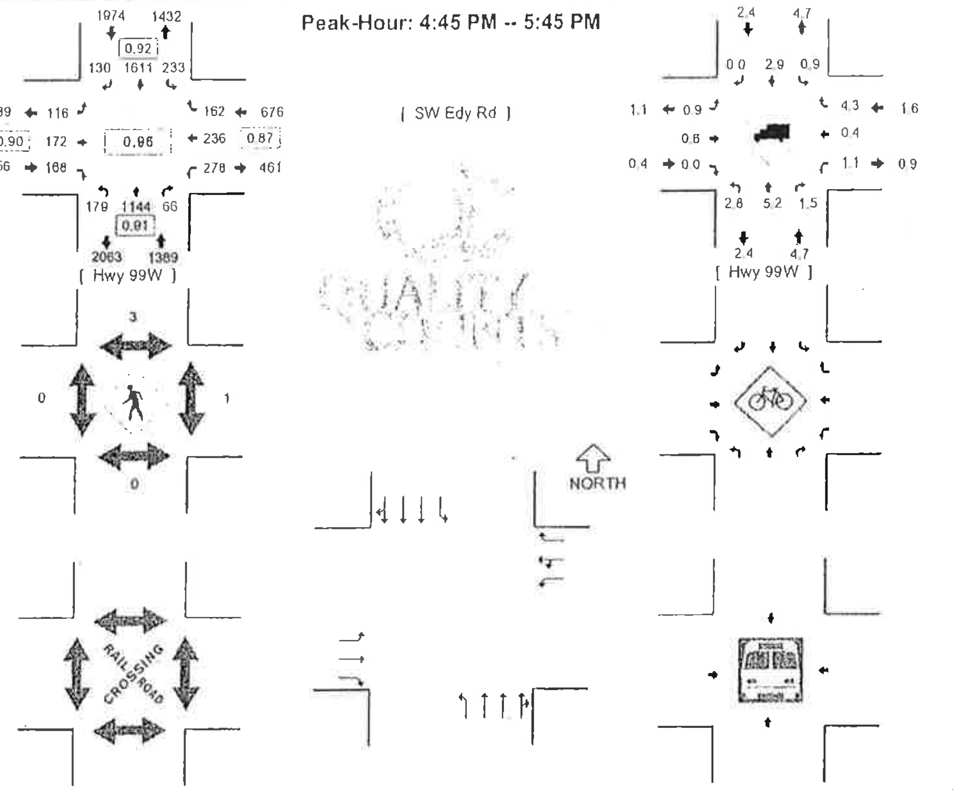
Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

INTERSECTION: Hwy 99W--SW Edy Rd
WEATHER:

QC JOB #: 10256102
DATE: 5/17/2007

Peak-Hour: 4:45 PM -- 5:45 PM



*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	Hwy 99W (Northbound)				Hwy 99W (Southbound)				SW Edy Rd (Eastbound)				SW Edy Rd (Westbound)				TOTAL	HOURLY TOTALS
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	10	83	9	0	4	132	7	1	16	14	10	0	24	16	16	0	342	
4:05 PM	12	101	3	0	10	105	13	0	7	8	8	0	15	22	12	0	316	
4:10 PM	10	73	7	1	12	111	14	1	6	13	6	0	24	18	10	1	307	
4:15 PM	12	98	10	0	14	146	7	1	12	10	17	0	12	15	12	0	366	
4:20 PM	12	103	8	0	26	136	9	0	4	12	11	0	30	20	12	0	383	
4:25 PM	12	98	5	1	17	134	10	0	12	20	11	0	21	19	9	0	369	
4:30 PM	16	88	10	1	11	116	5	1	6	7	12	0	24	21	6	0	324	
4:35 PM	15	87	6	1	12	121	6	1	14	14	15	0	27	15	13	0	347	
4:40 PM	7	78	7	0	14	107	7	0	9	9	11	0	38	25	7	0	319	
4:45 PM	5	106	4	2	18	150	16	0	8	19	13	0	16	15	10	0	382	
4:50 PM	12	58	6	0	26	137	7	0	8	12	16	0	24	21	12	0	339	
4:55 PM	18	112	7	0	18	118	7	1	13	15	9	0	23	13	8	0	362	4156
5:00 PM	14	86	6	0	23	147	12	0	6	11	11	0	25	25	24	0	390	4204
5:05 PM	12	120	7	0	11	105	5	0	12	19	18	0	26	24	15	0	374	4262
5:10 PM	14	85	4	1	28	170	14	3	7	12	10	0	28	14	16	0	406	4361
5:15 PM	17	119	4	0	11	113	8	1	11	17	18	0	24	18	8	0	369	4364
5:20 PM	11	80	5	1	25	144	11	1	6	11	12	0	28	17	15	0	367	4348
5:25 PM	20	108	7	0	11	153	15	1	8	14	10	0	15	21	16	0	399	4378
5:30 PM	14	75	4	0	22	143	8	3	15	11	13	0	23	25	11	0	367	4421
5:35 PM	18	116	5	1	11	117	10	0	8	18	21	0	23	17	15	0	380	4454
5:40 PM	18	79	7	1	19	114	17	0	14	13	17	0	23	26	12	0	360	4495
5:45 PM	10	90	11	0	15	112	13	2	9	12	13	0	18	18	11	0	334	4447
5:50 PM	8	72	3	0	29	148	10	1	15	12	19	0	26	24	8	0	375	4483
5:55 PM	11	100	11	0	18	117	6	3	15	21	16	0	20	18	7	0	363	4484

PEAK 15-MIN FLOW RATES	Northbound				Southbound				Eastbound				Westbound				TOTAL
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	160	1164	68	4	248	1688	124	12	100	168	156	0	316	252	220	0	4680
Heavy Trucks	0	64	0		8	40	0		0	4	0		0	0	12		128
Pedestrians		0				8				0				0			8
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

Report generated on 5/30/2007

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of peak hour being reported: Intersection Peak

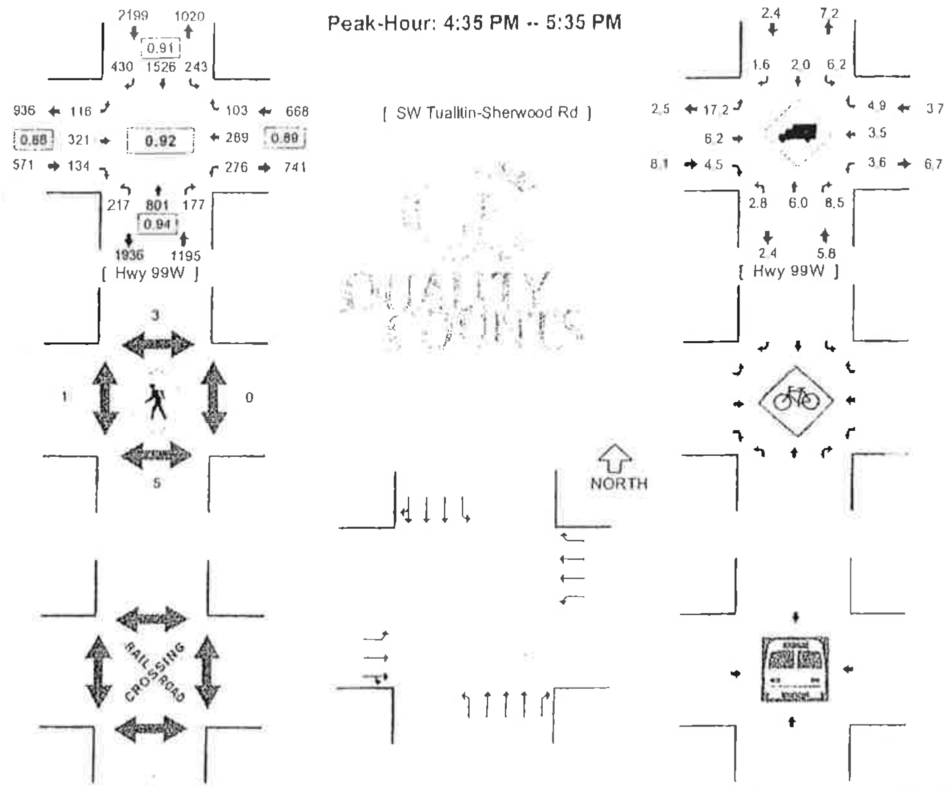
Method for determining peak hour: Total Entering Volume

INTERSECTION: Hwy 99W--SW Tualitin-Sherwood Rd

QC JOB #: 10256104

WEATHER:

DATE: 5/17/2007



*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	Hwy 99W (Northbound)				Hwy 99W (Southbound)				SW Tualitin-Sherw... (Eastbound)				SW Tualitin-Sherw... (Westbound)				TOTAL	HOURLY TOTALS
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	17	76	21	1	11	102	26	0	7	22	12	0	21	27	6	0	349	
4:05 PM	14	64	13	0	19	119	40	0	9	24	3	0	10	21	4	0	340	
4:10 PM	23	58	13	0	19	97	42	0	12	27	9	0	24	23	8	0	355	
4:15 PM	13	71	19	0	16	148	30	0	6	31	8	0	14	20	8	0	384	
4:20 PM	21	79	8	0	19	113	24	0	8	24	7	0	32	27	6	0	368	
4:25 PM	21	80	14	0	20	143	32	0	20	29	12	0	35	26	8	0	440	
4:30 PM	16	60	14	0	12	73	26	0	4	19	7	0	22	18	8	0	279	
4:35 PM	13	61	13	0	27	135	37	0	9	26	9	0	15	20	13	0	378	
4:40 PM	24	61	18	0	16	78	44	0	7	22	14	0	28	31	10	0	353	
4:45 PM	13	63	16	0	18	172	32	0	11	20	6	0	23	17	6	0	397	
4:50 PM	21	62	14	0	19	111	33	0	11	29	9	0	23	24	10	0	366	
4:55 PM	16	52	11	0	23	135	24	0	19	33	9	0	14	23	3	0	362	4371
5:00 PM	21	81	9	0	14	101	28	0	8	26	12	0	31	29	6	0	366	4388
5:05 PM	9	71	17	0	17	153	43	0	5	23	9	0	11	20	10	0	388	4436
5:10 PM	22	66	19	0	20	121	32	0	14	25	9	0	38	30	9	0	405	4486
5:15 PM	17	79	17	0	30	137	54	0	12	40	14	0	13	18	14	0	445	4547
5:20 PM	20	70	14	0	18	119	33	0	9	24	13	0	37	30	11	0	398	4577
5:25 PM	16	78	9	0	23	151	42	0	9	32	18	0	17	17	3	0	415	4552
5:30 PM	25	57	20	0	16	113	28	0	2	21	12	0	26	30	8	0	360	4633
5:35 PM	14	69	10	0	29	114	30	0	10	33	12	0	8	22	17	0	368	4623
5:40 PM	15	79	13	0	18	100	30	0	6	21	10	0	29	27	8	0	356	4626
5:45 PM	14	73	15	0	22	123	27	0	16	27	18	0	32	21	10	0	398	4627
5:50 PM	23	48	14	0	10	117	28	0	4	21	19	0	26	34	11	0	355	4616
5:55 PM	14	54	15	0	21	127	28	0	9	40	12	0	26	22	10	0	378	4632

PEAK 15-MIN FLOW RATES	Northbound				Southbound				Eastbound				Westbound				TOTAL
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	212	908	160	0	284	1628	516	0	120	384	180	0	268	260	112	0	5032
Heavy Trucks	4	60	12		24	24	4		28	32	8		12	0	4		212
Pedestrians		0				0				4				0			4
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

Report generated on 5/30/2007

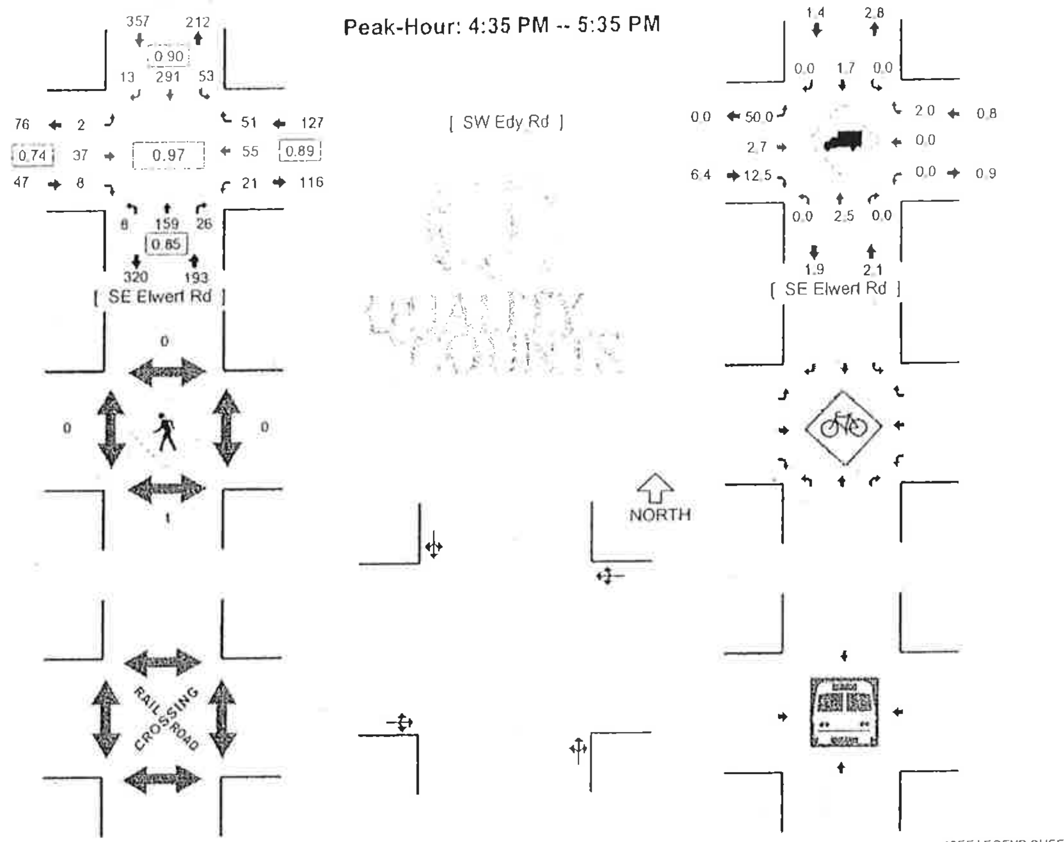
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

INTERSECTION: SE Elwert Rd--SW Edy Rd
WEATHER:

QC JOB #: 10256108
DATE: 5/17/2007



5-MIN COUNT PERIOD BEGINNING AT	SE Elwert Rd (Northbound) Left	Thru	Right	U	SE Elwert Rd (Southbound) Left	Thru	Right	U	SW Edy Rd (Eastbound) Left	Thru	Right	U	SW Edy Rd (Westbound) Left	Thru	Right	U	TOTAL	HOURLY TOTALS
4:00 PM	1	6	1	0	2	11	1	0	1	5	0	0	1	2	3	0	34	
4:05 PM	0	13	3	0	2	21	0	0	1	6	1	0	2	6	3	0	58	
4:10 PM	1	7	1	0	3	17	0	0	0	3	1	0	0	4	4	0	41	
4:15 PM	1	14	2	0	2	15	0	0	0	1	0	0	0	8	5	0	48	
4:20 PM	1	11	4	0	3	19	0	0	0	6	3	0	2	6	6	0	61	
4:25 PM	0	12	1	0	4	19	1	0	0	3	0	0	1	2	4	0	47	
4:30 PM	2	8	2	0	4	23	0	0	2	5	1	0	4	6	3	0	60	
4:35 PM	0	14	4	0	3	36	1	0	0	4	1	0	1	2	4	0	70	
4:40 PM	0	6	1	0	3	21	1	0	0	6	0	0	1	3	3	0	45	
4:45 PM	1	17	2	0	9	25	0	0	0	2	0	0	1	8	5	0	70	
4:50 PM	1	15	3	0	4	21	2	0	0	2	0	0	5	1	5	0	59	
4:55 PM	0	18	0	0	5	19	1	0	1	2	0	0	1	1	3	0	51	644
5:00 PM	2	13	0	0	5	20	3	0	0	5	3	0	2	5	7	0	65	675
5:05 PM	2	17	1	0	5	21	2	0	0	3	0	0	3	6	4	0	64	681
5:10 PM	1	11	1	0	6	22	1	0	0	2	0	0	0	6	5	0	55	695
5:15 PM	1	17	5	0	3	25	1	0	0	4	2	0	2	6	2	0	68	715
5:20 PM	0	7	4	0	5	27	0	0	1	2	2	0	3	5	4	0	60	714
5:25 PM	0	10	5	0	1	27	0	0	0	2	0	0	1	5	3	0	54	721
5:30 PM	0	14	0	0	4	27	1	0	0	3	0	0	1	7	6	0	63	724
5:35 PM	0	8	1	0	1	23	0	0	0	7	0	0	5	4	3	0	52	706
5:40 PM	0	10	6	0	3	26	0	0	1	3	0	0	3	3	4	0	59	720
5:45 PM	1	15	5	0	1	24	1	0	0	5	1	0	0	6	2	0	61	711
5:50 PM	1	9	4	0	1	25	0	0	1	5	0	0	3	8	3	0	60	712
5:55 PM	0	9	0	0	4	34	0	0	2	3	0	0	4	0	0	0	56	717

PEAK 15-MIN FLOW RATES	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	TOTAL
All Vehicles	16	180	28	0	56	272	16	0	0	36	8	0	20	72	44	0	748
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	0	0		0
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

Report generated on 5/30/2007

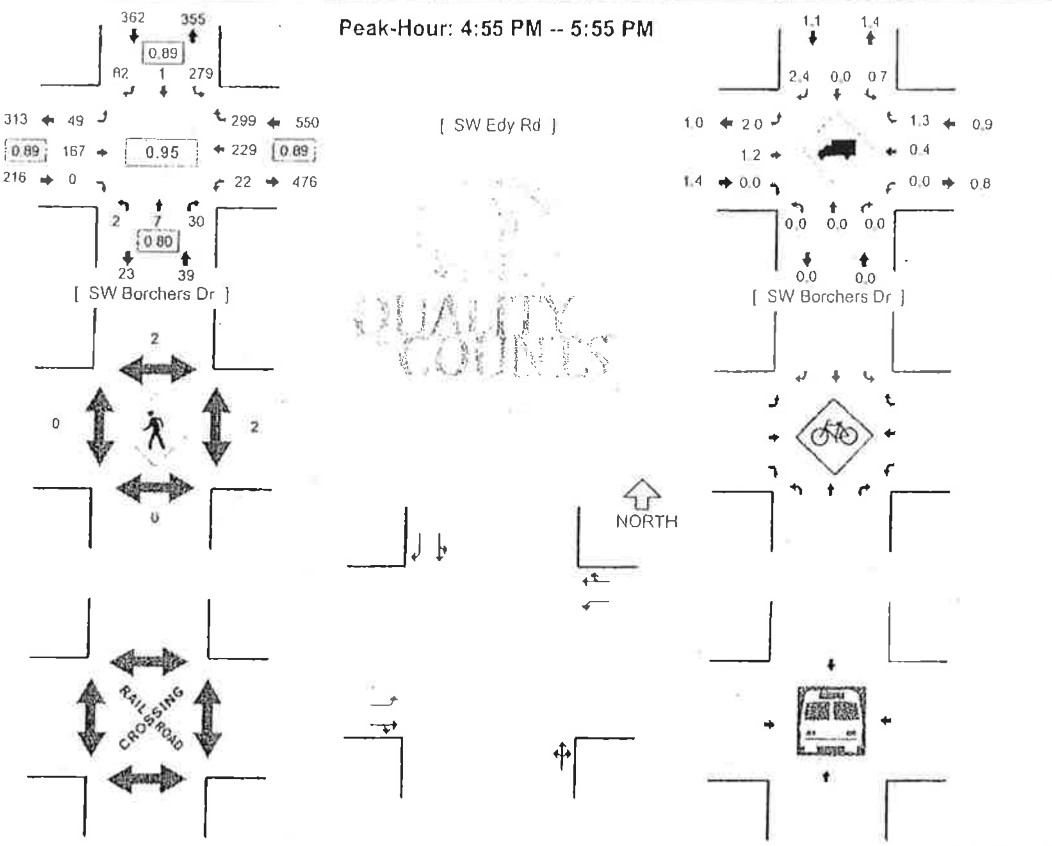
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

INTERSECTION: SW Borchers Dr--SW Edy Rd
WEATHER:

QC JOB #: 10256106
DATE: 5/17/2005



*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	SW Borchers Dr (Northbound)				SW Borchers Dr (Southbound)				SW Edy Rd (Eastbound)				SW Edy Rd (Westbound)				TOTAL	HOURLY TOTALS
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	2	3	0	16	3	3	0	2	14	0	0	3	11	17	0	74	
4:05 PM	0	2	3	0	18	0	6	0	2	12	1	0	7	18	30	0	99	
4:10 PM	0	2	2	0	13	0	5	0	0	8	0	0	2	17	18	0	67	
4:15 PM	0	1	5	0	31	0	5	0	1	9	0	0	0	18	20	0	90	
4:20 PM	0	1	2	0	18	0	5	0	3	11	0	0	2	17	19	0	78	
4:25 PM	0	0	5	0	19	0	4	0	2	12	0	0	2	19	22	0	85	
4:30 PM	0	0	5	0	20	0	7	0	6	13	1	0	1	15	18	0	86	
4:35 PM	0	1	1	0	29	0	7	0	2	15	0	0	1	12	30	0	98	
4:40 PM	1	1	1	0	18	0	2	0	1	11	0	0	4	16	15	0	70	
4:45 PM	0	0	2	0	20	0	4	0	3	18	1	0	0	22	20	0	90	
4:50 PM	0	0	4	0	26	1	3	0	3	15	0	0	6	13	21	0	92	
4:55 PM	0	0	4	0	22	0	7	0	6	15	0	0	0	16	32	0	102	1031
5:00 PM	0	2	2	0	24	1	8	0	6	10	0	0	5	17	22	0	97	1054
5:05 PM	0	0	3	0	23	0	9	0	3	11	0	0	3	17	28	0	97	1052
5:10 PM	0	2	0	0	22	0	2	0	7	14	0	0	3	22	19	0	91	1076
5:15 PM	0	1	3	0	31	0	15	0	5	11	0	0	2	18	24	0	110	1096
5:20 PM	1	0	2	0	15	0	4	0	4	14	0	0	0	13	25	0	78	1096
5:25 PM	0	1	4	0	16	0	6	0	4	15	0	0	1	24	25	0	96	1107
5:30 PM	1	1	2	0	29	0	4	0	1	14	0	0	2	24	17	0	95	1116
5:35 PM	0	0	1	0	29	0	7	0	4	10	0	0	0	20	34	0	105	1123
5:40 PM	0	0	4	0	16	0	6	0	4	18	0	0	0	27	29	0	104	1157
5:45 PM	0	0	4	0	23	0	4	0	1	19	0	0	5	16	25	0	97	1164
5:50 PM	0	0	1	0	29	0	10	0	4	16	0	0	1	15	19	0	95	1167
5:55 PM	0	0	2	0	24	0	7	0	5	11	0	0	0	13	28	0	90	1155

PEAK 15-MIN FLOW RATES	Northbound				Southbound				Eastbound				Westbound				TOTAL
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	36	0	272	0	68	0	36	188	0	0	20	252	352	0	1224
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	0	4		4
Pedestrians		0				4				0				0			4
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

Type of peak hour being reported: Intersection Peak

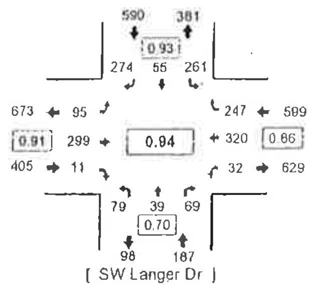
Method for determining peak hour: Total Entering Volume

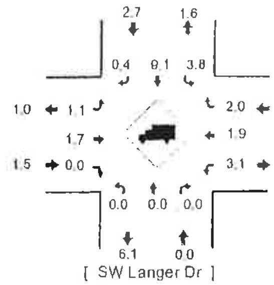
INTERSECTION: SW Langer Dr--N Sherwood Blvd
WEATHER:

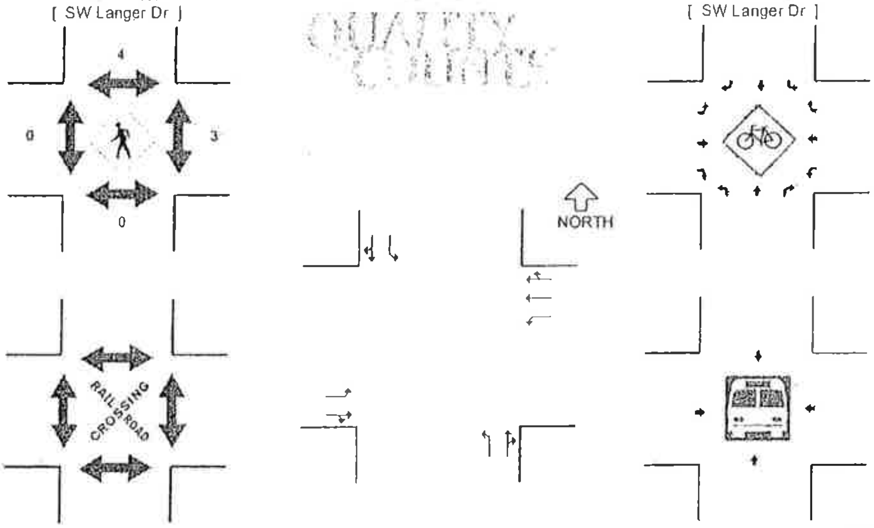
QC JOB #: 10256109
DATE: 5/17/2007

Peak-Hour: 4:50 PM -- 5:50 PM

[N Sherwood Blvd]







*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	SW Langer Dr (Northbound)				SW Langer Dr (Southbound)				N Sherwood Blvd (Eastbound)				N Sherwood Blvd (Westbound)				TOTAL	HOURLY TOTALS
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	8	1	9	0	7	1	16	0	9	23	0	0	2	25	18	0	119	
4:05 PM	10	6	4	0	12	4	18	0	8	20	0	0	3	32	27	0	144	
4:10 PM	7	4	10	0	12	2	19	0	6	17	2	0	3	27	23	0	132	
4:15 PM	3	4	1	0	12	2	24	0	11	19	0	0	5	18	18	0	117	
4:20 PM	10	2	6	0	21	7	21	0	4	20	0	0	1	24	12	0	128	
4:25 PM	3	2	4	0	17	6	26	0	11	31	1	0	3	18	14	0	136	
4:30 PM	6	2	2	0	21	3	25	0	9	12	1	0	4	27	14	0	126	
4:35 PM	6	2	8	0	16	9	24	0	8	19	0	0	4	34	13	0	143	
4:40 PM	8	4	3	0	20	1	19	0	6	21	0	0	1	33	10	0	126	
4:45 PM	11	4	10	0	16	4	18	0	5	24	4	0	14	22	14	0	146	
4:50 PM	17	3	12	0	14	4	22	0	15	23	0	0	1	24	24	0	159	
4:55 PM	5	2	3	0	22	5	30	0	7	35	1	0	1	20	26	0	157	1633
5:00 PM	1	0	9	0	23	2	20	0	9	19	2	0	4	34	20	0	143	1657
5:05 PM	11	3	6	0	21	7	22	0	10	26	1	0	3	41	23	0	174	1687
5:10 PM	4	5	8	0	22	5	24	0	5	13	0	0	2	31	17	0	136	1691
5:15 PM	6	2	3	0	20	4	32	0	5	27	2	0	4	18	22	0	145	1719
5:20 PM	5	2	5	0	17	6	24	0	11	32	3	0	2	28	20	0	155	1746
5:25 PM	4	3	3	0	30	5	23	0	3	18	0	0	3	19	21	0	132	1742
5:30 PM	6	2	3	0	24	3	18	0	5	31	0	0	3	24	16	0	135	1751
5:35 PM	4	6	3	0	19	3	25	0	4	29	1	0	6	33	18	0	151	1759
5:40 PM	3	8	8	0	27	5	17	0	11	22	1	0	3	25	16	0	146	1779
5:45 PM	13	3	6	0	22	6	17	0	10	24	0	0	0	23	24	0	148	1781
5:50 PM	9	6	4	0	18	7	22	0	7	29	0	0	3	23	19	0	147	1769
5:55 PM	9	3	3	0	24	6	26	0	7	38	0	0	2	21	16	0	155	1767

PEAK 15-MIN FLOW RATES	Northbound				Southbound				Eastbound				Westbound				TOTAL
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	68	20	72	0	264	56	288	0	104	320	16	0	32	380	276	0	1896
Heavy Trucks	0	0	0		4	8	0		4	16	0		4	8	4		48
Pedestrians		0				16				0				12			28
Bicycles																	
Railroad																	
Stopped Buses																	

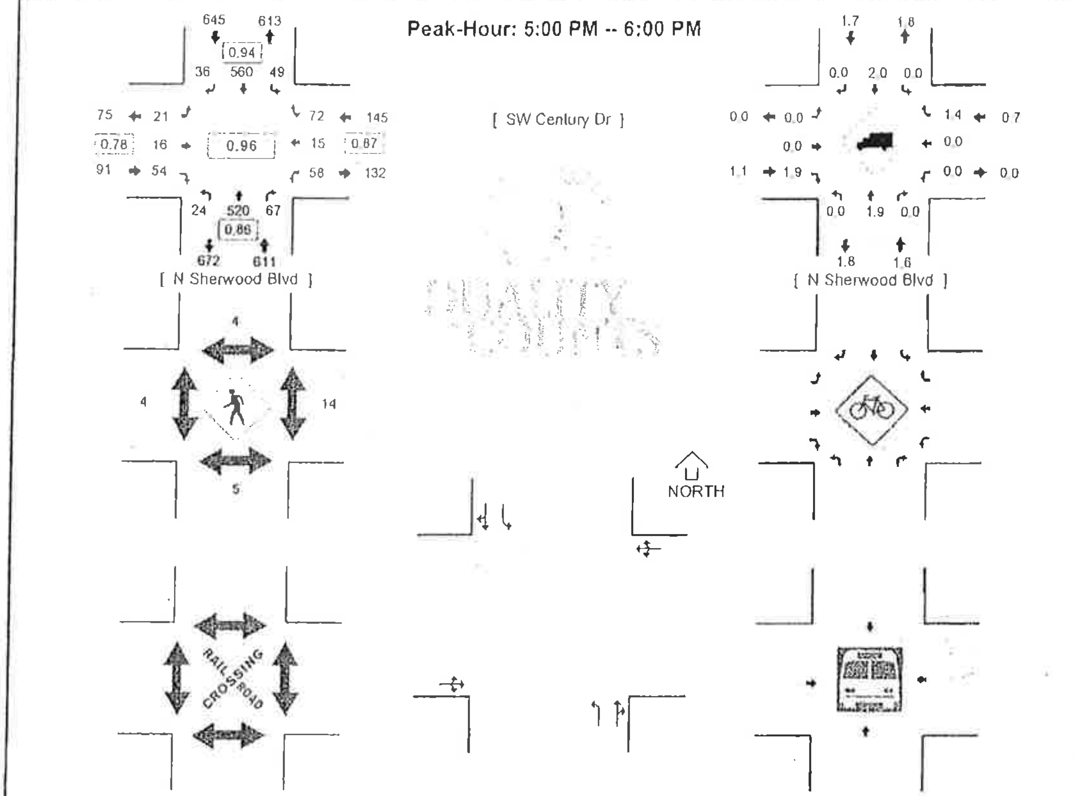
Counter Comments:

Report generated on 5/30/2007

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of peak hour being reported: Intersection Peak　　　　Method for determining peak hour: Total Entering Volume

INTERSECTION: N Sherwood Blvd--SW Century Dr　　　　QC JOB #: 10256105
WEATHER:　　　　DATE: 5/17/2007



*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	N Sherwood Blvd (Northbound) Left	Thru	Right	U	N Sherwood Blvd (Southbound) Left	Thru	Right	U	SW Century Dr (Eastbound) Left	Thru	Right	U	SW Century Dr (Westbound) Left	Thru	Right	U	TOTAL	HOURLY TOTALS
4:00 PM	2	42	2	0	2	29	0	0	2	3	2	0	5	0	9	0	98	
4:05 PM	2	49	5	0	4	36	1	0	1	3	2	0	3	1	3	0	110	
4:10 PM	0	48	4	0	4	27	3	0	1	1	3	0	3	2	8	0	104	
4:15 PM	1	38	5	0	7	23	5	0	0	0	2	0	1	0	6	0	88	
4:20 PM	6	25	2	0	6	40	3	0	0	1	4	0	3	2	9	0	101	
4:25 PM	3	28	4	0	5	44	4	0	0	2	7	0	5	4	10	0	116	
4:30 PM	6	39	3	0	2	32	1	0	0	1	4	0	2	0	9	0	99	
4:35 PM	2	34	6	0	4	30	3	0	2	1	5	0	4	1	15	0	107	
4:40 PM	2	40	8	0	4	44	3	0	1	2	1	0	3	1	5	0	114	
4:45 PM	2	28	2	0	1	45	1	0	5	3	8	0	4	4	14	0	117	
4:50 PM	2	42	10	0	3	34	4	0	1	3	4	0	9	2	3	0	117	
4:55 PM	3	43	3	0	4	53	2	0	2	2	3	0	10	0	2	0	127	1298
5:00 PM	1	48	8	0	3	33	5	0	2	2	1	0	8	5	5	0	121	1321
5:05 PM	2	62	3	0	7	54	2	0	3	0	8	0	2	0	5	0	148	1359
5:10 PM	2	48	7	0	2	36	3	0	0	1	2	0	2	0	7	0	110	1365
5:15 PM	1	40	9	0	5	51	3	0	1	2	2	0	7	3	5	0	129	1406
5:20 PM	0	39	1	0	5	38	5	0	0	1	6	0	8	0	13	0	116	1421
5:25 PM	3	39	8	0	3	45	3	0	4	1	4	0	5	0	4	0	119	1424
5:30 PM	1	47	7	0	3	47	5	0	0	0	5	0	2	1	5	0	123	1448
5:35 PM	1	42	5	0	7	50	4	0	3	1	10	0	4	1	9	0	137	1478
5:40 PM	2	36	3	0	5	48	2	0	3	1	3	0	7	2	5	0	117	1481
5:45 PM	5	42	9	0	4	47	1	0	3	1	2	0	5	0	7	0	126	1490
5:50 PM	2	39	4	0	3	50	0	0	2	4	5	0	4	2	2	0	117	1490
5:55 PM	4	38	3	0	2	61	3	0	0	2	6	0	4	1	5	0	129	1492

PEAK 15-MIN FLOW RATES	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	TOTAL
All Vehicles	20	600	76	0	56	564	32	0	16	12	48	0	44	12	68	0	1548
Heavy Trucks	0	8	0		0	8	0		0	0	0		0	0	4		20
Pedestrians		0				8				4				4			16
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

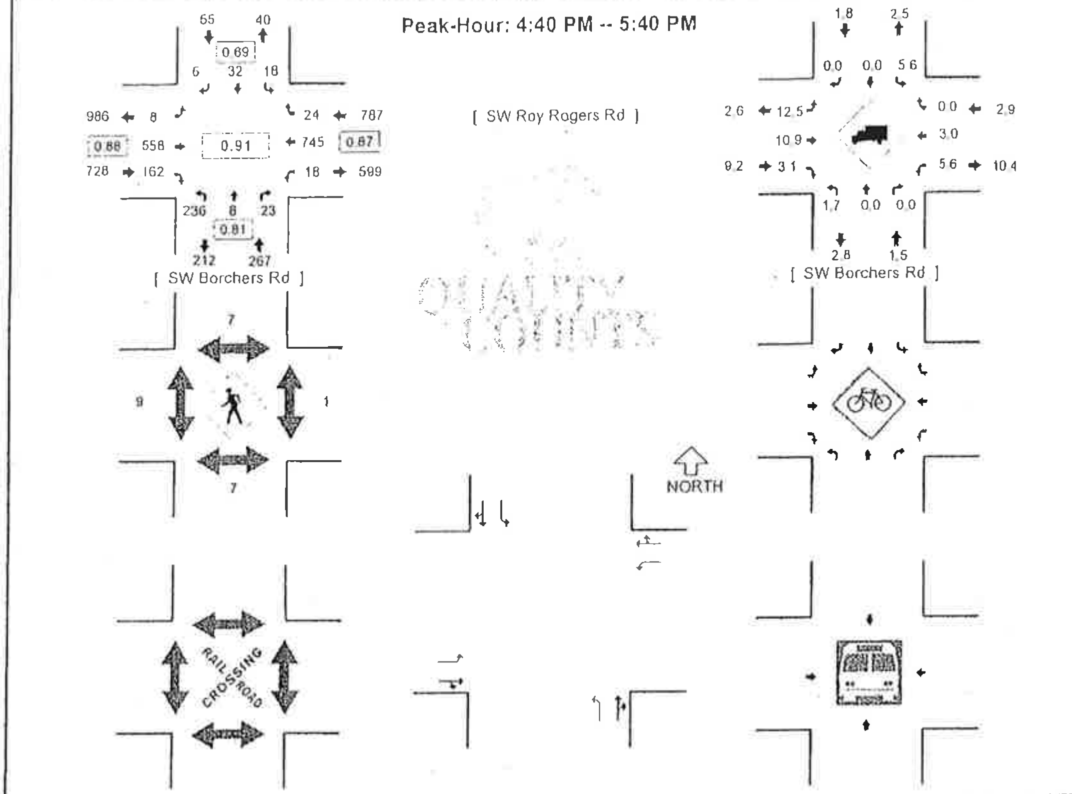
INTERSECTION: SW Borchers Rd--SW Roy Rogers Rd

QC JOB #: 10256107

WEATHER:

DATE: 5/17/2007

Peak-Hour: 4:40 PM -- 5:40 PM



*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	SW Borchers Rd (Northbound)				SW Borchers Rd (Southbound)				SW Roy Rogers Rd (Eastbound)				SW Roy Rogers Rd (Westbound)				TOTAL	HOURLY TOTALS
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	16	1	3	0	2	1	0	0	0	44	4	0	1	41	2	0	115	
4:05 PM	12	0	1	0	1	0	1	0	2	47	5	0	2	69	2	0	142	
4:10 PM	20	0	3	0	1	2	3	0	0	47	9	0	1	70	4	0	160	
4:15 PM	16	0	5	0	2	3	1	0	1	36	6	0	0	62	2	0	134	
4:20 PM	24	1	0	0	0	1	0	0	0	49	13	0	2	44	4	0	138	
4:25 PM	12	2	1	0	3	0	1	0	0	48	10	0	2	60	1	0	140	
4:30 PM	15	0	3	0	1	3	1	0	1	39	13	0	1	45	1	0	123	
4:35 PM	11	0	2	0	2	2	1	0	1	45	9	0	1	63	3	0	140	
4:40 PM	21	0	2	0	4	4	0	0	1	33	9	0	3	84	1	0	162	
4:45 PM	14	1	1	0	2	2	1	0	1	51	14	0	4	49	2	0	142	
4:50 PM	21	0	1	0	0	1	1	0	0	54	19	0	4	58	1	0	160	
4:55 PM	24	2	2	0	1	3	0	0	1	44	16	0	0	43	3	0	139	1695
5:00 PM	14	0	0	0	3	8	1	0	0	50	15	0	0	65	1	0	157	1737
5:05 PM	21	0	4	0	1	6	1	0	1	64	16	0	0	58	2	0	174	1769
5:10 PM	20	1	3	0	1	3	0	0	1	33	14	0	2	63	3	0	144	1753
5:15 PM	28	1	4	0	1	2	0	0	0	49	11	0	1	82	5	0	184	1803
5:20 PM	12	1	0	0	2	1	0	0	1	36	15	0	2	69	2	0	141	1806
5:25 PM	26	1	1	0	1	1	0	0	2	56	10	0	0	56	2	0	156	1822
5:30 PM	18	0	1	0	1	1	1	0	0	37	13	0	2	62	0	0	136	1835
5:35 PM	17	1	4	0	1	0	0	0	0	51	10	0	0	56	2	0	142	1837
5:40 PM	14	1	3	0	0	0	0	0	0	31	7	0	4	50	2	0	112	1787
5:45 PM	13	1	2	0	3	0	0	0	1	47	13	0	0	55	2	0	137	1782
5:50 PM	16	0	3	0	2	2	0	0	0	41	13	0	3	64	3	0	147	1769
5:55 PM	15	1	0	0	2	3	1	0	0	52	18	0	2	45	3	0	142	1772

PEAK 15-MIN FLOW RATES	Northbound				Southbound				Eastbound				Westbound				TOTAL
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	276	8	44	0	12	44	4	0	8	584	164	0	12	812	40	0	2008
Heavy Trucks	0	0	0		0	0	0		0	68	0		0	20	0		88
Pedestrians		4				4				4				0			12
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

Report generated on 5/30/2007

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Existing Traffic Volumes
PM Peak Hour

Intersection	*EBLT*	*EBTH*	*EBRT*	*NBLT*	*NBTH*	*NBRT*	*WBLT*	*WBTH*	*WBRT*	*SBLT*	*SBTH*	*SBRT*	*PHF*
Highway 99W/Sunset Boulevard	127	1088	76	131	70	188	172	1540	29	16	101	173	0.96
Highway 99W/Meinecke Road	10	1246	14	40	40	121	249	1763	51	38	17	4	0.94
Highway 99W/Edy Road	179	1144	66	278	236	162	233	1611	130	116	172	168	0.96
Highway 99W/Tualatin-Sherwood Road	217	801	177	276	289	103	243	1526	430	116	321	134	0.92
Elwert Road/Edy Road	2	37	8	8	159	26	21	55	51	53	291	13	0.97
Borchers Drive/Edy Road	49	167	0	2	7	30	22	229	299	279	1	82	0.95
Langer Drive/Sherwood Boulevard	79	39	69	32	320	247	261	55	274	95	299	11	0.94
Century Drive/Sherwood Boulevard	21	16	54	24	520	67	58	15	72	49	560	36	0.96
Borchers Drive/Roy Rogers Road	8	558	162	236	8	23	18	745	24	18	32	5	0.91
Highway 99W/South Site Access	0	0	0	0	1389	0	0	0	0	0	2063	0	0.96
Edy Road/Site Access	0	456	0	0	0	0	0	539	0	0	0	0	0.96

Seasonal Adjustment Factor: 1.0525

Seasonally Adjusted Traffic Volumes
PM Peak Hour

Intersection	*EBLT*	*EBTH*	*EBRT*	*NBLT*	*NBTH*	*NBRT*	*WBLT*	*WBTH*	*WBRT*	*SBLT*	*SBTH*	*SBRT*	*PHF*
Highway 99W/Sunset Boulevard	134	1145	80	138	74	198	181	1621	31	17	106	182	0.96
Highway 99W/Meinecke Road	11	1311	15	42	42	127	262	1856	54	40	18	4	0.94
Highway 99W/Edy Road	188	1204	69	293	248	171	245	1696	137	122	181	177	0.96
Highway 99W/Tualatin-Sherwood Road	228	843	186	290	304	108	256	1606	453	122	338	141	0.92
Elwert Road/Edy Road	2	39	8	8	167	27	22	58	54	56	306	14	0.97
Borchers Drive/Edy Road	52	176	0	2	7	32	23	241	315	294	1	86	0.95
Langer Drive/Sherwood Boulevard	83	41	73	34	337	260	275	58	288	100	315	12	0.94
Century Drive/Sherwood Boulevard	22	17	57	25	547	71	61	16	76	52	589	38	0.96
Borchers Drive/Roy Rogers Road	8	587	171	248	8	24	19	784	25	19	34	5	0.91
Highway 99W/South Site Access	0	0	0	0	1462	0	0	0	0	0	2171	0	0.96
Edy Road/Site Access	0	480	0	0	0	0	0	567	0	0	0	0	0.96

Growth Rate: 0.0093
Number of Years: 15

Growth Factor 1.1485

Adjusted Background Traffic Conditions
PM Peak Hour

Intersection	*EBLT*	*EBTH*	*EBRT*	*NBLT*	*NBTH*	*NBRT*	*WBLT*	*WBTH*	*WBRT*	*SBLT*	*SBTH*	*SBRT*
Highway 99W/Sunset Boulevard	154	1319	92	158	85	233	212	1864	36	20	122	209
Highway 99W/Meinecke Road	13	1516	17	48	48	148	303	2138	62	46	21	5
Highway 99W/Edy Road	228	1383	79	345	291	196	281	1954	159	144	216	205
Highway 99W/Tualatin-Sherwood Road	262	970	216	337	349	124	294	1849	520	140	388	162
Elwert Road/Edy Road	2	45	9	9	192	31	25	67	62	64	351	16
Borchers Drive/Edy Road	62	216	0	2	8	37	26	297	362	338	1	103
Langer Drive/Sherwood Boulevard	0	0	84	39	494	299	0	0	333	116	369	14
Century Drive/Sherwood Boulevard	120	67	65	29	638	82	386	85	89	61	366	44
Borchers Drive/Roy Rogers Road	9	674	200	287	9	28	22	900	29	22	39	6
Highway 99W/South Site Access	0	0	6	0	1691	0	0	0	0	0	2495	14
Edy Road/Site Access	0	551	2	2	0	16	24	651	0	0	0	0

Background + Site Trips Traffic Conditions
PM Peak Hour

Intersection	*EBLT*	*EBTH*	*EBRT*	*NBLT*	*NBTH*	*NBRT*	*WBLT*	*WBTH*	*WBRT*	*SBLT*	*SBTH*	*SBRT*
Highway 99W/Sunset Boulevard	154	1338	92	158	85	261	248	1889	36	20	122	209
Highway 99W/Meinecke Road	13	1563	17	48	48	157	314	2199	62	46	21	5
Highway 99W/Edy Road	284	1383	79	381	319	196	281	1982	169	194	303	223
Highway 99W/Tualatin-Sherwood Road	262	995	241	356	349	124	294	1868	520	140	388	162
Elwert Road/Edy Road	2	45	9	9	192	31	25	67	62	64	351	16
Borchers Drive/Edy Road	87	371	0	2	8	37	26	391	362	338	1	122
Langer Drive/Sherwood Boulevard	0	0	84	39	548	299	0	0	343	129	443	14
Century Drive/Sherwood Boulevard	120	67	65	29	683	82	386	85	98	73	428	44
Borchers Drive/Roy Rogers Road	9	674	219	312	9	28	22	900	29	22	39	6
Highway 99W/South Site Access	0	0	60	0	1747	0	0	0	0	0	2513	78
Edy Road/Site Access	0	551	11	13	0	196	137	651	0	0	0	0

TRIP GENERATION SUMMARY
Pfeifer Zone Change

Scenario	Land Use	Size	AM Peak Hour			PM Peak Hour			Weekday		
			In	Out	Total	In	Out	Total	In	Out	Total
Scheme 1	Medical-Dental Office Building	11,000	21	6	27	11	30	41	199	199	397
	Shopping Center	77,000	153	98	251	253	274	527	2,865	2,865	5,730
	Pass-by (34%)		*-43*	*-43*	*-86*	*-90*	*-90*	*-180*	*-974*	*-974*	*-1,948*
	Drive-in Bank	4,500	31	25	56	103	103	206	555	555	1,110
	Pass-by (47%)		*-13*	*-13*	*-26*	*-48*	*-48*	*-96*	*-261*	*-261*	*-522*
Total Trips			**149**	**73**	**222**	**229**	**269**	**498**	**2,384**	**2,384**	**4,767**

Scenario	AM Peak Hour			PM Peak Hour			Weekday		
	In	Out	Total	In	Out	Total	In	Out	Total
Current Zoning	12	35	47	40	24	64	301	301	602
Proposed Zoning	149	73	222	229	269	498	2,384	2,384	4,767
Net Increase in Site Trips	**137**	**38**	**175**	**189**	**245**	**434**	**2,083**	**2,083**	**4,165**

TRIP GENERATION CALCULATIONS

Land Use: Single-Family Detached Housing
Land Use Code: 210
Variable: Dwelling Units
Variable Value: 63

AM PEAK HOUR

Trip Rate: 0.75

	Enter	Exit	Total
Directional Distribution	25%	75%	
Trip Ends	12	35	47

PM PEAK HOUR

Trip Rate: 1.01

	Enter	Exit	Total
Directional Distribution	63%	37%	
Trip Ends	40	24	64

WEEKDAY

Trip Rate: 9.57

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	301	301	602

SATURDAY

Trip Rate: 10.10

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	318	318	636

Source: TRIP GENERATION, Seventh Edition

1e

TRIP GENERATION CALCULATIONS

Land Use: Medical-Dental Office Building
Land Use Code: 720
Variable: 1,000 Sq Ft Gross Floor Area
Variable Quantity: 11.0

AM PEAK HOUR

Trip Rate: 2.48

	Enter	Exit	Total
Directional Distribution	79%	21%	
Trip Ends	21	6	27

PM PEAK HOUR

Trip Rate: 3.72

	Enter	Exit	Total
Directional Distribution	27%	73%	
Trip Ends	11	30	41

WEEKDAY

Trip Rate: 36.13

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	199	199	397

SATURDAY

Trip Rate: 8.96

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	49	49	99

Source: TRIP GENERATION, Seventh Edition

2e

TRIP GENERATION CALCULATIONS

Land Use: Shopping Center
Land Use Code: 820
Variable: 1,000 Sq Ft Gross Leasable Area
Variable Value: 77.0

AM PEAK HOUR

Trip Rate: Ln(T)=0.60Ln(X)+2.29

	Enter	Exit	Total
Directional Distribution	61%	39%	
Trip Ends	153	98	251

PM PEAK HOUR

Trip Rate: Ln(T)=.66Ln(X)+3.40

	Enter	Exit	Total
Directional Distribution	48%	52%	
Trip Ends	253	274	527

WEEKDAY

Trip Rate: Ln(T)=.65Ln(X)+5.83

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	2,865	2,865	5,730

SATURDAY

Trip Rate: Ln(T)=.63Ln(X)+6.23

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	3,918	3,918	7,836

Source: TRIP GENERATION, Seventh Edition

TRIP GENERATION CALCULATIONS

Land Use: Drive-in Bank
Land Use Code: 912
Variable: 1000 Sq Ft Gross Floor Area
Variable Value: 4.5

AM PEAK HOUR

Trip Rate: 12.34

	Enter	Exit	Total
Directional Distribution	56%	44%	
Trip Ends	31	25	56

PM PEAK HOUR

Trip Rate: 45.74

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	103	103	206

WEEKDAY

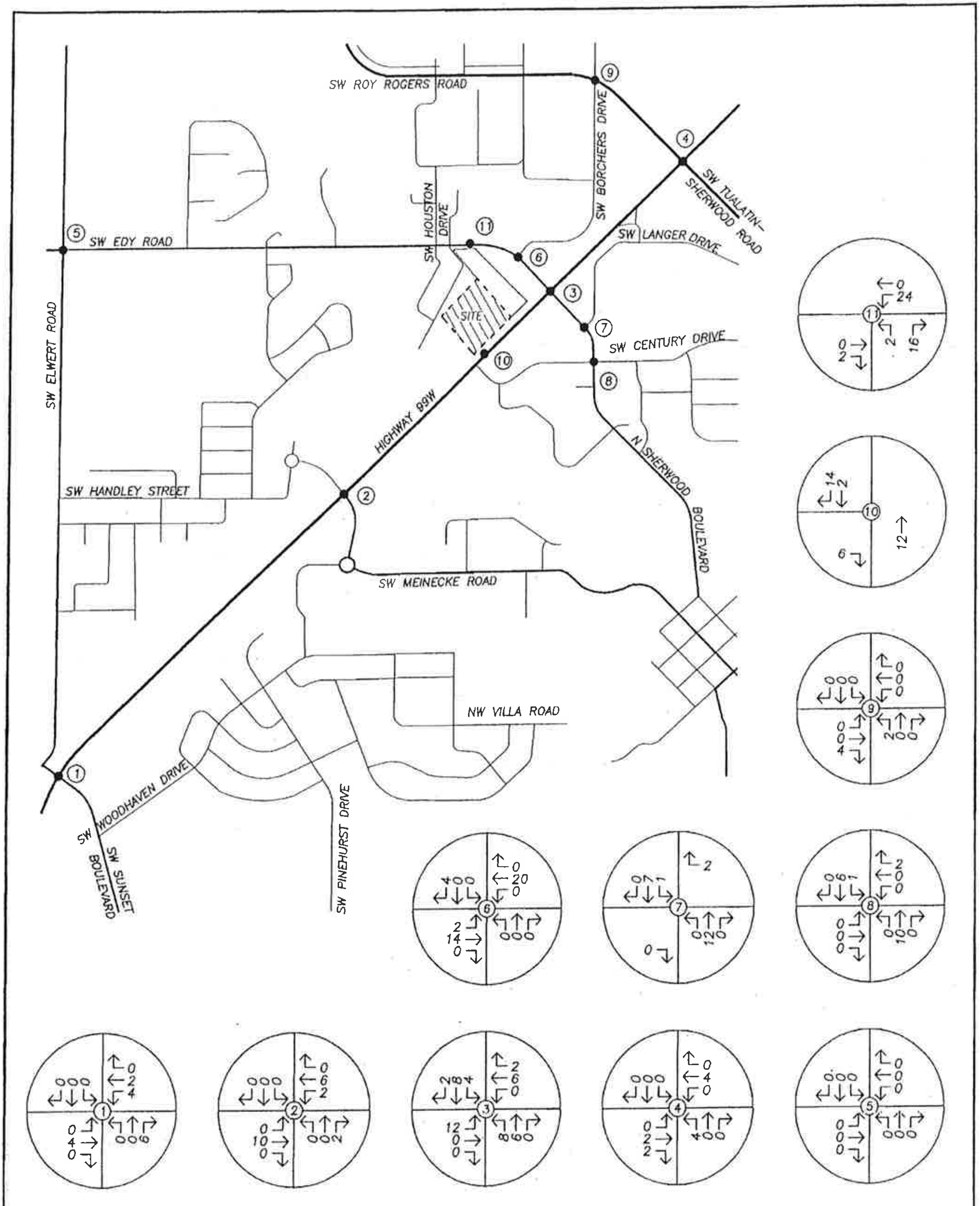
Trip Rate: 246.49

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	555	555	1,110

SATURDAY

Trip Rate: 71.21

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	160	160	320

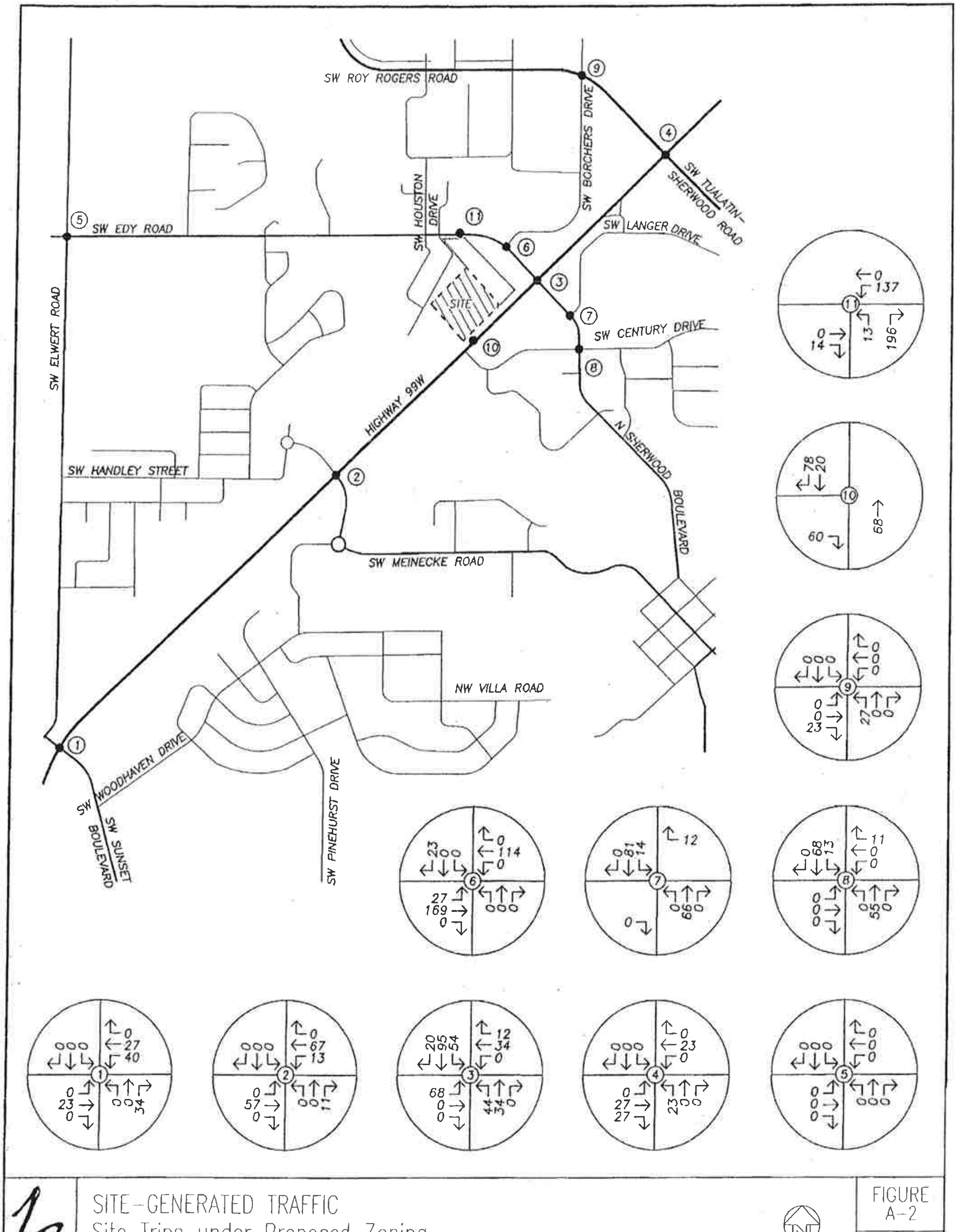


SITE-GENERATED TRAFFIC
Site Trips under Current Zoning
PM Peak Hour

no scale

FIGURE A-1

APPENDIX



SITE-GENERATED TRAFFIC
Site Trips under Proposed Zoning
PM Peak Hour

FIGURE A-2

APPENDIX

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.99	1.00		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1871	1583		1810	1583	1736	3406	1599	3467	3505	1509
Flt Permitted		0.94	1.00		0.66	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1776	1583		1238	1583	1736	3406	1599	3467	3505	1509
Volume (vph)	17	106	182	138	74	198	134	1145	80	181	1621	31
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	18	110	190	144	77	206	140	1193	83	189	1689	32
RTOR Reduction (vph)	0	0	142	0	0	161	0	0	36	0	0	14
Lane Group Flow (vph)	0	128	48	0	221	45	140	1193	47	189	1689	18
Heavy Vehicles (%)	0%	1%	2%	2%	1%	2%	4%	6%	1%	1%	3%	7%
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		8			4		5	2		1	6	
Permitted Phases	8		8	4		4			2			6
Actuated Green, G (s)		22.0	22.0		22.0	22.0	10.5	56.6	56.6	9.4	55.5	55.5
Effective Green, g (s)		22.0	22.0		22.0	22.0	10.5	56.6	56.6	9.4	55.5	55.5
Actuated g/C Ratio		0.22	0.22		0.22	0.22	0.10	0.57	0.57	0.09	0.56	0.56
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		391	348		272	348	182	1928	905	326	1945	837
v/s Ratio Prot							c0.08	0.35		0.05	c0.48	
v/s Ratio Perm		0.07	0.12		c0.18	0.13			0.05			0.02
v/c Ratio		0.33	0.14		0.81	0.13	0.77	0.62	0.05	0.58	0.87	0.02
Uniform Delay, d1		32.8	31.4		37.0	31.3	43.6	14.5	9.7	43.4	19.1	10.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.92	1.64	1.87
Incremental Delay, d2		2.2	0.8		22.6	0.8	17.6	1.5	0.1	1.8	4.1	0.0
Delay (s)		35.0	32.2		59.7	32.1	61.2	16.0	9.8	41.9	35.5	18.8
Level of Service		D	C		E	C	E	B	A	D	D	B
Approach Delay (s)		33.3			46.4			20.1			35.8	
Approach LOS		C			D			C			D	

Intersection Summary			
HCM Average Control Delay	31.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1792	1615	1752	1900	1615	1805	3471	1615	1787	3505	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	1792	1615	1752	1900	1615	1805	3471	1615	1787	3505	1615
Volume (vph)	40	18	4	42	42	127	11	1311	15	262	1856	54
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	43	19	4	45	45	135	12	1395	16	279	1974	57
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	43	19	4	45	45	135	12	1395	16	279	1974	57
Heavy Vehicles (%)	0%	6%	0%	3%	0%	0%	0%	4%	0%	1%	3%	0%
Turn Type	Prot		Free	Prot		Free	Prot		Free	Prot		Free
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases			Free		4	Free			Free			Free
Actuated Green, G (s)	3.2	3.8	100.0	5.5	6.1	100.0	0.8	53.2	100.0	21.5	73.9	100.0
Effective Green, g (s)	3.2	3.8	100.0	5.5	6.1	100.0	0.8	53.2	100.0	21.5	73.9	100.0
Actuated g/C Ratio	0.03	0.04	1.00	0.06	0.06	1.00	0.01	0.53	1.00	0.22	0.74	1.00
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	58	68	1615	96	116	1615	14	1847	1615	384	2590	1615
v/s Ratio Prot	c0.02	0.01		0.03	c0.02		0.01	c0.40		0.16	c0.56	
v/s Ratio Perm			0.00			0.08			0.01			0.04
v/c Ratio	0.74	0.28	0.00	0.47	0.39	0.08	0.86	0.76	0.01	0.73	0.76	0.04
Uniform Delay, d1	48.0	46.8	0.0	45.8	45.2	0.0	49.5	18.3	0.0	36.5	7.8	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.74	0.50	1.00	1.25	0.61	1.00
Incremental Delay, d2	39.6	2.2	0.0	3.6	2.1	0.1	146.4	2.4	0.0	2.8	0.9	0.0
Delay (s)	87.6	49.0	0.0	49.4	47.3	0.1	183.2	11.6	0.0	48.4	5.7	0.0
Level of Service	F	D	A	D	D	A	F	B	A	D	A	A
Approach Delay (s)		71.2			19.4			12.9			10.7	
Approach LOS		E			B			B			B	

Intersection Summary			
HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	0.85	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	1599	1615	1698	1713	1553	1752	4907		1787	4990	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1787	1599	1615	1698	1803	1553	1752	4907		1787	4990	
Volume (vph)	122	181	177	293	248	171	188	1204	69	245	1696	137
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	127	189	184	305	258	178	196	1254	72	255	1767	143
RTOR Reduction (vph)	0	0	157	0	0	146	0	6	0	0	9	0
Lane Group Flow (vph)	127	189	27	280	283	32	196	1320	0	255	1901	0
Heavy Vehicles (%)	1%	1%	0%	1%	0%	4%	3%	5%	2%	1%	3%	0%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases			8			4						
Actuated Green, G (s)	14.7	14.8	14.8	17.9	18.0	18.0	12.6	33.3		18.0	38.7	
Effective Green, g (s)	14.7	14.8	14.8	17.9	18.0	18.0	12.6	33.3		18.0	38.7	
Actuated g/C Ratio	0.15	0.15	0.15	0.18	0.18	0.18	0.13	0.33		0.18	0.39	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	263	237	239	304	325	280	221	1634		322	1931	
v/s Ratio Prot	0.07	c0.12		c0.16	0.16		0.11	c0.27		0.14	c0.38	
v/s Ratio Perm			0.11		0.01	0.11						
v/c Ratio	0.48	0.80	0.11	0.92	0.87	0.11	0.89	0.81		0.79	0.98	
Uniform Delay, d1	39.2	41.2	36.9	40.4	40.3	34.3	43.0	30.4		39.2	30.4	
Progression Factor	1.00	1.00	1.00	0.96	0.96	1.80	1.33	1.32		0.57	0.43	
Incremental Delay, d2	1.4	16.8	0.2	20.9	13.3	0.1	25.7	3.3		4.7	9.0	
Delay (s)	40.6	58.0	37.1	59.8	52.0	61.9	82.8	43.6		27.0	21.9	
Level of Service	D	E	D	E	D	E	F	D		C	C	
Approach Delay (s)	45.9				57.3			48.6			22.5	
Approach LOS	D				E			D			C	

Intersection Summary			
HCM Average Control Delay	38.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	81.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCS+™ DETAILED REPORT

General Information		Site Information	
Analyst	GAJ	Intersection	Hwy 99W/Edy Rd
Agency or Co.	Lancaster Engineering	Area Type	All other areas
Date Performed	6/22/2007	Jurisdiction	ODOT
Time Period	PM Peak Hour	Analysis Year	EX Cond
		Project ID	07038 - Pfeifer Zone Change

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N_1	1	3	0	1	3	0	1	1	1	1	1	1
Lane Group	L	TR		L	TR		L	LT	R	L	T	R
Volume, V (vph)	188	1204	69	245	1696	137	293	248	171	122	181	177
% Heavy Vehicles, %HV	3	5	2	1	3	0	1	1	4	1	1	0
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, l_1	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green, e	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Arrival Type, AT	3	3		3	3		3	3	3	3	3	3
Unit Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Filtering/Metering, I	1.000	1.000		1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Initial Unmet Demand, Q_b	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N_m												
Buses Stopping, N_B	0	0		0	0		0	0	0	0	0	0
Min. Time for Pedestrians, G_p	3.2			3.2			3.2			3.2		

Phasing	Excl. Left	WB Only	Thru & RT	04	NB Only	SB Only	07	08
Timing	G = 7.0	G = 10.0	G = 33.0	G =	G = 17.0	G = 11.0	G =	G =
	Y = 4	Y = 4	Y = 6	Y =	Y = 4	Y = 4	Y =	Y =
Duration of Analysis, T = 0.25						Cycle Length, C = 100.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	196	1326		255	1910		305	258	178	127	189	184
Lane Group Capacity, c	123	1616		375	2340		304	320	264	197	207	178
v/c Ratio, X	1.59	0.82		0.68	0.82		1.00	0.81	0.67	0.64	0.91	1.03
Total Green Ratio, g/C	0.07	0.33		0.21	0.47		0.17	0.17	0.17	0.11	0.11	0.11
Uniform Delay, d_1	46.5	30.8		36.4	22.8		41.5	39.9	38.9	42.6	44.0	44.5
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Delay Calibration, k	0.50	0.36		0.25	0.36		0.50	0.35	0.25	0.22	0.43	0.50
Incremental Delay, d_2	301.8	3.5		4.9	2.4		52.4	14.1	6.6	7.1	39.3	76.6
Initial Queue Delay, d_3	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay	348.3	34.3		41.3	25.2		93.9	54.0	45.5	49.7	83.4	121.1
Lane Group LOS	F	C		D	C		F	D	D	D	F	F
Approach Delay	74.7			27.1			68.4			88.7		
Approach LOS	E			C			E			F		
Intersection Delay	54.3			X_c = 0.95			Intersection LOS			D		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑	↱	↰↰	↑	↱	↰	↑↑↑	↱	↰	↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.91	1.00	1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	5025	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	5025	
Volume (vph)	122	338	141	290	304	108	228	843	186	256	1606	137
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	133	367	153	315	330	117	248	916	202	278	1746	149
RTOR Reduction (vph)	0	0	121	0	0	91	0	0	136	0	10	0
Lane Group Flow (vph)	133	367	32	315	330	26	248	916	66	278	1885	0
Heavy Vehicles (%)	17%	6%	5%	4%	4%	5%	3%	6%	9%	6%	2%	2%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			
Actuated Green, G (s)	9.0	21.0	21.0	10.0	22.0	22.0	15.0	32.6	32.6	20.4	38.0	
Effective Green, g (s)	9.0	21.0	21.0	10.0	22.0	22.0	15.0	32.6	32.6	20.4	38.0	
Actuated g/C Ratio	0.09	0.21	0.21	0.10	0.22	0.22	0.15	0.33	0.33	0.20	0.38	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	139	376	323	337	402	338	263	1595	483	347	1910	
v/s Ratio Prot	0.09	c0.20		c0.09	0.18		c0.14	0.19		c0.16	c0.38	
v/s Ratio Perm			0.10			0.08			0.14			
v/c Ratio	0.96	0.98	0.10	0.93	0.82	0.08	0.94	0.57	0.14	0.80	0.99	
Uniform Delay, d1	45.3	39.3	31.9	44.7	37.1	30.9	42.1	27.9	23.8	37.9	30.8	
Progression Factor	1.35	1.10	2.44	1.00	1.00	1.00	0.47	1.20	3.60	1.00	1.00	
Incremental Delay, d2	39.6	25.3	0.1	32.3	12.6	0.1	30.8	1.0	0.4	12.5	17.7	
Delay (s)	100.7	68.6	77.8	77.0	49.8	31.0	50.6	34.6	85.8	50.3	48.5	
Level of Service	F	E	E	E	D	C	D	C	F	D	D	
Approach Delay (s)		77.3			58.1			45.1			48.7	
Approach LOS		E			E			D			D	

Intersection Summary			
HCM Average Control Delay	52.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

ALL-WAY STOP CONTROL ANALYSIS

General Information		Site Information	
Analyst	GAJ	Intersection	Edy Rd/Elwert Rd
Agency/Co.	Lancaster Engineering	Jurisdiction	Sherwood
Date Performed	6/13/2007	Analysis Year	EX Cond
Analysis Time Period	PM Peak Hour		

Project ID 07038 - Pfeifer Zone Change

East/West Street: SW Edy Road	North/South Street: SW Elwert Road

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	2	39	8	22	58	54
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	8	167	27	56	306	14
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.97		0.97		0.97		0.97	
Flow Rate (veh/h)	50		136		207		386	
% Heavy Vehicles	6		1		2		1	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.0		0.2		0.0		0.1	
Prop. Right-Turns	0.2		0.4		0.1		0.0	
Prop. Heavy Vehicle	0.1		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.0		-0.2		-0.0		0.0	

Departure Headway and Service Time

hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.04		0.12		0.18		0.34	
hd, final value (s)	5.60		5.24		4.87		4.72	
x, final value	0.08		0.20		0.28		0.51	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	3.6		3.2		2.9		2.7	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	300		386		457		636	
Delay (s/veh)	9.08		9.52		9.76		12.45	
LOS	A		A		A		B	
Approach: Delay (s/veh)	9.08		9.52		9.76		12.45	
LOS	A		A		A		B	
Intersection Delay (s/veh)	11.01							
Intersection LOS	B							

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	GAJ	Intersection	Century Dr/Sherwood Blvd
Agency/Co.	Lancaster Engineering	Jurisdiction	Sherwood
Date Performed	6/13/2007	Analysis Year	EX Cond
Analysis Time Period	PM Peak Hour		

Project Description 07038 - Pfeifer Zone Change

East/West Street:	SW Century Drive	North/South Street:	SW Sherwood Boulevard
Intersection Orientation:	North-South	Study Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	25	547	71	52	589	38
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR (veh/h)	26	569	73	54	613	39
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal		0			1	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	22	17	57	61	16	76
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR (veh/h)	22	17	59	63	16	79
Percent Heavy Vehicles	0	0	2	0	0	1
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L		LTR			LTR	
v (veh/h)	26	54		158			98	
C (m) (veh/h)	876	946		115			139	
v/c	0.03	0.06		1.37			0.71	
95% queue length	0.09	0.18		10.84			4.02	
Control Delay (s/veh)	9.2	9.0		283.0			76.9	
LOS	A	A		F			F	
Approach Delay (s/veh)	--	--	283.0			76.9		
Approach LOS	--	--	F			F		

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.90		1.00	0.88		1.00	0.99		1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	1705		1752	1630		1805	1889		1736	1690	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1787	1705		1752	1630		1805	1889		1736	1690	
Volume (vph)	83	41	73	275	58	288	100	315	12	34	337	260
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	88	44	78	293	62	306	106	335	13	36	359	277
RTOR Reduction (vph)	0	68	0	0	189	0	0	1	0	0	28	0
Lane Group Flow (vph)	88	54	0	293	179	0	106	347	0	36	608	0
Heavy Vehicles (%)	1%	2%	0%	3%	2%	2%	0%	0%	0%	4%	9%	0%
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases												
Actuated Green, G (s)	5.6	9.9		16.0	20.3		22.9	53.7		4.4	35.2	
Effective Green, g (s)	5.6	9.9		16.0	20.3		22.9	53.7		4.4	35.2	
Actuated g/C Ratio	0.06	0.10		0.16	0.20		0.23	0.54		0.04	0.35	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	100	169		280	331		413	1014		76	595	
v/s Ratio Prot	0.05	0.07		c0.17	c0.23		0.06	c0.18		c0.02	c0.38	
v/s Ratio Perm												
v/c Ratio	0.88	0.32		1.05	0.54		0.26	0.34		0.47	1.02	
Uniform Delay, d1	46.9	41.9		42.0	35.7		31.6	13.1		46.7	32.4	
Progression Factor	1.00	1.00		1.00	1.00		0.99	0.90		1.00	1.00	
Incremental Delay, d2	53.6	1.1		66.4	1.8		0.9	0.6		4.6	42.6	
Delay (s)	100.4	43.0		108.4	37.5		32.2	12.4		51.3	75.0	
Level of Service	F	D		F	D		C	B		D	E	
Approach Delay (s)		67.1			68.9			17.0			73.7	
Approach LOS		E			E			B			E	

Intersection Summary			
HCM Average Control Delay	58.6	HCM Level of Service	E
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	77.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	GAJ	Intersection	Century Dr/Sherwood Blvd
Agency/Co.	Lancaster Engineering	Jurisdiction	Sherwood
Date Performed	6/13/2007	Analysis Year	EX Cond
Analysis Time Period	PM Peak Hour		

Project Description 07038 - Pfeifer Zone Change

East/West Street: SW Century Drive	North/South Street: SW Sherwood Boulevard
Intersection Orientation: North-South	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	25	547	71	52	589	38
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR (veh/h)	26	569	73	54	613	39
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal		0			1	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	22	17	57	61	16	76
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR (veh/h)	22	17	59	63	16	79
Percent Heavy Vehicles	0	0	2	0	0	1
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L		LTR			LTR	
v (veh/h)	26	54		158			98	
C (m) (veh/h)	876	946		115			139	
v/c	0.03	0.06		1.37			0.71	
95% queue length	0.09	0.18		10.84			4.02	
Control Delay (s/veh)	9.2	9.0		283.0			76.9	
LOS	A	A		F			F	
Approach Delay (s/veh)	--	--	283.0			76.9		
Approach LOS	--	--	F			F		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.89		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1597	1681		1703	1838		1770	1688		1703	1866	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1597	1681		1703	1838		1770	1688		1703	1866	
Volume (vph)	8	587	171	19	784	25	248	8	24	19	34	5
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	9	645	188	21	862	27	273	9	26	21	37	5
RTOR Reduction (vph)	0	9	0	0	1	0	0	19	0	0	4	0
Lane Group Flow (vph)	9	824	0	21	888	0	273	16	0	21	38	0
Heavy Vehicles (%)	13%	11%	3%	6%	3%	0%	2%	0%	0%	6%	0%	0%
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	0.8	53.6		1.6	54.4		15.0	26.8		2.0	13.8	
Effective Green, g (s)	0.8	53.6		1.6	54.4		15.0	26.8		2.0	13.8	
Actuated g/C Ratio	0.01	0.54		0.02	0.54		0.15	0.27		0.02	0.14	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	13	901		27	1000		266	452		34	258	
v/s Ratio Prot	0.01	c0.50		c0.01	0.48		c0.15	0.02		0.01	c0.02	
v/s Ratio Perm												
v/c Ratio	0.69	0.91		0.78	0.89		1.03	0.04		0.62	0.15	
Uniform Delay, d1	49.5	21.1		49.0	20.1		42.5	27.0		48.6	37.9	
Progression Factor	1.00	1.00		0.83	1.56		1.07	1.36		1.00	1.00	
Incremental Delay, d2	96.3	13.5		62.5	6.9		50.4	0.1		29.0	1.2	
Delay (s)	145.8	34.6		103.0	38.4		96.0	36.9		77.6	39.1	
Level of Service	F	C		F	D		F	D		E	D	
Approach Delay (s)		35.8			39.9			89.3			51.9	
Approach LOS		D			D			F			D	

Intersection Summary			
HCM Average Control Delay	45.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	69.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.99	1.00		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1871	1583		1810	1583	1736	3406	1599	3467	3505	1509
Flt Permitted		0.94	1.00		0.64	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1766	1583		1194	1583	1736	3406	1599	3467	3505	1509
Volume (vph)	20	122	209	158	85	233	154	1319	92	212	1864	36
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	21	127	218	165	89	243	160	1374	96	221	1942	38
RTOR Reduction (vph)	0	0	122	0	0	140	0	0	44	0	0	15
Lane Group Flow (vph)	0	148	97	0	254	104	160	1374	52	221	1942	23
Heavy Vehicles (%)	0%	1%	2%	2%	1%	2%	4%	6%	1%	1%	3%	7%
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		8			4		5	2		1	6	
Permitted Phases	8		8	4		4			2			6
Actuated Green, G (s)		25.0	25.0		25.0	25.0	9.0	54.1	54.1	8.9	54.0	54.0
Effective Green, g (s)		25.0	25.0		25.0	25.0	9.0	54.1	54.1	8.9	54.0	54.0
Actuated g/C Ratio		0.25	0.25		0.25	0.25	0.09	0.54	0.54	0.09	0.54	0.54
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		442	396		299	396	156	1843	865	309	1893	815
v/s Ratio Prot							c0.09	0.40		0.06	c0.55	
v/s Ratio Perm		0.08	0.14		c0.21	0.15			0.06			0.03
v/c Ratio		0.33	0.24		0.85	0.26	1.03	0.75	0.06	0.72	1.03	0.03
Uniform Delay, d1		30.7	29.9		35.7	30.1	45.5	17.7	10.9	44.3	23.0	10.7
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.97	1.41	1.44
Incremental Delay, d2		2.0	1.5		24.9	1.6	79.0	2.8	0.1	4.4	22.6	0.0
Delay (s)		32.7	31.4		60.6	31.7	124.5	20.4	11.0	47.6	55.0	15.5
Level of Service		C	C		E	C	F	C	B	D	D	B
Approach Delay (s)		31.9			46.4			30.1			53.5	
Approach LOS		C			D			C			D	

Intersection Summary			
HCM Average Control Delay	43.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	94.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1792	1615	1752	1900	1615	1805	3471	1615	1787	3505	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	1792	1615	1752	1900	1615	1805	3471	1615	1787	3505	1615
Volume (vph)	46	21	5	48	48	148	13	1516	17	303	2138	62
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	49	22	5	51	51	157	14	1613	18	322	2274	66
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	49	22	5	51	51	157	14	1613	18	322	2274	66
Heavy Vehicles (%)	0%	6%	0%	3%	0%	0%	0%	4%	0%	1%	3%	0%
Turn Type	Prot		Free	Prot		Free	Prot		Free	Prot		Free
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases			Free		4	Free			Free			Free
Actuated Green, G (s)	3.2	4.0	100.0	5.6	6.4	100.0	1.6	48.1	100.0	26.3	72.8	100.0
Effective Green, g (s)	3.2	4.0	100.0	5.6	6.4	100.0	1.6	48.1	100.0	26.3	72.8	100.0
Actuated g/C Ratio	0.03	0.04	1.00	0.06	0.06	1.00	0.02	0.48	1.00	0.26	0.73	1.00
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	58	72	1615	98	122	1615	29	1670	1615	470	2552	1615
v/s Ratio Prot	c0.03	0.01		0.03	c0.03		0.01	c0.46		0.18	c0.65	
v/s Ratio Perm			0.00			0.10			0.01			0.04
v/c Ratio	0.84	0.31	0.00	0.52	0.42	0.10	0.48	0.97	0.01	0.69	0.89	0.04
Uniform Delay, d1	48.2	46.7	0.0	45.9	45.0	0.0	48.8	25.2	0.0	33.1	10.5	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.70	0.43	1.00	1.18	0.70	1.00
Incremental Delay, d2	65.1	2.4	0.0	4.9	2.3	0.1	8.7	12.1	0.0	0.4	0.5	0.0
Delay (s)	113.2	49.1	0.0	50.8	47.3	0.1	43.0	22.8	0.0	39.5	7.9	0.0
Level of Service	F	D	A	D	D	A	D	C	A	D	A	A
Approach Delay (s)		87.2			19.4			22.7			11.6	
Approach LOS		F			B			C			B	

Intersection Summary			
HCM Average Control Delay	17.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	81.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	0.85	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	1599	1615	1698	1712	1553	1752	4908		1787	4990	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1787	1599	1615	1698	1802	1553	1752	4908		1787	4990	
Volume (vph)	144	216	205	345	291	196	228	1383	79	281	1954	159
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	150	225	214	359	303	204	238	1441	82	293	2035	166
RTOR Reduction (vph)	0	0	177	0	0	169	0	6	0	0	9	0
Lane Group Flow (vph)	150	225	37	309	353	35	238	1517	0	293	2192	0
Heavy Vehicles (%)	1%	1%	0%	1%	0%	4%	3%	5%	2%	1%	3%	0%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases			8			4						
Actuated Green, G (s)	15.3	17.3	17.3	15.0	17.0	17.0	13.7	37.7		14.0	38.0	
Effective Green, g (s)	15.3	17.3	17.3	15.0	17.0	17.0	13.7	37.7		14.0	38.0	
Actuated g/C Ratio	0.15	0.17	0.17	0.15	0.17	0.17	0.14	0.38		0.14	0.38	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	273	277	279	255	306	264	240	1850		250	1896	
v/s Ratio Prot	0.08	c0.14		0.18	0.17		c0.14	0.31		0.16	c0.44	
v/s Ratio Perm			0.13		c0.03	0.13						
v/c Ratio	0.55	0.81	0.13	1.21	1.15	0.13	0.99	0.82		1.17	1.16	
Uniform Delay, d1	39.2	39.8	35.0	42.5	44.0	35.2	43.1	28.1		43.0	31.0	
Progression Factor	1.21	1.18	3.14	0.98	0.98	1.20	1.31	1.36		0.72	0.61	
Incremental Delay, d2	2.1	15.4	0.2	124.6	98.6	0.2	39.9	2.3		81.6	70.8	
Delay (s)	49.3	62.2	110.0	166.1	141.6	42.6	96.5	40.6		112.5	89.8	
Level of Service	D	E	F	F	F	D	F	D		F	F	
Approach Delay (s)	76.3				127.0			48.1			92.4	
Approach LOS	E				F			D			F	

Intersection Summary			
HCM Average Control Delay	82.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	92.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCS+™ DETAILED REPORT

General Information		Site Information	
Analyst	GAJ	Intersection	Hwy 99W/Edy Rd
Agency or Co.	Lancaster Engineering	Area Type	All other areas
Date Performed	6/22/2007	Jurisdiction	ODOT
Time Period	PM Peak Hour	Analysis Year	BK Cond
		Project ID	07038 - Pfeifer Zone Change

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N_1	1	3	0	1	3	0	1	1	1	1	1	1
Lane Group	L	TR		L	TR		L	LT	R	L	T	R
Volume, V (vph)	228	1383	79	281	1954	159	345	291	196	144	216	205
% Heavy Vehicles, %HV	3	5	2	1	3	0	1	1	4	1	1	0
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, l_1	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green, e	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Arrival Type, AT	3	3		3	3		3	3	3	3	3	3
Unit Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Filtering/Metering, I	1.000	1.000		1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Initial Unmet Demand, Q_b	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N_m												
Buses Stopping, N_B	0	0		0	0		0	0	0	0	0	0
Min. Time for Pedestrians, G_p		3.2			3.2			3.2			3.2	

Phasing	Excl. Left	WB Only	Thru & RT	04	NB Only	SB Only	07	08
Timing	G = 7.0	G = 6.0	G = 42.0	G =	G = 14.0	G = 9.0	G =	G =
	Y = 4	Y = 4	Y = 6	Y =	Y = 4	Y = 4	Y =	Y =
Duration of Analysis, T = 0.25						Cycle Length, C = 100.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	238	1523		293	2201		359	303	204	150	225	214
Lane Group Capacity, c	123	2057		304	2589		250	263	217	161	169	145
v/c Ratio, X	1.93	0.74		0.96	0.85		1.44	1.15	0.94	0.93	1.33	1.48
Total Green Ratio, g/C	0.07	0.42		0.17	0.52		0.14	0.14	0.14	0.09	0.09	0.09
Uniform Delay, d_1	46.5	24.4		41.2	20.6		43.0	43.0	42.6	45.2	45.5	45.5
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Delay Calibration, k	0.50	0.30		0.47	0.38		0.50	0.50	0.45	0.45	0.50	0.50
Incremental Delay, d_2	449.1	1.5		41.8	2.9		217.6	102.9	44.5	51.1	183.8	247.5
Initial Queue Delay, d_3	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay	495.6	25.9		82.9	23.5		260.6	145.9	87.1	96.3	229.3	293.0
Lane Group LOS	F	C		F	C		F	F	F	F	F	F
Approach Delay		89.4			30.5			179.6			218.6	
Approach LOS		F			C			F			F	
Intersection Delay		90.7			X_c = 1.11		Intersection LOS				F	

 HCS+™ Version 5.21 Generated: 7/20/2007 10:48 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑	↱	↰↰	↑	↱	↰	↑↑↑	↱	↰	↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.91	1.00	1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	4918	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	4918	
Volume (vph)	140	388	162	337	349	124	262	970	216	294	1849	520
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	422	176	366	379	135	285	1054	235	320	2010	565
RTOR Reduction (vph)	0	0	137	0	0	104	0	0	161	0	51	0
Lane Group Flow (vph)	152	422	39	366	379	31	285	1054	74	320	2524	0
Heavy Vehicles (%)	17%	6%	5%	4%	4%	5%	3%	6%	9%	6%	2%	2%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases		4	4			8			2			
Actuated Green, G (s)	8.0	22.0	22.0	9.0	23.0	23.0	12.0	31.7	31.7	21.3	41.0	
Effective Green, g (s)	8.0	22.0	22.0	9.0	23.0	23.0	12.0	31.7	31.7	21.3	41.0	
Actuated g/C Ratio	0.08	0.22	0.22	0.09	0.23	0.23	0.12	0.32	0.32	0.21	0.41	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	123	394	338	303	420	354	210	1551	470	363	2016	
v/s Ratio Prot	0.10	c0.24		c0.11	0.21		c0.16	0.22		0.19	c0.52	
v/s Ratio Perm			0.11			0.09			0.16			
v/c Ratio	1.24	1.07	0.11	1.21	0.90	0.09	1.36	0.68	0.16	0.88	1.25	
Uniform Delay, d1	46.0	39.0	31.2	45.5	37.4	30.3	44.0	29.7	24.6	38.1	29.5	
Progression Factor	1.58	0.61	1.39	1.00	1.00	1.00	0.61	1.28	3.93	1.00	1.00	
Incremental Delay, d2	145.7	58.6	0.1	120.4	22.1	0.1	179.3	1.5	0.5	21.3	117.7	
Delay (s)	218.2	82.4	43.5	165.9	59.5	30.4	206.2	39.7	97.0	59.4	147.2	
Level of Service	F	F	D	F	E	C	F	D	F	E	F	
Approach Delay (s)		100.8			99.3			78.4			137.5	
Approach LOS		F			F			E			F	

Intersection Summary			
HCM Average Control Delay	112.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	105.2%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

ALL-WAY STOP CONTROL ANALYSIS

General Information		Site Information	
Analyst	GAJ	Intersection	Edy Rd/Elwert Rd
Agency/Co.	Lancaster Engineering	Jurisdiction	Sherwood
Date Performed	6/13/2007	Analysis Year	BK Cond
Analysis Time Period	PM Peak Hour		

Project ID 07038 - Pfeifer Zone Change

East/West Street: SW Edy Road | North/South Street: SW Elwert Road

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	2	45	9	25	67	62
%Thrus Left Lane						
Approach	**Northbound**			**Southbound**		
Movement	L	T	R	L	T	R
Volume (veh/h)	9	192	31	64	351	16
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.97		0.97		0.97		0.97	
Flow Rate (veh/h)	57		157		237		442	
% Heavy Vehicles	6		1		2		1	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

	Eastbound L1	Eastbound L2	Westbound L1	Westbound L2	Northbound L1	Northbound L2	Southbound L1	Southbound L2
Prop. Left-Turns	0.0		0.2		0.0		0.1	
Prop. Right-Turns	0.2		0.4		0.1		0.0	
Prop. Heavy Vehicle	0.1		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.0		-0.2		-0.0		0.0	

Departure Headway and Service Time

	Eastbound L1	Eastbound L2	Westbound L1	Westbound L2	Northbound L1	Northbound L2	Southbound L1	Southbound L2
hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.05		0.14		0.21		0.39	
hd, final value (s)	5.94		5.52		5.10		4.89	
x, final value	0.09		0.24		0.34		0.60	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	3.9		3.5		3.1		2.9	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	307		407		487		692	
Delay (s/veh)	9.56		10.26		10.65		14.98	
LOS	A		B		B		B	
Approach: Delay (s/veh)	9.56		10.26		10.65		14.98	
LOS	A		B		B		B	
Intersection Delay (s/veh)	12.65							
Intersection LOS	B							

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.92		1.00	0.88		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1881		1805	1726		1805	1664		1787	1586	
Flt Permitted	0.14	1.00		0.56	1.00		0.69	1.00		0.73	1.00	
Satd. Flow (perm)	253	1881		1073	1726		1305	1664		1366	1586	
Volume (vph)	62	216	0	26	297	362	2	8	37	338	1	103
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	65	227	0	27	313	381	2	8	39	356	1	108
RTOR Reduction (vph)	0	0	0	0	57	0	0	21	0	0	58	0
Lane Group Flow (vph)	65	227	0	27	637	0	2	26	0	356	51	0
Heavy Vehicles (%)	2%	1%	0%	0%	1%	1%	0%	0%	0%	1%	0%	2%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	45.6	45.6		45.6	45.6		46.4	46.4		46.4	46.4	
Effective Green, g (s)	45.6	45.6		45.6	45.6		46.4	46.4		46.4	46.4	
Actuated g/C Ratio	0.46	0.46		0.46	0.46		0.46	0.46		0.46	0.46	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	115	858		489	787		606	772		634	736	
v/s Ratio Prot		0.12			c0.40			0.03			0.07	
v/s Ratio Perm	0.26			0.03			0.00			c0.26		
v/c Ratio	0.57	0.26		0.06	0.81		0.00	0.03		0.56	0.07	
Uniform Delay, d1	19.9	16.8		15.2	23.5		14.4	14.6		19.4	14.8	
Progression Factor	1.00	1.00		0.80	1.18		1.00	1.00		1.18	2.03	
Incremental Delay, d2	6.2	0.2		0.0	0.6		0.0	0.1		3.4	0.2	
Delay (s)	26.2	17.0		12.2	28.3		14.4	14.7		26.3	30.4	
Level of Service	C	B		B	C		B	B		C	C	
Approach Delay (s)		19.0			27.7			14.7			27.2	
Approach LOS		B			C			B			C	

Intersection Summary			
HCM Average Control Delay	25.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	GAJ	Intersection	Langer Dr/Sherwood Blvd
Agency/Co.	Lancaster Engineering	Jurisdiction	Sherwood
Date Performed	6/13/2007	Analysis Year	
Analysis Time Period	PM Peak Hour		

Project Description	07038 - Pfeifer Zone Change		
East/West Street:	SW Langer Drive	North/South Street:	SW Sherwood Boulevard
Intersection Orientation:	North-South	Study Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	39	494	299	116	369	14
Peak-Hour Factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Hourly Flow Rate, HFR (veh/h)	40	509	308	119	380	14
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal		1			1	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			84			333
Peak-Hour Factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Hourly Flow Rate, HFR (veh/h)	0	0	86	0	0	343
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)	0			0		
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	1	0	0	1
Configuration			R			R

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L			R			R
v (veh/h)	40	119			343			86
C (m) (veh/h)	796	747			483			529
v/c	0.05	0.16			0.71			0.16
95% queue length	0.16	0.56			5.57			0.58
Control Delay (s/veh)	9.8	10.7			28.7			13.1
LOS	A	B			D			B
Approach Delay (s/veh)	--	--	28.7			13.1		
Approach LOS	--	--	D			B		

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	0.92		1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1742		1805	1745		1805	1837		1805	1835	
Flt Permitted	0.58	1.00		0.64	1.00		0.20	1.00		0.43	1.00	
Satd. Flow (perm)	1107	1742		1221	1745		381	1837		814	1835	
Volume (vph)	120	67	65	386	85	89	61	366	44	29	638	82
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	125	70	68	402	89	93	64	381	46	30	665	85
RTOR Reduction (vph)	0	39	0	0	42	0	0	4	0	0	4	0
Lane Group Flow (vph)	125	99	0	402	140	0	64	423	0	30	746	0
Heavy Vehicles (%)	0%	0%	2%	0%	0%	1%	0%	2%	0%	0%	2%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	35.2	35.2		35.2	35.2		56.8	56.8		56.8	56.8	
Effective Green, g (s)	35.2	35.2		35.2	35.2		56.8	56.8		56.8	56.8	
Actuated g/C Ratio	0.35	0.35		0.35	0.35		0.57	0.57		0.57	0.57	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	390	613		430	614		216	1043		462	1042	
v/s Ratio Prot		0.08			0.10			0.23			c0.41	
v/s Ratio Perm	0.11			c0.33			0.17			0.04		
v/c Ratio	0.32	0.16		0.93	0.23		0.30	0.41		0.06	0.72	
Uniform Delay, d1	23.7	22.3		31.3	22.8		11.2	12.1		9.7	15.7	
Progression Factor	1.00	1.00		1.00	1.00		0.99	0.89		1.00	1.00	
Incremental Delay, d2	0.5	0.1		27.5	0.2		2.1	0.7		0.3	4.2	
Delay (s)	24.1	22.4		58.8	23.0		13.2	11.5		10.0	19.9	
Level of Service	C	C		E	C		B	B		A	B	
Approach Delay (s)		23.2			47.7			11.8			19.6	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM Average Control Delay	26.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	84.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↱		↰	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.89		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1597	3193		1703	3492		1770	1685		1703	1860	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1597	3193		1703	3492		1770	1685		1703	1860	
Volume (vph)	9	674	200	22	900	29	287	9	28	22	39	6
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	10	741	220	24	989	32	315	10	31	24	43	7
RTOR Reduction (vph)	0	30	0	0	3	0	0	17	0	0	5	0
Lane Group Flow (vph)	10	931	0	24	1018	0	315	24	0	24	45	0
Heavy Vehicles (%)	13%	11%	3%	6%	3%	0%	2%	0%	0%	6%	0%	0%
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	0.8	34.7		1.6	35.5		21.8	45.0		2.7	25.9	
Effective Green, g (s)	0.8	34.7		1.6	35.5		21.8	45.0		2.7	25.9	
Actuated g/C Ratio	0.01	0.35		0.02	0.36		0.22	0.45		0.03	0.26	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	13	1108		27	1240		386	758		46	482	
v/s Ratio Prot	0.01	c0.30		c0.01	0.29		c0.18	0.02		0.01	c0.03	
v/s Ratio Perm												
v/c Ratio	0.77	0.84		0.89	0.82		0.82	0.03		0.52	0.09	
Uniform Delay, d1	49.5	30.1		49.1	29.4		37.2	15.3		48.0	28.1	
Progression Factor	1.00	1.00		0.94	0.97		0.91	0.56		1.00	1.00	
Incremental Delay, d2	128.6	5.9		25.6	0.4		10.3	0.1		10.3	0.4	
Delay (s)	178.1	36.0		72.0	29.0		44.4	8.7		58.3	28.5	
Level of Service	F	D		E	C		D	A		E	C	
Approach Delay (s)		37.4			30.0			40.2			38.2	
Approach LOS		D			C			D			D	

Intersection Summary			
HCM Average Control Delay	34.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	55.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.99	1.00		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1871	1583		1810	1583	1736	3406	1599	3467	3505	1509
Flt Permitted		0.94	1.00		0.64	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1766	1583		1194	1583	1736	3406	1599	3467	3505	1509
Volume (vph)	20	122	209	158	85	261	154	1338	92	248	1889	36
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	21	127	218	165	89	272	160	1394	96	258	1968	38
RTOR Reduction (vph)	0	0	122	0	0	138	0	0	44	0	0	15
Lane Group Flow (vph)	0	148	97	0	254	134	160	1394	52	258	1968	23
Heavy Vehicles (%)	0%	1%	2%	2%	1%	2%	4%	6%	1%	1%	3%	7%
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		8			4		5	2		1	6	
Permitted Phases	8		8	4		4			2			6
Actuated Green, G (s)		25.0	25.0		25.0	25.0	9.0	54.0	54.0	9.0	54.0	54.0
Effective Green, g (s)		25.0	25.0		25.0	25.0	9.0	54.0	54.0	9.0	54.0	54.0
Actuated g/C Ratio		0.25	0.25		0.25	0.25	0.09	0.54	0.54	0.09	0.54	0.54
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		442	396		299	396	156	1839	863	312	1893	815
v/s Ratio Prot							c0.09	0.41		0.07	c0.56	
v/s Ratio Perm		0.08	0.14		c0.21	0.17			0.06			0.03
v/c Ratio		0.33	0.24		0.85	0.34	1.03	0.76	0.06	0.83	1.04	0.03
Uniform Delay, d1		30.7	29.9		35.7	30.7	45.5	17.9	10.9	44.7	23.0	10.7
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.99	1.35	1.31
Incremental Delay, d2		2.0	1.5		24.9	2.3	79.0	3.0	0.1	9.6	26.9	0.0
Delay (s)		32.7	31.4		60.6	33.0	124.5	20.9	11.1	54.0	57.9	14.1
Level of Service		C	C		E	C	F	C	B	D	E	B
Approach Delay (s)		31.9			46.3			30.4			56.7	
Approach LOS		C			D			C			E	

Intersection Summary			
HCM Average Control Delay	44.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	94.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↑	↱	↰	↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1792	1615	1752	1900	1615	1805	3471	1615	1787	3505	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	1792	1615	1752	1900	1615	1805	3471	1615	1787	3505	1615
Volume (vph)	46	21	5	48	48	157	13	1563	17	314	2199	62
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	49	22	5	51	51	167	14	1663	18	334	2339	66
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	49	22	5	51	51	167	14	1663	18	334	2339	66
Heavy Vehicles (%)	0%	6%	0%	3%	0%	0%	0%	4%	0%	1%	3%	0%
Turn Type	Prot		Free	Prot		Free	Prot		Free	Prot		Free
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases			Free		4	Free			Free			Free
Actuated Green, G (s)	3.2	4.0	100.0	5.6	6.4	100.0	0.8	46.6	100.0	27.8	73.6	100.0
Effective Green, g (s)	3.2	4.0	100.0	5.6	6.4	100.0	0.8	46.6	100.0	27.8	73.6	100.0
Actuated g/C Ratio	0.03	0.04	1.00	0.06	0.06	1.00	0.01	0.47	1.00	0.28	0.74	1.00
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	58	72	1615	98	122	1615	14	1617	1615	497	2580	1615
v/s Ratio Prot	c0.03	0.01		0.03	c0.03		0.01	c0.48		0.19	c0.67	
v/s Ratio Perm			0.00			0.10			0.01			0.04
v/c Ratio	0.84	0.31	0.00	0.52	0.42	0.10	1.00	1.03	0.01	0.67	0.91	0.04
Uniform Delay, d1	48.2	46.7	0.0	45.9	45.0	0.0	49.6	26.7	0.0	32.1	10.5	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.72	0.47	1.00	1.16	0.85	1.00
Incremental Delay, d2	65.1	2.4	0.0	4.9	2.3	0.1	199.9	26.3	0.0	0.3	0.6	0.0
Delay (s)	113.2	49.1	0.0	50.8	47.3	0.1	235.5	38.8	0.0	37.6	9.5	0.0
Level of Service	F	D	A	D	D	A	F	D	A	D	A	A
Approach Delay (s)		87.2			18.7			40.0			12.7	
Approach LOS		F			B			D			B	

Intersection Summary			
HCM Average Control Delay	23.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	83.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	0.85	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	1599	1615	1698	1712	1553	1752	4908		1787	4988	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1787	1599	1615	1698	1802	1553	1752	4908		1787	4988	
Volume (vph)	194	303	223	381	319	196	284	1383	79	281	1982	169
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	202	316	232	397	332	204	296	1441	82	293	2065	176
RTOR Reduction (vph)	0	0	180	0	0	169	0	6	0	0	10	0
Lane Group Flow (vph)	202	316	52	340	389	35	296	1517	0	293	2231	0
Heavy Vehicles (%)	1%	1%	0%	1%	0%	4%	3%	5%	2%	1%	3%	0%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases			8			4						
Actuated Green, G (s)	17.0	19.0	19.0	15.0	17.0	17.0	12.0	36.0		14.0	38.0	
Effective Green, g (s)	17.0	19.0	19.0	15.0	17.0	17.0	12.0	36.0		14.0	38.0	
Actuated g/C Ratio	0.17	0.19	0.19	0.15	0.17	0.17	0.12	0.36		0.14	0.38	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	304	304	307	255	306	264	210	1767		250	1895	
v/s Ratio Prot	0.11	c0.20		0.20	0.19		c0.17	0.31		0.16	c0.45	
v/s Ratio Perm			0.14		c0.03	0.13						
v/c Ratio	0.66	1.04	0.17	1.33	1.27	0.13	1.41	0.86		1.17	1.18	
Uniform Delay, d1	38.8	40.5	33.9	42.5	44.0	35.2	44.0	29.6		43.0	31.0	
Progression Factor	1.16	1.12	2.44	0.96	0.97	1.19	1.30	1.37		0.72	0.62	
Incremental Delay, d2	4.9	59.7	0.2	173.0	144.0	0.2	196.8	2.7		81.6	80.4	
Delay (s)	49.8	105.0	82.8	213.9	186.7	42.0	253.8	43.4		112.7	99.5	
Level of Service	D	F	F	F	F	D	F	D		F	F	
Approach Delay (s)	83.3				165.0			77.6			101.1	
Approach LOS	F				F			E			F	

Intersection Summary			
HCM Average Control Delay	101.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	101.3%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCS+™ DETAILED REPORT

General Information		Site Information	
Analyst	GAJ	Intersection	Hwy 99W/Edy Rd
Agency or Co.	Lancaster Engineering	Area Type	All other areas
Date Performed	6/22/2007	Jurisdiction	ODOT
Time Period	PM Peak Hour	Analysis Year	BK Cond
		Project ID	07038 - Pfeifer Zone Change

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N_1	1	3	0	1	3	0	1	1	1	1	1	1
Lane Group	L	TR		L	TR		L	LT	R	L	T	R
Volume, V (vph)	284	1383	79	281	1982	169	381	319	196	194	303	223
% Heavy Vehicles, %HV	3	5	2	1	3	0	1	1	4	1	1	0
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, l_1	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green, e	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Arrival Type, AT	3	3		3	3		3	3	3	3	3	3
Unit Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Filtering/Metering, I	1.000	1.000		1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Initial Unmet Demand, Q_b	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N_m												
Buses Stopping, N_B	0	0		0	0		0	0	0	0	0	0
Min. Time for Pedestrians, G_p	3.2			3.2			3.2			3.2		

Phasing	Excl. Left	WB Only	Thru & RT	04	NB Only	SB Only	07	08
Timing	G = 7.0	G = 6.0	G = 42.0	G =	G = 14.0	G = 9.0	G =	G =
	Y = 4	Y = 4	Y = 6	Y =	Y = 4	Y = 4	Y =	Y =
Duration of Analysis, T = 0.25						Cycle Length, C = 100.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	296	1523		293	2241		397	332	204	202	316	232
Lane Group Capacity, c	123	2057		304	2588		250	263	217	161	169	145
v/c Ratio, X	2.41	0.74		0.96	0.87		1.59	1.26	0.94	1.25	1.87	1.60
Total Green Ratio, g/C	0.07	0.42		0.17	0.52		0.14	0.14	0.14	0.09	0.09	0.09
Uniform Delay, d_1	46.5	24.4		41.2	21.0		43.0	43.0	42.6	45.5	45.5	45.5
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Delay Calibration, k	0.50	0.30		0.47	0.40		0.50	0.50	0.45	0.50	0.50	0.50
Incremental Delay, d_2	657.0	1.5		41.8	3.4		282.8	144.9	44.5	155.3	413.1	299.8
Initial Queue Delay, d_3	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay	703.5	25.9		82.9	24.3		325.8	187.9	87.1	200.8	458.6	345.3
Lane Group LOS	F	C		F	C		F	F	F	F	F	F
Approach Delay	136.2			31.1			224.5			354.1		
Approach LOS	F			C			F			F		
Intersection Delay	132.8			X_c = 1.23			Intersection LOS			F		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑	↱	↰↰	↑	↱	↰	↑↑↑	↱	↰	↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.91	1.00	1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	4919	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	4919	
Volume (vph)	140	388	162	356	349	124	262	995	241	294	1868	520
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	422	176	387	379	135	285	1082	262	320	2030	565
RTOR Reduction (vph)	0	0	137	0	0	104	0	0	179	0	50	0
Lane Group Flow (vph)	152	422	39	387	379	31	285	1082	83	320	2545	0
Heavy Vehicles (%)	17%	6%	5%	4%	4%	5%	3%	6%	9%	6%	2%	2%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases		4	4			8			2			
Actuated Green, G (s)	8.0	22.0	22.0	9.0	23.0	23.0	12.0	31.7	31.7	21.3	41.0	
Effective Green, g (s)	8.0	22.0	22.0	9.0	23.0	23.0	12.0	31.7	31.7	21.3	41.0	
Actuated g/C Ratio	0.08	0.22	0.22	0.09	0.23	0.23	0.12	0.32	0.32	0.21	0.41	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	123	394	338	303	420	354	210	1551	470	363	2017	
v/s Ratio Prot	0.10	c0.24		c0.11	0.21		c0.16	0.22		0.19	c0.53	
v/s Ratio Perm			0.11			0.09			0.18			
v/c Ratio	1.24	1.07	0.11	1.28	0.90	0.09	1.36	0.70	0.18	0.88	1.26	
Uniform Delay, d1	46.0	39.0	31.2	45.5	37.4	30.3	44.0	29.9	24.7	38.1	29.5	
Progression Factor	1.56	0.63	1.42	1.00	1.00	1.00	0.60	1.29	3.99	1.00	1.00	
Incremental Delay, d2	144.9	58.2	0.1	147.8	22.1	0.1	177.8	1.5	0.5	21.3	121.9	
Delay (s)	216.9	82.6	44.6	193.3	59.5	30.4	204.2	40.1	98.9	59.4	151.4	
Level of Service	F	F	D	F	E	C	F	D	F	E	F	
Approach Delay (s)		100.9			112.6			78.3			141.3	
Approach LOS		F			F			E			F	

Intersection Summary			
HCM Average Control Delay	116.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.24		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	106.1%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	GAJ
Agency/Co.	Lancaster Engineering
Date Performed	6/13/2007
Analysis Time Period	PM Peak Hour

Site Information

Intersection	Edy Rd/Elwert Rd
Jurisdiction	Sherwood
Analysis Year	BK + ST Cond

Project ID 07038 - Pfeifer Zone Change

East/West Street: SW Edy Road

North/South Street: SW Elwert Road

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	2	45	9	25	67	62
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	9	192	31	64	351	16
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.97		0.97		0.97		0.97	
Flow Rate (veh/h)	57		157		237		442	
% Heavy Vehicles	6		1		2		1	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

	Eastbound L1	Eastbound L2	Westbound L1	Westbound L2	Northbound L1	Northbound L2	Southbound L1	Southbound L2
Prop. Left-Turns	0.0		0.2		0.0		0.1	
Prop. Right-Turns	0.2		0.4		0.1		0.0	
Prop. Heavy Vehicle	0.1		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.0		-0.2		-0.0		0.0	

Departure Headway and Service Time

	Eastbound L1	Eastbound L2	Westbound L1	Westbound L2	Northbound L1	Northbound L2	Southbound L1	Southbound L2
hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.05		0.14		0.21		0.39	
hd, final value (s)	5.94		5.52		5.10		4.89	
x, final value	0.09		0.24		0.34		0.60	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	3.9		3.5		3.1		2.9	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	307		407		487		692	
Delay (s/veh)	9.56		10.26		10.65		14.98	
LOS	A		B		B		B	
Approach: Delay (s/veh)	9.56		10.26		10.65		14.98	
LOS	A		B		B		B	
Intersection Delay (s/veh)	12.65							
Intersection LOS	B							

 HCS+™ Version 5.21 Generated: 7/20/2007 10:49 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.93		1.00	0.88		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1881		1805	1746		1805	1664		1787	1586	
Flt Permitted	0.10	1.00		0.42	1.00		0.67	1.00		0.73	1.00	
Satd. Flow (perm)	185	1881		803	1746		1269	1664		1366	1586	
Volume (vph)	87	371	0	26	391	362	2	8	37	338	1	122
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	92	391	0	27	412	381	2	8	39	356	1	128
RTOR Reduction (vph)	0	0	0	0	40	0	0	22	0	0	73	0
Lane Group Flow (vph)	92	391	0	27	753	0	2	25	0	356	56	0
Heavy Vehicles (%)	2%	1%	0%	0%	1%	1%	0%	0%	0%	1%	0%	2%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	49.3	49.3		49.3	49.3		42.7	42.7		42.7	42.7	
Effective Green, g (s)	49.3	49.3		49.3	49.3		42.7	42.7		42.7	42.7	
Actuated g/C Ratio	0.49	0.49		0.49	0.49		0.43	0.43		0.43	0.43	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	91	927		396	861		542	711		583	677	
v/s Ratio Prot		0.21			0.45			0.03			0.08	
v/s Ratio Perm	c0.50			0.03			0.00			c0.26		
v/c Ratio	1.01	0.42		0.07	0.87		0.00	0.03		0.61	0.08	
Uniform Delay, d1	25.4	16.2		13.3	22.6		16.4	16.7		22.2	17.0	
Progression Factor	1.00	1.00		0.75	1.18		1.00	1.00		1.19	2.29	
Incremental Delay, d2	97.4	0.3		0.0	1.0		0.0	0.1		4.4	0.2	
Delay (s)	122.7	16.5		9.9	27.8		16.5	16.8		30.8	39.1	
Level of Service	F	B		A	C		B	B		C	D	
Approach Delay (s)		36.8			27.2			16.7			33.0	
Approach LOS		D			C			B			C	

Intersection Summary			
HCM Average Control Delay	31.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	GAJ	Intersection	Langer Dr/Sherwood Blvd
Agency/Co.	Lancaster Engineering	Jurisdiction	Sherwood
Date Performed	6/13/2007	Analysis Year	BK + ST Cond
Analysis Time Period	PM Peak Hour		

Project Description 07038 - Pfeifer Zone Change

East/West Street: SW Langer Drive | North/South Street: SW Sherwood Boulevard

Intersection Orientation: North-South | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	39	548	299	129	443	14
Peak-Hour Factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Hourly Flow Rate, HFR (veh/h)	40	564	308	132	456	14
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal		1			1	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			84			343
Peak-Hour Factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Hourly Flow Rate, HFR (veh/h)	0	0	86	0	0	353
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)	0			0		
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	1	0	0	1
Configuration			R			R

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L			R			R
v (veh/h)	40	132			353			86
C (m) (veh/h)	796	703			441			529
v/c	0.05	0.19			0.80			0.16
95% queue length	0.16	0.69			7.25			0.58
Control Delay (s/veh)	9.8	11.3			38.7			13.1
LOS	A	B			E			B
Approach Delay (s/veh)	--	--	38.7			13.1		
Approach LOS	--	--	E			B		

 HCS+™ Version 5.21 Generated: 7/20/2007 10:49 AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	0.92		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1742		1805	1739		1805	1840		1805	1837	
Flt Permitted	0.57	1.00		0.64	1.00		0.17	1.00		0.38	1.00	
Satd. Flow (perm)	1084	1742		1221	1739		324	1840		721	1837	
Volume (vph)	120	67	65	386	85	98	73	428	44	29	683	82
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	125	70	68	402	89	102	76	446	46	30	711	85
RTOR Reduction (vph)	0	39	0	0	46	0	0	3	0	0	4	0
Lane Group Flow (vph)	125	99	0	402	145	0	76	489	0	30	792	0
Heavy Vehicles (%)	0%	0%	2%	0%	0%	1%	0%	2%	0%	0%	2%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			6			2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)	35.2	35.2		35.2	35.2		56.8	56.8		56.8	56.8	
Effective Green, g (s)	35.2	35.2		35.2	35.2		56.8	56.8		56.8	56.8	
Actuated g/C Ratio	0.35	0.35		0.35	0.35		0.57	0.57		0.57	0.57	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	382	613		430	612		184	1045		410	1043	
v/s Ratio Prot		0.08			0.11			0.27			c0.43	
v/s Ratio Perm	0.12			c0.33			0.23			0.04		
v/c Ratio	0.33	0.16		0.93	0.24		0.41	0.47		0.07	0.76	
Uniform Delay, d1	23.7	22.3		31.3	22.9		12.2	12.7		9.7	16.4	
Progression Factor	1.00	1.00		1.00	1.00		0.90	0.81		1.00	1.00	
Incremental Delay, d2	0.5	0.1		27.5	0.2		2.9	0.6		0.3	5.2	
Delay (s)	24.2	22.4		58.8	23.1		13.9	10.9		10.1	21.6	
Level of Service	C	C		E	C		B	B		B	C	
Approach Delay (s)		23.3			47.3			11.3			21.2	
Approach LOS		C			D			B			C	

Intersection Summary			
HCM Average Control Delay	25.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	87.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱		↰	↑↑↱		↰	↱		↰	↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	1.00		1.00	0.89		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1597	3189		1703	3492		1770	1685		1703	1860	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1597	3189		1703	3492		1770	1685		1703	1860	
Volume (vph)	9	674	219	22	900	29	312	9	28	22	39	6
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	10	741	241	24	989	32	343	10	31	24	43	7
RTOR Reduction (vph)	0	34	0	0	3	0	0	17	0	0	5	0
Lane Group Flow (vph)	10	948	0	24	1018	0	343	24	0	24	45	0
Heavy Vehicles (%)	13%	11%	3%	6%	3%	0%	2%	0%	0%	6%	0%	0%
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	0.8	35.2		1.6	36.0		22.5	44.6		2.6	24.7	
Effective Green, g (s)	0.8	35.2		1.6	36.0		22.5	44.6		2.6	24.7	
Actuated g/C Ratio	0.01	0.35		0.02	0.36		0.22	0.45		0.03	0.25	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	13	1123		27	1257		398	752		44	459	
v/s Ratio Prot	0.01	c0.31		c0.01	0.29		c0.19	0.02		0.01	c0.03	
v/s Ratio Perm												
v/c Ratio	0.77	0.84		0.89	0.81		0.86	0.03		0.55	0.10	
Uniform Delay, d1	49.5	29.9		49.1	28.9		37.3	15.6		48.1	29.0	
Progression Factor	1.00	1.00		0.94	0.98		0.96	0.40		1.00	1.00	
Incremental Delay, d2	128.6	6.0		25.6	0.4		12.9	0.1		13.1	0.4	
Delay (s)	178.1	35.8		72.0	28.6		48.6	6.2		61.2	29.5	
Level of Service	F	D		E	C		D	A		E	C	
Approach Delay (s)		37.3			29.6			44.1			39.8	
Approach LOS		D			C			D			D	

Intersection Summary			
HCM Average Control Delay	35.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	56.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	GAJ	Intersection	Highway 99W/Site Access
Agency/Co.	Lancaster Engineering	Jurisdiction	Sherwood
Date Performed	6/13/2007	Analysis Year	BK + ST Cond
Analysis Time Period	PM Peak Hour		

Project Description 07038 - Pfeifer Zone Change

East/West Street:		North/South Street:	Highway 99W
Intersection Orientation:	North-South	Study Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		1747			1675	78
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR (veh/h)	0	1819	0	0	1744	81
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	2	0	0	2	1
Configuration		T			T	R
Upstream Signal		0			0	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			60			
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR (veh/h)	0	0	62	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	1	0	0	0
Configuration			R			

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration								R
v (veh/h)								62
C (m) (veh/h)								298
v/c								0.21
95% queue length								0.77
Control Delay (s/veh)								20.2
LOS								C
Approach Delay (s/veh)	--	--				20.2		
Approach LOS	--	--				C		

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	GAJ	Intersection	Edy Road Site Access
Agency/Co.	Lancaster Engineering	Jurisdiction	Sherwood
Date Performed	6/13/2007	Analysis Year	BK + ST Cond
Analysis Time Period	PM Peak Hour		

Project Description 07038 - Pfeifer Zone Change

East/West Street: SW Edy Road	North/South Street: Site Access
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		551	14	137	651	
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR (veh/h)	0	573	14	142	678	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	13		196			
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR (veh/h)	13	0	204	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	2
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
v (veh/h)		142		217				
C (m) (veh/h)		998		424				
v/c		0.14		0.51				
95% queue length		0.50		2.83				
Control Delay (s/veh)		9.2		22.1				
LOS		A		C				
Approach Delay (s/veh)	--	--		22.1				
Approach LOS	--	--		C				

HCM Signalized Intersection Capacity Analysis
3: SW Edy Road & Highway 99W

Movement	EBL	EBR	EBR2	NWL2	NWL	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↱	↱	↰↰	↰↰	↱	↰	↑↑↑↱		↰	↑↑↑↱	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.97	0.97	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	0.85	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	1599	1615	3467	3502	1553	1752	4908		1787	4988	
Flt Permitted	0.95	1.00	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1787	1599	1615	3467	3502	1553	1752	4908		1787	4988	
Volume (vph)	194	303	223	381	319	196	284	1383	79	281	1982	169
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	202	316	232	397	332	204	296	1441	82	293	2065	176
RTOR Reduction (vph)	0	0	179	0	0	174	0	6	0	0	10	0
Lane Group Flow (vph)	202	316	53	397	332	30	296	1517	0	293	2231	0
Heavy Vehicles (%)	1%	1%	0%	1%	0%	4%	3%	5%	2%	1%	3%	0%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases			8			4						
Actuated Green, G (s)	19.3	19.5	19.5	14.5	14.7	14.7	12.0	36.0		14.0	38.0	
Effective Green, g (s)	19.3	19.5	19.5	14.5	14.7	14.7	12.0	36.0		14.0	38.0	
Actuated g/C Ratio	0.19	0.20	0.20	0.14	0.15	0.15	0.12	0.36		0.14	0.38	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	345	312	315	503	515	228	210	1767		250	1895	
v/s Ratio Prot	0.11	c0.20		0.11	0.09		c0.17	0.31		0.16	c0.45	
v/s Ratio Perm			0.14			0.13						
v/c Ratio	0.59	1.01	0.17	0.79	0.64	0.13	1.41	0.86		1.17	1.18	
Uniform Delay, d1	36.7	40.2	33.5	41.3	40.2	37.1	44.0	29.6		43.0	31.0	
Progression Factor	1.21	1.18	2.68	0.94	0.93	1.19	1.30	1.37		0.68	0.56	
Incremental Delay, d2	2.3	51.6	0.2	7.6	2.6	0.2	196.8	2.7		88.9	81.5	
Delay (s)	46.9	99.0	90.1	46.3	40.2	44.2	253.8	43.4		118.1	98.7	
Level of Service	D	F	F	D	D	D	F	D		F	F	
Approach Delay (s)	82.2				43.7			77.6			101.0	
Approach LOS	F				D			E			F	

Intersection Summary			
HCM Average Control Delay	82.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	92.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCS+™ DETAILED REPORT

General Information		Site Information	
Analyst	GAJ	Intersection	Hwy 99W/Edy Rd
Agency or Co.	Lancaster Engineering	Area Type	All other areas
Date Performed	6/22/2007	Jurisdiction	ODOT
Time Period	PM Peak Hour	Analysis Year	BK Cond
		Project ID	07038 - Pfeifer Zone Change

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N_1	1	3	0	1	3	0	2	2	1	1	1	1
Lane Group	L	TR		L	TR		L	T	R	L	T	R
Volume, V (vph)	284	1383	79	281	1982	169	381	319	196	194	303	223
% Heavy Vehicles, %HV	3	5	2	1	3	0	1	1	4	1	1	0
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, l_1	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green, e	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Arrival Type, AT	3	3		3	3		3	3	3	3	3	3
Unit Extension, UE	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Filtering/Metering, I	1.000	1.000		1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Initial Unmet Demand, Q_b	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N_m												
Buses Stopping, N_B	0	0		0	0		0	0	0	0	0	0
Min. Time for Pedestrians, G_p	3.2			3.2			3.2			3.2		

Phasing	Excl. Left	WB Only	Thru & RT	04	Excl. Left	Thru & RT	07	08
Timing	G = 12.7	G = 6.0	G = 36.7	G =	G = 9.8	G = 12.8	G =	G =
	Y = 4	Y = 4	Y = 6	Y =	Y = 4	Y = 4	Y =	Y =
Duration of Analysis, T = 0.25						Cycle Length, C = 100.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	296	1523		293	2241		397	332	204	202	316	232
Lane Group Capacity, c	223	1797		406	2324		340	458	199	175	241	207
v/c Ratio, X	1.33	0.85		0.72	0.96		1.17	0.72	1.03	1.15	1.31	1.12
Total Green Ratio, g/C	0.13	0.37		0.23	0.47		0.10	0.13	0.13	0.10	0.13	0.13
Uniform Delay, d_1	43.7	29.1		35.7	25.8		45.1	41.9	43.6	45.1	43.6	43.6
Progression Factor, PF	1.000	1.000		1.000	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Delay Calibration, k	0.50	0.38		0.28	0.47		0.50	0.29	0.50	0.50	0.50	0.50
Incremental Delay, d_2	174.9	4.0		6.2	11.5		102.6	5.7	70.5	115.6	166.5	98.8
Initial Queue Delay, d_3	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay	218.5	33.1		41.9	37.3		147.7	47.6	114.1	160.7	210.1	142.4
Lane Group LOS	F	C		D	D		F	D	F	F	F	F
Approach Delay	63.3			37.9			104.7			175.9		
Approach LOS	E			D			F			F		
Intersection Delay	73.0			X_c = 1.10			Intersection LOS			E		

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HCM Signalized Intersection Capacity Analysis
4: SW Roy Rogers Road & Highway 99W

7/20/2007

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑	↱	↰↰	↑	↱	↰	↑↑↑	↱	↰	↑↑↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1543	1792	1538	3367	1827	1538	1752	4893	1482	1703	5085	1583
Volume (vph)	140	388	162	356	349	124	262	995	241	294	1868	520
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	422	176	387	379	135	285	1082	262	320	2030	565
RTOR Reduction (vph)	0	0	137	0	0	104	0	0	179	0	0	168
Lane Group Flow (vph)	152	422	39	387	379	31	285	1082	83	320	2030	397
Heavy Vehicles (%)	17%	6%	5%	4%	4%	5%	3%	6%	9%	6%	2%	2%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases		4	4			8			2			6
Actuated Green, G (s)	8.0	22.0	22.0	9.0	23.0	23.0	12.0	31.7	31.7	21.3	41.0	41.0
Effective Green, g (s)	8.0	22.0	22.0	9.0	23.0	23.0	12.0	31.7	31.7	21.3	41.0	41.0
Actuated g/C Ratio	0.08	0.22	0.22	0.09	0.23	0.23	0.12	0.32	0.32	0.21	0.41	0.41
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	123	394	338	303	420	354	210	1551	470	363	2085	649
v/s Ratio Prot	0.10	c0.24		c0.11	0.21		c0.16	0.22		c0.19	c0.40	
v/s Ratio Perm			0.11			0.09			0.18			0.36
v/c Ratio	1.24	1.07	0.11	1.28	0.90	0.09	1.36	0.70	0.18	0.88	0.97	0.61
Uniform Delay, d1	46.0	39.0	31.2	45.5	37.4	30.3	44.0	29.9	24.7	38.1	29.0	23.2
Progression Factor	1.57	0.63	1.42	1.00	1.00	1.00	0.61	1.28	3.98	1.00	1.00	1.00
Incremental Delay, d2	144.9	58.2	0.1	147.8	22.1	0.1	178.1	1.6	0.5	21.3	14.4	4.3
Delay (s)	217.1	82.6	44.6	193.3	59.5	30.4	204.8	39.9	98.9	59.4	43.4	27.5
Level of Service	F	F	D	F	E	C	F	D	F	E	D	C
Approach Delay (s)		100.9			112.6			78.2			42.1	
Approach LOS		F			E			E			D	

Intersection Summary			
HCM Average Control Delay	69.0	HCM Level of Service	E
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	94.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

QUEUING ANALYSIS - SIGNALIZED INTERSECTION

Project Name: 07038 - Pfeifer Zone Change
Analyst: GAJ
Date: 7/13/2007
Intersection: Elwert Rd/Highway 99W
Time Period: PM Peak Hour
Scenario: 2022 BK + ST Condition

DATA ENTRY

Cycle Length: 100 sec
Storage per Vehicle: 25 feet

	Eastbound			Westbound			Northbound			Southbound			
	L	T	R	L	T	R	L	T	R	L	T	R	
Volume:	154	1338	92	248	1889	36		243	261		142	209	vph
Green Time:	9	54	54	9	54	54		25	25		25	25	sec
Yellow Time:	4	4	4	4	4	4		4	4		4	4	sec
Number of Lanes:	1	2	1	2	2	1		1	1		1	1	

CALCULATIONS

Average Total Queue:	3.7	15.6	1.1	6.0	22.0	0.4	0.0	4.8	5.1	0.0	2.8	4.1	veh
95th Percentile Queue:	7	22	3	10	30	2	#N/A	9	9	#N/A	6	8	veh
95th Percentile Queue Length:	175	550	75	250	750	50	#N/A	225	225	#N/A	150	200	feet
Required Storage per Lane:	**175**	**275**	**75**	**125**	375	**50**	#N/A	**225**	**225**	#N/A	**150**	**200**	feet

QUEUING ANALYSIS - SIGNALIZED INTERSECTION

Project Name: 07038 - Pfeifer Zone Change
Analyst: GAJ
Date: 7/13/2007
Intersection: Meinecke Rd/Highway 99W
Time Period: PM Peak Hour
Scenario: 2022 BK + ST Condition

DATA ENTRY

Cycle Length: 100 sec
Storage per Vehicle: 25 feet

	Eastbound			Westbound			Northbound			Southbound			
	L	T	R	L	T	R	L	T	R	L	T	R	
Volume:	13	1563	17	314	2199	157	48	48	62	46	21	46	vph
Green Time:	2	46	100	25	70	100	4	6	100	6	8	100	sec
Yellow Time:	4	4	0	4	4	0	4	4	0	4	4	0	sec
Number of Lanes:	1	2	1	1	2	1	1	1	1	1	1	1	

CALCULATIONS

Average Total Queue:	0.3	21.7	0.0	6.2	15.9	0.0	1.2	1.2	0.0	1.2	0.5	0.0	veh
95^{th} Percentile Queue:	1	30	#N/A	10	23	#N/A	3	3	#N/A	3	2	#N/A	veh
95^{th} Percentile Queue Length:	25	750	#N/A	250	575	#N/A	75	75	#N/A	75	50	#N/A	feet
Required Storage per Lane:	**25**	**375**	**#N/A**	**250**	**300**	**#N/A**	**75**	**75**	**#N/A**	**75**	**50**	**#N/A**	feet

QUEUING ANALYSIS - SIGNALIZED INTERSECTION

Project Name: 07038 - Pfeifer Zone Change
Analyst: GAJ
Date: 7/13/2007
Intersection: Edy Rd/Highway 99W
Time Period: PM Peak Hour
Scenario: 2022 BK + ST Condition

DATA ENTRY

Cycle Length: 100 sec
Storage per Vehicle: 25 feet

	Eastbound			Westbound			Northbound			Southbound			
	L	T	R	L	T	R	L	T	R	L	T	R	
Volume:	284	1462		281	2151		381	319	196	194	303	223	vph
Green Time:	7	42		13	48		14	14		9	9		sec
Yellow Time:	4	4		4	4		4	4		4	4		sec
Number of Lanes:	1	3		1	3		2	1	1	1	1	1	

CALCULATIONS

Average Total Queue:	7.0	21.9	0.0	6.5	28.7	0.0	8.7	7.3	5.4	4.7	7.3	6.2	veh
95th Percentile Queue:	12	30	#N/A	11	38	#N/A	14	12	9	8	12	10	veh
95th Percentile Queue Length:	300	750	#N/A	275	950	#N/A	350	300	225	200	300	250	feet
Required Storage per Lane:	**300**	**250**	#N/A	**275**	**325**	#N/A	**175**	**300**	**225**	**200**	**300**	**250**	feet

QUEUING ANALYSIS - SIGNALIZED INTERSECTION

Project Name: 07038 - Pfeifer Zone Change
Analyst: GAJ
Date: 7/13/2007
Intersection: Tualatin-Sherwood Rd/Highway 99W
Time Period: PM Peak Hour
Scenario: 2027 BK + ST Condition

DATA ENTRY

Cycle Length: 100 sec
Storage per Vehicle: 25 feet

	Eastbound			Westbound			Northbound			Southbound			
	L	T	R	L	T	R	L	T	R	L	T	R	
Volume:	262	995	241	294	2388		356	349	124	140	550		vph
Green Time:	12	30	30	23	42		9	23	23	8	22		sec
Yellow Time:	4	4	4	4	4		4	4	4	4	4		sec
Number of Lanes:	1	3	1	1	3		2	1	1	1	2		

CALCULATIONS

Average Total Queue:	6.1	18.2	4.4	6.0	35.8	0.0	8.6	7.1	2.5	3.4	11.3	0.0	veh
95th Percentile Queue:	10	25	8	10	46	#N/A	14	12	5	7	17	#N/A	veh
95th Percentile Queue Length:	250	625	200	250	1150	#N/A	350	300	125	175	425	#N/A	feet
Required Storage per Lane:	**250**	**200**	**200**	**250**	**375**	**#N/A**	**175**	**300**	**125**	**175**	**225**	**#N/A**	feet

QUEUING ANALYSIS - SIGNALIZED INTERSECTION

Project Name: 07038 - Pfeifer Zone Change
Analyst: GAJ
Date: 7/13/2007
Intersection: Edy Road/Borchers Drive
Time Period: PM Peak Hour
Scenario: 2027 BK + ST Condition

DATA ENTRY

Cycle Length: 100 sec
Storage per Vehicle: 25 feet

	Eastbound			Westbound			Northbound			Southbound			
	L	T	R	L	T	R	L	T	R	L	T	R	
Volume:	87	371		26	753		2	45		338	123		vph
Green Time:	15	52		5	43		1	5		21	26		sec
Yellow Time:	4	4		4	4		4	4		4	4		sec
Number of Lanes:	1	1		1	1		1	1		1	1		

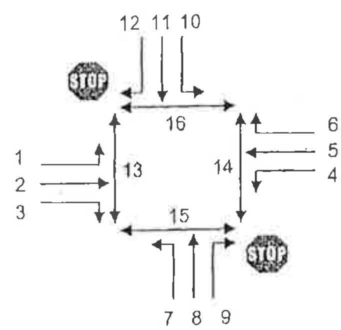
CALCULATIONS

Average Total Queue:	2.0	4.5	0.0	0.7	11.1	0.0	0.1	1.1	0.0	7.0	2.4	0.0	veh
95th Percentile Queue:	4	8	#N/A	2	17	#N/A	0	3	#N/A	12	5	#N/A	veh
95th Percentile Queue Length:	100	200	#N/A	50	425	#N/A	0	75	#N/A	300	125	#N/A	feet
Required Storage per Lane:	**100**	**200**	#N/A	**50**	**425**	#N/A	**0**	**75**	#N/A	**300**	**125**	#N/A	feet

Maximum Queue Lengths at Unsignalized Intersections

Major St: Sherwood Boulevard
Minor St: Langer Drive
Scenario: 2027 BK + ST Cond
PM Peak Hour

	Moves	Inputs			Results		Validation
		Lanes	Va	Vc	Max Queue		
Major St	1	1	41	485	3.27	4	
	2	1	582				
	3	0	318				
	4	1	137	900	5.91	6	
	5	1	471				
	6	0	14				
Minor St	7	0	0	1575	x	x	
	8	0	0	1582	x	x	
	9	1	364	741	7.67	8	
	10	0	0	1575	x	x	
	11	0	0	1734	x	x	
	12	1	89	478	-0.75	-1	
Pedestrian	13	0	0				
	14	0	0				
	15	0	0				
	16	0	0				
Speed (mph)	35						
PHF	0.94						
TS	1	There is/are signal(s) within 1/4 mi of the intersection on Major St.					



"Study" indicates that the calculated queue length is out of the field observed data ranges.

Maximum Queue Length Estimation based on John T. Gard's article
"Estimation of Maximum Queue Lengths at Unsignalized Intersections", ITE Journal / Nov. 2001

QUEUING ANALYSIS - SIGNALIZED INTERSECTION

Project Name: 07038 - Pfeifer Zone Change
Analyst: GAJ
Date: 7/13/2007
Intersection: Century Drive/Sherwood Bouelvard
Time Period: PM Peak Hour
Scenario: 2027 BK + ST Condition

DATA ENTRY

Cycle Length: 100 sec
Storage per Vehicle: 25 feet

	Eastbound			Westbound			Northbound			Southbound			
	L	T	R	L	T	R	L	T	R	L	T	R	
Volume:	120	132		386	183		29	765		73	472		vph
Green Time:	6	13		21	28		7	46		4	43		sec
Yellow Time:	4	4		4	4		4	4		4	4		sec
Number of Lanes:	1	1		1	1		1	1		1	1		

CALCULATIONS

Average Total Queue:	3.0	3.0	0.0	8.0	3.5	0.0	0.7	10.6	0.0	1.9	6.9	0.0	veh
95^{th} Percentile Queue:	6	6	#N/A	13	7	#N/A	2	16	#N/A	4	11	#N/A	veh
95^{th} Percentile Queue Length:	150	150	#N/A	325	175	#N/A	50	400	#N/A	100	275	#N/A	feet
Required Storage per Lane:	**150**	**150**	#N/A	**325**	**175**	#N/A	**50**	**400**	#N/A	**100**	**275**	#N/A	feet

QUEUING ANALYSIS - SIGNALIZED INTERSECTION

Project Name: 07038 - Pfeifer Zone Change
Analyst: GAJ
Date: 7/13/2007
Intersection: Borchers Drive/Roy Rogers Road
Time Period: PM Peak Hour
Scenario: 2027 BK + ST Condition

DATA ENTRY

Cycle Length: 100 sec
Storage per Vehicle: 25 feet

	Eastbound			Westbound			Northbound			Southbound			
	L	T	R	L	T	R	L	T	R	L	T	R	
Volume:	9	893		22	929		312	37		22	45		vph
Green Time:	1	45		2	46		24	33		4	13		sec
Yellow Time:	4	4		4	4		4	4		4	4		sec
Number of Lanes:	1	1		1	1		1	1		1	1		

CALCULATIONS

Average Total Queue:	0.2	12.7	0.0	0.6	12.9	0.0	6.2	0.6	0.0	0.6	1.0	0.0	veh
95^{th} Percentile Queue:	1	19	#N/A	2	19	#N/A	11	2	#N/A	2	3	#N/A	veh
95^{th} Percentile Queue Length:	25	475	#N/A	50	475	#N/A	275	50	#N/A	50	75	#N/A	feet
Required Storage per Lane:	**25**	**475**	#N/A	**50**	**475**	#N/A	**275**	**50**	#N/A	**50**	**75**	#N/A	feet

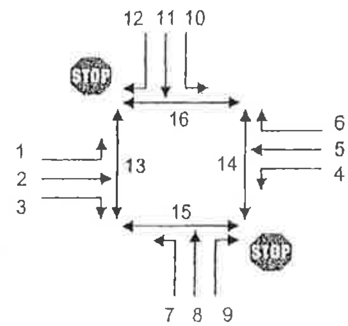
Maximum Queue Lengths at Unsignalized Intersections

Major St: Highway 99W
Minor St: Site Access
Scenario: 2027 BK + ST Cond
PM Peak Hour

	Moves	Inputs			Results		Validation
		Lanes	Va	Vc	Max Queue		
Major St	1	0	0	2698	x	x	
	2	3	1819				
	3	0	0				
	4	0	0	1819	x	x	
	5	3	2617				
	6	1	81				
Minor St	7	0	0	2691	x	x	
	8	0	0	4517	x	x	
	9	0	0	606	x	x	
	10	0	0	3223	x	x	
	11	0	0	4436	x	x	
	12	1	62	872	3.17	3	
Pedestrian	13	0	0				
	14	0	0				
	15	0	0				
	16	0	0				

Speed (mph)	45	
PHF	0.96	
TS	1	There is/are signal(s) within 1/4 mi of the Intersection on Major St.

"Study" indicates that the calculated queue length is out of the field observed data ranges.



Maximum Queue Length Estimation based on John T. Gard's article
"Estimation of Maximum Queue Lengths at Unsignalized Intersections", ITE Journal / Nov. 2001

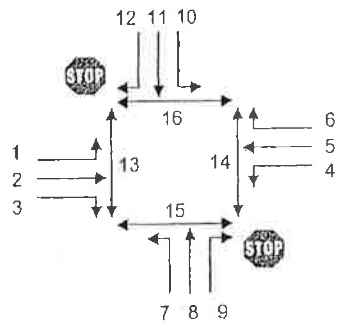
Maximum Queue Lengths at Unsignalized Intersections

Major St: Edy Road
Minor St: Site Access
Scenario: 2027 BK + ST Cond
PM Peak Hour

	Moves	Inputs: Lanes	Va	Vc	Results: Max Queue	Validation
Major St	1	0	0	678	x	x
	2	1	573			
	3	0	11			
	4	0	142	584	5.55	6
	5	1	678			
	6	0	0			
Minor St	7	0	13	1541	x	x
	8	1	0	1541	16.75	Study
	9	0	204	579	x	x
	10	0	0	1643	x	x
	11	0	0	1546	x	x
	12	0	0	678	x	x
Pedestrian	13	0	0			
	14	0	0			
	15	0	0			
	16	0	0			

Speed (mph)	35	
PHF	0.96	
TS	1	There is/are signal(s) within 1/4 mi of the intersection on Major St.

"Study" indicates that the calculated queue length is out of the field observed data ranges.



Maximum Queue Length Estimation based on John T. Gard's article
"Estimation of Maximum Queue Lengths at Unsignalized Intersections", ITE Journal / Nov. 2001

July 24, 2007

TO City of Sherwood
Julia Hajduk, Planning Manager

FROM Leslie Ann Hauer AICP

RE Supplemental Information for Comprehensive Plan and Zoning Map Amendment
File PA 07-01

This memorandum responds to the City's letter of July 13, 2007, requesting additional information for File PA 07-01, Comprehensive Plan Amendment and Zone Change for property located at 2105 SW Pacific Highway.

Transportation Impacts

A traffic impact study has been prepared by Lancaster Engineering, Inc. and is submitted as part of the application. The Sherwood Municipal Code requires an analysis of transportation impacts, consistent with the Transportation Planning Rule (OAR 660-012-0060), as implemented by SMC 16.80.030.3:

3. Transportation Planning Rule Consistency

A. Review of plan and text amendment applications for effect on transportation facilities. Proposals shall be reviewed to determine whether it significantly affects a transportation facility, in accordance with OAR 660-12-0060 (the TPR). Review is required when a development application includes a proposed amendment to the Comprehensive Plan or changes to land use regulations.

B. "Significant" means that the transportation facility would change the functional classification of an existing or planned transportation facility, change the standards implementing a functional classification, allow types of land use, allow types or levels of land use that would result in levels of travel or access that are inconsistent with the functional classification of a transportation facility, or would reduce the level of service of the facility below the minimum level identified on the Transportation System Plan.

C. Per OAR 660-12-0060, Amendments to the Comprehensive Plan or changes to land use regulations which significantly affect a transportation facility shall assure that allowed land uses are consistent with the function, capacity, and level of service of the facility identified in the Transportation System Plan. This shall be accomplished by one of the following:

1. Limiting allowed uses to be consistent with the planned function of the transportation facility.

2. Amending the Transportation System Plan to ensure that existing, improved, or new transportation facilities are adequate to support the proposed land uses.

3. Altering land use designations, densities or design requirements to reduce demand for automobile travel and meet travel needs through other modes.

The Lancaster TIS notes that the weekday site trips increases from 602 under the present MDRL zoning to 4,767, an increase of 4,165 daily trips. While the trip generation calculation is based upon "worst case" development scenarios under both existing and proposed zoning designations, there unquestionably will be a large increase under the proposed RC designation.

The Lancaster TIS does not conclude that the proposed zone change will have a "significant impact" on the surrounding roadways, as defined by the SMC and TPR. This is because the Tualatin-Sherwood Road/Highway 99W and Edy Road/Highway 99W intersections are projected to exceed LOS standards even with no change in zoning for this site. However, the Lancaster TIS does recommend improvements at these intersections that will have the effect of bringing operating conditions to slightly better than background conditions (see Lancaster TIS, "Conclusions", page 24).

No condition of approval should be imposed at this time, as the Lancaster TIS is based upon the "worst case" development, in other words, the highest potential trip generators among all possible future uses. The actual uses that occur on the site will most likely generate less traffic. Mitigation is appropriately required at the time of development, consistent with the level of impact that will be confirmed by an analysis of traffic from a specific building proposal.

Based on the Lancaster TIS, the zoning change proposed will be consistent with the SMC 16.80.030.3 and the TPR, with mitigation required through future development review.

Compliance with the Metro Functional Plan

All jurisdictions in the "Metro" Planning Area must comply with requirements in the Functional Plan to plan to accommodate future residents and employment opportunities. The City of Sherwood has been allocated the goal of providing capacity for 5,216 dwelling units and 9,518 jobs, as noted in the application narrative.

The 5.74-acre site was developed with spaces for 41 manufactured homes and could, under the MDRL Zone, be developed with 63 single family residences under the most optimistic development scenario (based upon the Lancaster TIS "worst case", page 11). Even if 63 dwellings were possible, accounting for street right of way, design constraints, access, etc., the site would represent only 1.2% of the City's assigned total dwelling units.

Employment density is not as easy to determine, owing to the widely varying numbers of employees by business type. Based upon the Lancaster TIS "worst case" for commercial

development, the site could be developed with 11,000 square feet of Medical Office Building, 77,000 square feet of Shopping Center, and 4,500 square feet of Drive-in Bank.

Employment densities are the subject of Metro's "2002-2022 Urban Growth Report: An Employment Land Need Analysis, Table 2 (page 13), reproduced in part here:

Regional Average Densities by Building Type

	Office	Retail	Medical/Government
Square feet/job	300	350	400
Floor Area Ratio	0.60	0.44	0.34

Using Lancaster's numbers, the following employment generation might be expected:

Site Employment Projection

Building type	Area	Employment
Medical Office Building	11,000 square feet	27.5 jobs
Shopping Center	77,000 square feet	220 jobs
Drive-in Bank (office/retail)	4,500 square feet	15 office or 12.9 retail jobs (Average: 14 jobs)
	92,500 square feet	231.5 jobs

This analysis must be taken with due consideration for the basis of the assumptions: Lancaster's "worst case" development scenario and Metro's regional averages. Neither may apply directly to the site, which is unlikely to be developed to worst case build-out and which may have more—or less—employees per square foot of building area.

What can be safely concluded is that the present zoning allows as many as 63 dwellings, with a likely population density of 160.65 persons[1] (assuming 2.55 persons/dwelling). The estimate of 231.5 jobs would be an increase in population (employment) density under the proposed RC zoning.

Why this site and an RC designation?

The application explains why the site is both suitable and appropriate for a designation of "Retail Commercial" (RC), given the history of the site and surrounding area as well as adjacent uses. The Cogan Owens Cogan Economic Opportunities Analysis (2007) concluded there would be a need for an additional 27 acres of commercial land. Therefore, the question for the City to

[1] City of Sherwood Staff Report: File No. PA 00-04 2040 Title 1 Plan & Code Amendments, December 6, 2000, Exhibit A, page 8 of 14.

consider is not whether other sites are suitable for a commercial designation, but what designation is most appropriate for *this site*.

Based upon policies in the Comprehensive Plan, discussed in the application, the "Six Corners" area is appropriate for commercial development. A commercial zoning designation for this site, with frontage on Highway 99W, would be consistent with the commercial zoning on adjacent properties and could be developed to provide coordinated access with adjacent properties. More specifically, the Retail Commercial (RC) designation is somewhat less intensive than the General Commercial (GC designation, therefore the proposed designation is more suited given the proximity of high density residential development.

The site is between properties designated Retail Commercial and General Commercial, with properties designated General Commercial located east of Highway 99. Given the mix of designations, either could be appropriate. What appears unarguable, both in terms of the situation on the ground as well as the City's policies, is that the site should have a commercial designation as discussed in the application narrative.

Other Issues

The June 13, 2007 letter requests additional items, including mailing labels, copies of all documents, electronic copies, and so on. The requested information is included with this memorandum.

City of Sherwood

Pfeifer Comprehensive Plan Amendment and Zone Change

June 6, 2007

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APPLICATION: **Comprehensive Plan Map Amendment & Zone Change**

PROPOSAL: **Amend the Comprehensive Plan and Zoning Maps from Medium Density Residential (MDRL) to Retail Commercial (RC).**

LOCATION: **21305 SW Pacific Highway; Tax Lot: 2S130D001200**

ZONING: Medium Density Residential (MDRL)

DATE: **June 6, 2007**

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Narrative

Site Description & Neighboring Properties

The site is located at 21305 SW Pacific Highway. As shown on Map A: Vicinity Map, the site is approximately ½ mile southwest of the intersection of Tualatin-Sherwood Highway and Pacific Highway (Hwy 99). The site is 5.74 acres in size, flat, and currently has no mobile home residents. There is a single family home on the site, which was used as a residence and office for the park manager. The site has internal road and utility infrastructure appropriate to a mobile home park. The site has two driveway accesses onto Pacific Highway.

The site was originally developed in 1964 as a mobile home park with 41 single-wide spaces. At that time, it was surrounded on three sides by vacant fields. The Sherwood Comprehensive Plan was acknowledged in 1981, and assigned the MDRL plan designation to the site in accordance with its use.

As shown on Map 2: Zoning/Plan Map, properties to the northeast along Pacific Highway are planned and zoned predominantly RC to the intersection of Tualatin-Sherwood Highway, with one Mixed Use Employment (MUE) parcel. To the southwest, properties are primarily General Commercial (GC) for another ¾ mile, with a sizeable High Density Residential (HDR) parcel. Across Pacific Highway, properties are primarily RC to the northeast, and a mix of GC, RC, HDR, MUE, and MDRL to the southwest.

Immediately adjacent to the northeast is the List property, planned and zoned RC, currently in use for small scale retail and storage. The property immediately adjacent to the southwest is planned and zoned GC, and currently is applying for development of a hotel. Behind the subject site, to the northwest, lies a HDR parcel, currently developed with apartments. The property immediately across Pacific Highway to the southeast is zoned GC and developed for highway retail.

In summary, the site is an unused former mobile home park, in what is now Sherwood's busiest commercial area, located along a highway, between two commercially-zoned lots, across the street from a commercially-zoned lot.

Proposal

The proposal is to amend the Sherwood Comprehensive Plan and Zoning Map from Medium Density Residential (MDRL) to Retail Commercial (RC) on the 5.7-acre site. The reasons for this proposal are:

1) The mobile home park is no longer a viable use for the property owner. The park is vacant and outdated, originally constructed for single-wide homes. The infrastructure investment to retrofit the park for the current standard of double-wide homes is not financially feasible.
2) The surrounding area has changed and continues to change. Adjacent properties along Pacific Highway are commercial. Traffic has increased dramatically, creating substantial noise concerns for residential dwellings.
3) The property was clearly spot-zoned for an existing use, located between RC and GC, and would make more sense as a commercial property.
4) Amending the Comprehensive Plan and Zoning Designations for the site is in accordance with the City's economic and commercial objectives and policies.
5) Discussions with City Planning Staff indicated that the Retail Commercial designation was the most appropriate commercial designation for the site.

Plan & Zone Amendment Standards

4.203.02 Map Amendment

An amendment to the City Zoning Map may be granted, provided that the proposal satisfies all applicable requirements of the adopted Sherwood Comprehensive Plan, the Transportation System Plan and this Code, and that:

A. The proposed amendment is consistent with the goals and policies of the Comprehensive Plan and the Transportation System Plan.

Response: The Goals and Policies of the Sherwood Comprehensive Plan (SCP) and Transportation System Plan (TSP) are provided in this application, as well as responses to each standard, goal, and policy.

B. There is an existing and demonstrable need for the particular uses and zoning proposed, taking into account the importance of such uses to the economy of the City, the existing market demand for any goods or services which such uses will provide, the presence or absence and location of other such uses or similar uses in the area, and the general public good.

Response: The City of Sherwood, working with Cogan Owens Cogan, completed its Economic Opportunities Analysis (EOA) in early 2007. The EOA found that the City of Sherwood had only 13 acres of vacant commercial land left, including just 6 lots zoned for RC.

The EOA concluded that Sherwood would need to add 27 additional acres to its UGB for new commercial development, under the preferred "medium growth scenario". This qualifies as a demonstrated need for commercial land within the City.

The EOA also included new Commercial Policies. The subject site is clearly consistent with Policies 1-3, and does not conflict with Old Town Revitalization planning:

- ***Policy 1. Commercial activities will be located so as to most conveniently service customers.***

The subject site is associated with the large, established "Six Corners" commercial area, making it very convenient to the customers who already use the area, as well as the large volume of traffic that passes through this area.

- ***Policy 2. Commercial uses will be developed so as to complement rather than detract from adjoining uses.***

Development of a commercial use on this site would *better* complement the adjacent commercial land and uses than a mobile home park or the single-family / duplex uses allowed under the current MDRL zoning.

- ***Policy 3. Highway 99W is an appropriate location for commercial development at the highway's intersections with City arterial and major collector roadways.***

The site is located along Highway 99W, near several major intersections.

- ***Policy 4. The 1983 "Sherwood Old Town Revitalization Plan" and its guidelines and strategies are adopted as a part of the Sherwood Comprehensive Plan.***

The site is not part of Old Town, and the Revitalization Plan is not applicable.

The City of Sherwood's ***Urban Renewal Plan*** also includes the goal:

> ***To promote private development, redevelopment, and rehabilitation in both Old Town and Six Corners to help create jobs, tax revenues, and self-sustaining, vital, and vibrant commercial districts.***

Amending the Comprehensive Plan and Zoning designation for the subject site would increase the vitality of the Six Corners area, by replacing a defunct mobile home park site with a commercial area consistent and compatible with surrounding zoning.

C. ***The proposed amendment is timely, considering the pattern of development in the area, surrounding land uses, any changes which may have occurred in the neighborhood or community to warrant the proposed amendment, and the*** *availability of utilities and services to serve all potential uses in the proposed zoning district.*

Response: As discussed above, the mobile home park use was originally developed before Sherwood's Comprehensive Plan was adopted, at a time when there was comparatively very little commercial development in the Six Corners area, and no development on adjacent properties. Now, the site is an unused former mobile home park zoned for medium density residential, between two commercial parcels, in Sherwood's busiest commercial area. The proposed amendment is both timely and consistent with the area's land use pattern.

D. Other lands in the City already zoned for the proposed uses are either unavailable or unsuitable for immediate development due to location, size or other factors.

Response: As discussed above, the City of Sherwood's EOA indicates a demonstrated need for additional commercial land. The subject site is the only property zoned MDRL along Pacific Highway between Tualatin-Sherwood Highway and Meineke Parkway, a stretch of nearly a mile.

Comprehensive Plan Goals and Policies

Residential Goals and Policies

Policy 1 Residential areas will be developed in a manner which will insure that the integrity of the community is preserved and strengthened.

Response: The proposed amendment will result in zoning consistent with adjacent properties along Pacific Highway. The Retail Commercial designation is intended to be compatible with residential development, and will serve as a buffer between heavy traffic along Pacific Highway and the HDR development behind the subject site.

Policy 2 The City will insure that an adequate distribution of housing styles and tenures are available.

Policy 3 The City will insure the availability of affordable housing and locational choice for all income groups.

Response: This application proposes to rezone 5.7 acres of MDRL land. According to Chapter 4 of the City of Sherwood's Comprehensive Plan, the City provides an excess of land capable of meeting the needs of manufactured housing:

> *"As illustrated in Table IV-4, there are 743 acres zoned VLDR and LDR for strictly conventional housing, and 151 acres zoned MDRL, for conventional or manufactured housing. This indicates a shortage of 64 acres available in the MDRL zone for manufactured housing. Therefore, the City permits manufactured homes on individual lots in the MDRH zone, of which there are 172 buildable acres (Table IV-4). The City then exceeds the requirements for meeting the needs of manufactured housing."*

However, the housing needs section of the Comprehensive Plan appears to be dated to 1990. Metro Title 1 also addresses housing needs for cities within the Metro area. Consistency with Title 1 requirements would indicate the City is remaining in compliance with these policies. Title 1 requirements are addressed in the Title 1 section of this application, and in Exhibit C: Capacity Analysis.

Given the unsuitability of the site for its current use and zoning, a demonstrated need for additional employment/ commercial land within Sherwood, suitability of the site for commercial, and compliance with all other standards, it is clear the site is more in compliance with the comprehensive plan as commercial than as residential.

Policy 4 The City shall provide housing and special care opportunities for the elderly, disadvantaged and children.
Policy 5 The City shall encourage government assisted housing for low to moderate income families.
Policy 6 The City will create, designate and administer five residential zones specifying the purpose and standards of each consistent with the need for a balance in housing densities, styles, prices and tenures.

Response: These policies are not applicable to this application.

Commercial Goals and Policies

Policy 1 The City will coordinate on-going economic development planning with involved public and private agencies at the state, regional, county and local level.

Response: The City has recently completed an EOA, which responds to regional and local economic development coordination concerns.

Policy 2 The City will encourage economic growth that is consistent with the management and use of its environmental resources.

Response: The subject site has already been developed, and has no identified environmental resources.

Policy 3 The City will direct public expenditures toward the realization of community development goals by assuring the adequacy of community services and facilities for existing and future economic development.

Response: The City has taken steps toward meeting this policy by developing an EOA. As discussed above, the proposed plan amendment helps meet the economic goals and policies of the EOA.

Policy 4 The City will seek to improve regional access to the urban area as a means to encourage local economic development.

Response: This policy deals with regional access to Sherwood and is inapplicable to this plan amendment application. However, the proposed plan amendment would increase Sherwood's commercial land supply near two major transportation routes, as it lies along Pacific Highway, and about ¼ from the Tualatin-Sherwood Highway. This would benefit the City's efforts to increase access to local businesses.

Policy 5 The City will seek to diversify and expand commercial and industrial development in order to provide nearby job opportunities, and expand the tax base.

Response: Providing additional employment land within Sherwood's most active commercial hub is consistent with a policy of providing nearby job opportunities and expanding the tax base.

Policy 6 The City will seek funding through EDA or HUD for the rehabilitation of the Old Town and Washington Hill neighborhoods.

Response: This policy is inapplicable to this application.

Commercial Policies
Policy 1. Commercial activities will be located so as to most conveniently service customers.
Policy 2. Commercial uses will be developed so as to complement rather than detract from adjoining uses.
Policy 3. Highway 99W is an appropriate location for commercial development at the highway's intersections with City arterial and major collector roadways.

Policy 4. The 1983 "Sherwood Old Town Revitalization Plan" and its guidelines and strategies are adopted as a part of the Sherwood Comprehensive Plan.

Response: These policies were addressed earlier in this application, in response to Map Amendment standard 4.203.02(B). The proposed plan amendment is highly supportive of Policies 1-3, and does not conflict with Policy 4.

Transportation Goals and Policies

Comprehensive Plan Chapter 6 Goals and Policies, Statewide Planning Goal 12, and Transportation Planning Rule Consistency.

Response: Winterbrook and Lancaster Engineering have coordinated closely with the City and ODOT throughout the application process. Lancaster Engineering has prepared a preliminary Traffic Analysis, attached as Exhibit A. Comprehensive Plan and TPR requirements will be addressed in full as part of the Transportation Impact Study, which will be submitted as Exhibit B.

Statewide Planning Goals

Statewide Planning Goal 9 (Economic Development)

To provide adequate opportunities throughout the state for a variety of economic activities vital to the health, welfare, and prosperity of Oregon's citizens. *Comprehensive plans and policies shall contribute to a stable and healthy economy in all regions of the state. Such plans shall be based on inventories of areas suitable for increased economic growth and activity after taking into consideration the health of the current economic base; materials and energy availability and cost; labor market factors; educational and technical training programs; availability of key public facilities; necessary support facilities; current market forces; location relative to markets; availability of renewable and non-renewable resources; availability of land; and pollution control requirements.*

Oregon Administrative Rule 660-009 (Economic Development) implements Goal 9. OAR 660-009 requires that Cities and Counties prepare Economic Opportunities Analyses in accordance with the directions in the Rule. It also requires that Cities provide an adequate supply of land to meet identified employment needs.

As discussed above, Sherwood adopted an EOA earlier this year. As discussed above, the proposed plan amendment helps meet some of the commercial land need identified in the EOA. As discussed above, the proposed plan amendment meets economic goals and policies found in the EOA, the City's Comprehensive Plan, and the City's Economic Development Strategy.

- The proposed plan amendment is consistent with the requirements of Goal 9 and its Administrative Rule.

Statewide Planning Goal 10 (Housing)

To provide for the housing needs of citizens of the state.
Buildable lands for residential use shall be inventoried and plans shall encourage the availability of adequate numbers of needed housing units at price ranges and rent levels which are commensurate with the financial capabilities of Oregon households and allow for flexibility of housing location, type and density.

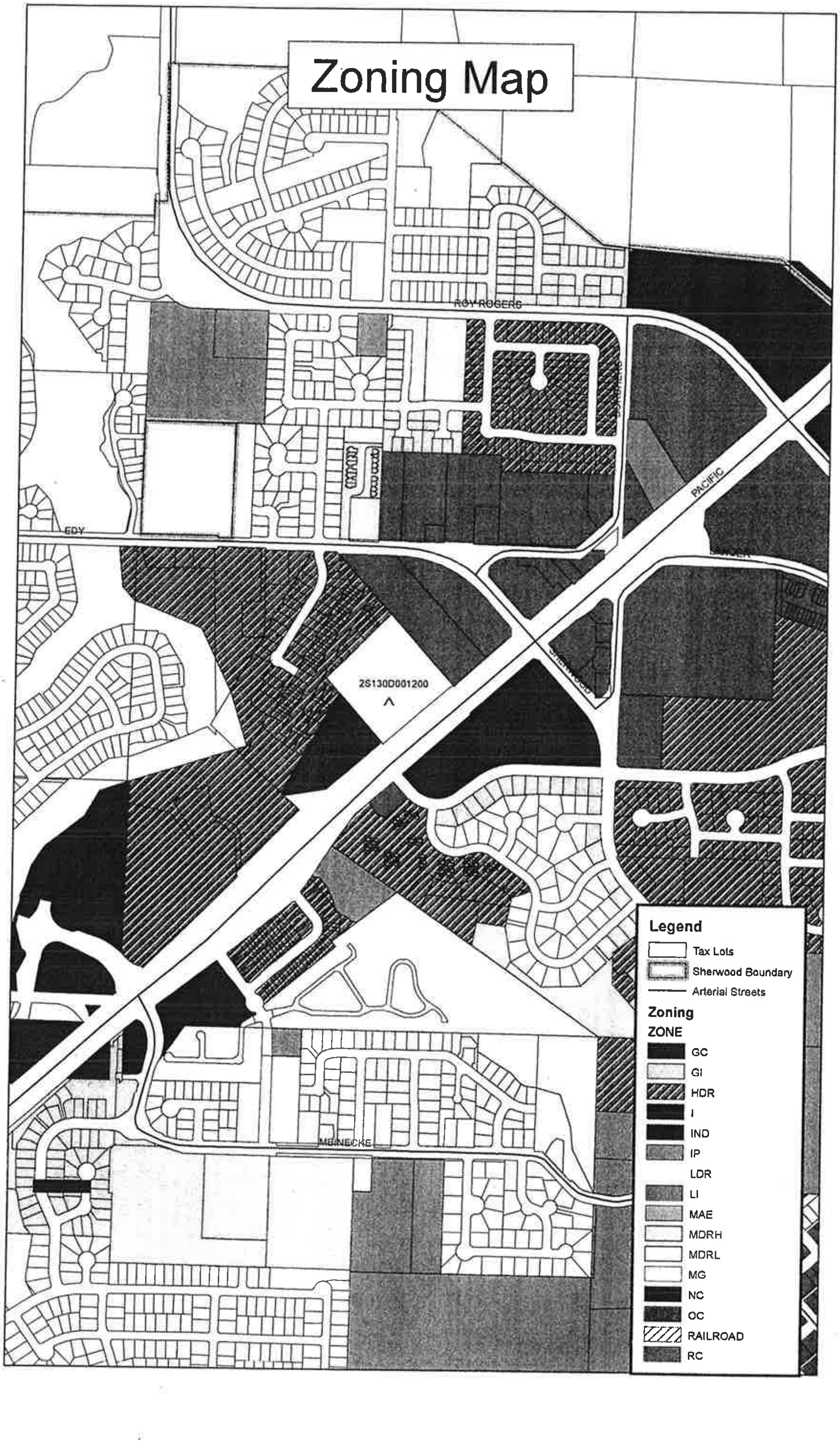
Statewide Planning Goal 10 is implemented in the Metro region by OAR 660-007 (Metropolitan Housing). OAR 660-007 provides density standards and methodology for land need and supply comparisons. Metro Title 1 responds to the requirements of the Metropolitan Housing Rule. By complying with Metro Title 1, Sherwood complies with OAR 660-007 as well as Statewide Planning Goal 10. Title 1 is discussed below.

Metro Title 1: Requirements for Housing and Employment Allocation

Metro Title 1 applies dwelling unit and job capacity to each city within the Metro area. These numbers are found in Table 3.07-1 of Metro's Urban Growth Management Functional Plan. Sherwood's capacity requirements are 5,216 dwelling units and 9,518 jobs. Winterbrook is coordinating with Metro to determine the capacity assigned to the subject site, and the effect of rezoning on this capacity. This information will be submitted as Exhibit C: Capacity Analysis.

Map 1: Vicinity Map

Map 2: Plan and Zoning Map

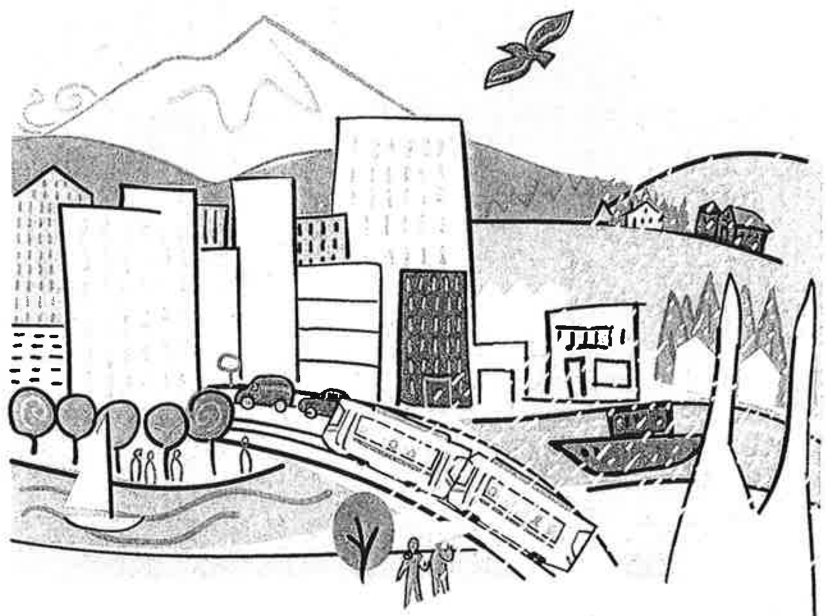


Zoning Map
ROY ROGERS
EDY
PACIFIC
2S130D001200
MEINECKE
Legend
Tax Lots
Sherwood Boundary
Arterial Streets
Zoning
ZONE
GC
GI
HDR
I
IND
IP
LDR
LI
MAE
MDRH
MDRL
MG
NC
OC
RAILROAD
RC

Appendix A
Item 3
Ordinance 02-969 B

2002-2022 Urban Growth Report: A Residential Land Need Analysis

August 2002
Updated December 2002



METRO
PEOPLE PLACES
OPEN SPACES

Metro

People places • open spaces

Clean air and clean water do not stop at city limits or county lines. Neither does the need for jobs, a thriving economy and good transportation choices for people and businesses in our region. Voters have asked Metro to help with the challenges that cross those lines and affect the 24 cities and three counties in the Portland metropolitan area.

A regional approach simply makes sense when it comes to protecting open space, caring for parks, planning for the best use of land, managing garbage disposal and increasing recycling. Metro oversees world-class facilities such as the Oregon Zoo, which contributes to conservation and education, and the Oregon Convention Center, which benefits the region's economy.

Your Metro representatives

Metro Council President – David Bragdon

Metro Councilors – Rod Park, deputy council president, District 1; Brian Newman, District 2; Carl Hosticka, District 3; Susan McLain, District 4; Rex Burkholder, District 5; Rod Monroe, District 6.

Auditor – Alexis Dow, CPA

Web site: www.metro-region.org

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2002-2022 Urban Growth Report:
A Residential Land Need Analysis

Conclusion

The Residential Urban Growth Report (UGR) is a technical document estimating the capacity for providing housing within the Urban Growth Boundary (UGB), and comparing this capacity with the expected growth for the next 20 years. The 2002 Residential UGR provides a portion of the technical findings needed to verify the State Goal 14 requirements needed to amend the UGB.

The Residential UGR compares the Regional Population and Housing Forecast with the zoned land capacity from 24 cities and three counties to determine whether a 20-year land supply is available inside the current UGB. A series of additions and subtractions are made to better estimate the land supply.

If a deficit is found ORS 197.296 and Metro Code provide several options for addressing the deficit. Three options available to the region include: 1) expand the UGB by the number of acres necessary to meet housing needs, 2) create additional capacity inside the UGB by adopting additional regulations or other measures, 3) combine expansion of the UGB and policy changes to meet a shortfall. Policy changes could take the form of upzoning, minimum floor area ratio (FAR) requirements or incentives that optimize development of land. The Department of Land Conservation and Development has stated that Metro can only take credit for increases in capacity if a regional regulation or measure has been adopted.

In brief, the housing need (demand number) for the 2000-2022 1/2 time frame is 220,700 units. The estimated capacity within the existing UGB is 177,300 units, which results in a deficit of 43,400 units. With additional measures to encourage greater refill in Centers, the capacity of the UGB can reasonably be expected to increase to 183,300 units, thereby reducing the deficit to 37,400 units. Specific assumptions and policy choices associated with this estimate are elaborated in the report. Table 1 is an overall synopsis of the housing needs analysis.

2000-2022 Urban Growth Report
Dwelling Unit Capacity Estimate & Need
2002-2022 Regional Forecast
of Residential Land Need

November 2002

Line No.		SUPPLY		DEMAND
	Residential Demand Estimates (in Households)			
1a/	4-County Population Forecast (July 2000 to Dec. 2022) - 22 1/2 years			744,200
1b/	4-County Household Forecast (July 2000 to Dec. 2022) - 22 1/2 years			312,100
2/	**Capture 68% of 4-County Forecast in Metro UGB**			**212,200**
3/	plus: 4% vacancy rate			8,500
4/	**Household Demand in the Metro UGB:**			**220,700**
	July 2000 Vacant Land Inventory (all zones):	**Metro UGB**		
5/	**Gross Vacant Land**	**44,000**		
6a/	less: Title 3 (Water Quality Protection)	7,600		
6b/				
7/	**Gross Vacant Buildable Acres (GVBA) - rounding**	**36,400**		
8/	less: Fed., State, Municipal exempt land (actual count)	1,700		
9/	less: Acres of Platted Single Family Lots (actual count)	2,000	A	
10/	less: Acres for Places of Worship and Social Org. (per capita basis)	700	C	
11/	less: Major Easements (Natural Gas, Electric & Petroleum) (actual count)	700	R	
12/	less: Acres for New Streets (0%, 10%, 18.5%)	4,900	E	
13/	less: Acres for New Schools (per capita student basis: H=45, M=55, E=70)	900	S	
14/	less: Acres for New Parks (based on SDC fees)	1,100		
15/	**Net Vacant Buildable Acres (NVBA)**	**24,400**		
	NVBA by Type:	**Metro UGB**		
16/	Net Vacant Buildable Acres – Employment see Employment Land Need Analysis			
17/	Net Vacant Buildable Acres - Residential	14,900		
	Net Vacant Buildable Acres (NVBA)	**14,900**		
		Metro UGB		
18/	**Dwelling Unit Capacity at Current Local Zoning (as of Jan. 2001)**	108,700		
19/	add: Res. Development in vac. Mixed Use Areas (MUC)	10,400	U	
20/	less: Units Lost to Underbuild @ 20%	(23,800)	N	
21/	add: Units from Residential Refill @ 26.3%	58,000	I	
22/	add: Minimum Development Capacity on Title 3 land (actual count)	500	T	
23/	add: Units from Platted Single Family Lots (actual count)	14,000	S	
24/	add: Land Adjustments (land capacity for these items not included in line 18/)			
24a/	Pleasant Valley Master Plan	5,000		
24b/	Villebois Village	2,300		
24c/	Marylhurst Convent town center development	700		
24d/	Washington Square regional center plan update	1,500		
25/	**Subtotal: Dwelling Unit Capacity**	**177,300**		
26/	**Net Need in Residential Dwelling Units (DEFICIT):**			**(43,400)**
27/	add: Added policy actions inside UGB (refill: +2.7% centers)	6,000		
28/	**Adjusted Dwelling Unit Capacity**	**183,300**		
29/	**Net Need for Residential Households (DEFICIT):**			**(37,400)**

Chapter 1
Introduction to the Report

Purpose

State land use law and Metro Code require periodic review of the Metro's UGB to assess its capacity to accommodate future urban growth for a 20-year period. The *2002 Residential Urban Growth Report* (UGR) represents the technical findings needed to verify that State Goal 14, has been met in order to amend the UGB.

The Residential UGR is a blending of science, policy and technical assumptions in a study that estimates regional housing capacity. This report uses the best available research about urban growth boundaries, capacity and economic growth to estimate regional housing need (demand). The supply (inventory) estimates in this report are to the maximum extent possible grounded in scientific research and up-to-date geographic information system (GIS) data. Where data are inconclusive, policy assumptions are recommended based on region wide goals and objectives.

State law, Metro Code and current policy direction provided by the Executive Office are all integral to estimating supply and demand. These estimates, therefore, represent a mix of regulation, policy and technical findings. State law ORS 197.269(2) requires at least 20 years supply of buildable land be provided for residential development. In addition to planning for future housing, Metro also plans for a 20-year land supply for commercial and industrial development which is addressed in the 2002 UGR: An Employment Land Need Analysis.

UGR Update – What's New?

Two Reports
The 2002 UGR has been separated into two companion reports – A Residential Land Need Analysis and An Employment Land Need Analysis.

In general, the methodology used for calculating the regional housing capacity in the Residential UGR has remained constant for the past several years, making it an almost rote exercise. Calculating employment land need on the other hand has proved to be a more complex procedure, and staff is currently exploring better methods to more accurately determine the regional need. Due to the distinct character of the methodologies, staff developed two stand-alone reports – A Residential Land Need Analysis and An Employment Land Need Analysis. This report deals solely with the residential land need analysis.

Upzone/Ramp-Up/Underbuild
Several methodological changes are included in the 2002 edition of the Residential UGR. These changes are in response to implementation of the Functional Plan requirements and a review of our technical practices. Most jurisdictions have adopted minimum density standards (80 percent of the underlying zoning) and are in compliance with Title 1, Table 1 targets of the Urban Growth Management Functional Plan. Achieving compliance with Table 1 targets is an indication that local jurisdictions have completed all zoning changes to increase capacity and therefore the upzone and ramp-up factors from the 1997 UGR are no longer necessary. Ramp-up had been included in prior UGRs as a discount to the anticipated upzone by local governments to account for the time it takes to make the required Functional Plan changes. The Functional Plan requires local governments to set minimum residential density standards at 80 percent of the maximum allowed.

Accessory Dwelling Units
Staff conducted a review of the accessory dwelling units factor. In review, we believe that to call out accessory dwelling units as a separate factor double counts both refill rate and the density assumptions for vacant land. In addition to this, efforts to track the construction of these units have proven difficult. Thus they are not called out separately in this report as an addition to land capacity.

Major Utility Easements
A new deduction from the land supply is being made for major utility easements in order to comply with State law and to more fully account for all non-buildable lands. The type of easements and the land area removed from buildable land is detailed in Chapter 4.

Residential Vacancy Rate
A residential vacancy rate of 4 percent is specifically called out in the 2002 Residential UGR. Although a 5 percent residential vacancy rate has been assumed in past editions of the UGR it had not been called out as part of the adjustments to the land demand discussion.

Adjustments
A new factor called adjustments has been added to this report. An allowance is reserved for adjustments to the buildable land supply so that the most accurate information is available for the 2002 Residential UGR. The "supply" was based on 2000 vacant land data and zoning and adjustments provide a way to report and more accurately account for major land use changes that have occurred since that time. Specific adjustments are outlined in the Summary Table on page 4 and are listed in detail in Appendix B.

New Model
Output from the new MetroScope model is used for portions of the 2002 Residential UGR. The MetroScope model is a set of decision support tools developed to evaluate changes in economic conditions, land use trends and transportation activity within the region. The four models that comprise MetroScope include an economic model, travel model and two real estate location models. All these models interact with the Metro GIS and the Regional Land Information System (RLIS) to allow mapping of results and maintenance of spatial relationships between data. The model is run in five-year iterations between the land use and transportation models. The purpose of bringing the four models together into a single, integrated framework is to allow them to interact with each other, producing more accurate predictions of future conditions and allowing them to better reflect the full effects of policy choices.

Five potential growth case studies were run to test the effectiveness of a range of policy options in implementing the 2040 Growth Concept or making changes to enhance the effectiveness of the existing policies. Each case study was a test of a unique set of policy objectives. A Base Case study tested the impacts of the application of current 2040 Growth Concept policies. An I-5 Trade Corridor case study tested whether major transportation improvements to the I-5 trade corridor diminish or enhance the effectiveness and the implementation of the 2040 Growth Concept. A third case study tested whether developing a new complete community in the Damascus area would effectively accommodate a 20-year need for land. An Enhanced 2040 Centers case study tested whether additional policies and incentives would enhance the functionality of 2040 Centers while limiting UGB expansion. Selected parts of this information helped provide the range of possible outcomes from different UGB decisions. Of particular importance to this report are the model outputs for the refill and capture rates.

Centers Research
Metro is evaluating the Centers identified on the 2040 Growth Concept map to determine if there is additional capacity to be found within these areas that would effect the bottom line numbers for this Residential UGR, testing capacity and policy effectiveness.

Centers are the keystone of the region's strategy to manage growth. The adopted Regional Framework Plan and the Functional Plan establish policy directions, regulations and recommendations to strengthen Centers. The hierarchy of Centers designated on the 2040 Growth Concept map includes the Central City, 7 Regional Centers, 30 Town Centers and the Station Communities around light rail stations.

Metro conducted a three-phased study to examine Centers. Phase I was a series of interviews with local government staff. Phase II of the Centers study consisted of an economic analysis examining why Metro's Centers are not developing at the densities anticipated. Phase III identified tools and developed an action plan designed to answer strategic and regional level implementation questions. A fuller discussion of the implications of the research is in the Increase in Refill Rate section in Chapter 5 of this report. A copy of the studies can be found on Metro's website at www.metro-region.org.

Background

In 1997, Metro Council adopted the Regional Framework Plan and in 1996, the Functional Plan requirements. The plans provided coordinated guidance to local jurisdictions to manage future urban growth. In December 1997, the first UGR was issued and approved by Metro Council. The 1997 UGR concluded that there was a deficit of 32,370 dwelling units and a nearly 2,900 acre job shortfall.

Earlier in 1997, the Oregon Legislature enacted ORS 197.299[1] that required Metro to show substantial progress towards meeting this land need, within two years of identifying any shortfall in supply. At least half the need was to be accommodated by the end of 1998 and the remainder by the end of 1999. Accommodating 20 years of residential capacity within the UGB can be accomplished by increasing the size of the UGB or adopting policies to increase capacity of lands within the current boundary. Metro Code and State Law require review of the UGB capacity at least every five years.[2] The last complete review was conducted for the 1997-2017 period.

Consistent with State law, the Metro Council in December 1998 amended the UGB by adding 3,549 gross acres. The Metro Council also indicated their intent to add an additional 1,831 acres by resolution on the same date. These actions by the Metro Council met the requirement in State law to satisfy at least half of the land need identified in the 1997 UGR by the end of 1998. By the conclusion of 2000, the 1997-2017 UGB review was completed with two major changes recognized. First, the original need for 32,370 dwelling units was disallowed by DLCD because it was based upon 200-foot stream setbacks, which had not been implemented. This effectively eliminated the need for the "second half" of the needed UGB expansion of 1,831 acres. Second, the courts rejected 939 acres of expansion requiring this shortfall to be made up in the 2002 assessment.

Key Points:
- *State law requires that 20-year supply of land be provided within the UGB.*
- *The need estimates found in the UGR blend regulation, policy choices and technical findings.*
- *A deficit of 939 acres from the 1997-2017 UGB assessment must be made up in this round.*

[1] ORS 197.299 was introduced as HB 2709.
[2] ORS 197.296 was introduced as HB 2493.

2002 Periodic Review

Metro – Periodic Review

To comply with state law to ensure the land supply is adequate for a 20-year period, Metro requested the Land Conservation and Development Commission (LCDC) place Metro in a process called "periodic review" for the UGB. Periodic review is a cooperative process between the state, local governments and other interested persons.

Periodic review of the UGB takes place to assure that the process of reviewing and amending the UGB complies with statewide planning goals and that adequate provisions are made for needed housing, employment, transportation and public facilities and services. The law requires cities and counties to do periodic review every 5 to 15 years, depending upon their size and location. Small cities and counties are exempt. Metro must do periodic review every 5 to 10 years. Metro's last periodic review was completed in December 1992.

This periodic review includes a two-phase process. The first phase addressed legislative amendments to the UGB for the period 1997-2017 and was completed in September 2000, when the Metro Council determined that a 20-year supply of land was available. The second phase began in the fall of 2000 and covers the 20-year period from 2002 to 2022. The UGB may be amended if a demonstrated need exists.

Report Outline

The Dwelling Unit Estimate Summary Table (Table 1) summarizes the need analysis for housing. Table 1 illustrates deductions made to the gross vacant buildable acres (GVBA) to arrive at net vacant buildable acres (NVBA). Chapter 2 summarizes the regional population and dwelling unit forecast. Chapter 3 in this report expands in detail on lines 1 – 4 of the Summary Table dealing with demand. Chapters 4 and 5 provide more detail on lines 6 – 27 dealing with supply.

Chapter 2
2002-2022 Regional Forecast

Summary

As a basis for estimating future regional housing and employment demand, the baseline 2002-2022 Regional Forecast developed by Metro represents the most likely and reasonable "middle-of the-road" growth projection. The forecast assumes a policy neutral stance on growth management and transportation policies in the region. What this means is that the forecast carries out the regulations and policies that are in force today and extrapolates their likely impacts in producing housing and employment demand projections (regional need) for the region. The forecast extends from July 2000 to December 2022, a period of 22.5 years. This is due to the fact that the best available data exists for 2000, based upon the July 2000 aerial photos and there must be a 20-year land supply from the date of the decision, which will be in December 2002.

The regional economic forecast is based on a framework of how the region has responded to historical trends – including economic, industry, demographic, national and global forces at work in the region. The regional baseline population and household forecast is tied to the economy of the region by the interaction of migration and employment trends/comparative economic strengths with neighboring state economies. A continuing vibrant regional economy will continue to draw migrants in the pursuit of greater economic opportunity and regional amenities. More importantly, about half of the region's future population growth will be based on demographic characteristics of the region that exist today. Population growth will continue because residents will have children, and their children will have children.

Lastly, the regional baseline forecast was not derived to predict the variations in growth caused by recessions nor firm-level decisions such as the behavior of a single company. The forecast does not forecast business cycles. Instead, the forecast is meant to be indicative of what trajectory or growth path the region is likely to have during the next 20 to 30 years. By looking at historical trends and relationships, by discerning emerging trends, and folding into the regional forecast the expert opinions of regional experts and national forecasters (DRI-WEFA), the regional baseline forecast represents the reasonable approach available for the upcoming UGB decisions.

Alternative growth projections could also be considered, but have been deemed to be less likely and less reasonable approaches. Optional assumptions based on different national and international outlooks could easily produce a higher or lower regional forecast, but are less plausible. DRI-WEFA and other national sources have produced alternative U.S. growth scenarios which could be used to prepare regional high or low growth outlooks, but they represent a much lower probability of materializing in the future.

As part of completing periodic review, Metro will produce a high and low forecast later this year to accompany its regional baseline forecast. Based on national estimates, the baseline regional forecast represents more than an 80 percent probability while a significantly higher or lower regional forecast faces less than a 10 percent probability each of happening.

Actions taken by public agencies throughout the region could have the effect of increasing or decreasing this forecast (examples include – but are not limited to – Columbia River channel deepening, truck access into the Columbia Corridor, decreased investment in transportation and airport capacity, inadequate higher education financing, economic development incentives, and quality of life oriented actions such as clean water and access to open space).

Chapter 3
Residential Demand Analysis

Residential Demand – Overview

Residential Demand is taken directly from the Regional Economic and Population Forecast.[3] A four-county population and household forecast from July 2000 to December 2022 (which equals 22.5 years) provides the basis for the demand estimate. The July 2000 vacant land inventory is being used as the basis for estimating supply. The December 2002 demand forecast is being used to insure a 20-year supply for the December 2002 decision. Population in the Metro region is expected to increase at a moderate pace of 1.6 percent per year. By the year 2022, population growth is expected to add another 744,200 residents to the region (in the four-county SMSA).[4]

In terms of the Metro UGB, population growth is expected to add 525,000 more residents or about another 212,000 households (or 220,700 dwelling units assuming a 4 percent vacancy rate). Metro Council had extensive discussions about the use of a vacancy rate. In Appendix A, Table Note 3, there is a description of the range considered for vacancy rate. Metro may look into vacancy rate as part of Task 3. These UGB figures are based on a 68 percent capture rate, which has been the historic rate between 1980 and 2000.

During the 1990s, about two-thirds of new residents had never lived in the Portland area before. Net in-migration will still be a force driving population growth in the future, but a lesser one. Only about half of the region's population increase during the next 20 years will come from migration; the remainder will come from residents having children.[5]

Regional population growth is expected to average about 1.6 percent per year through 2030, as compared to about 2 percent from 1970 to 2000. Population will increase more rapidly in the near term as current conditions favor an economic rebound, which will attract greater number of migrants. Over the long haul, the average growth rate per year will start to taper off as regional economic growth moderates.[6]

Key Points:
- *Population growth through the forecast period is expected to increase at a moderate pace of 1.6 percent per year.*
- *By the year 2022, population growth is expected to add another 744,000 residents to the region.*
- *Migration contributes 50 percent of population growth.*

Capture Rate
Since the geographic extent of the Residential UGR is the limits of the UGB, a forecast of housing units (dwelling units) is derived for the portion of growth anticipated to occur inside the UGB. This proportion of growth (capture rate) is the fraction of dwelling units predicted to occur in the UGB relative to the total amount of growth overall in the four-county region (Multnomah, Clackamas, Washington and Clark Counties). The 1997 UGR, as well as subsequent updates, assumed the capture rate for the UGB to be 70 percent for households. Capture rate in the 2002-2022 Residential UGR is assumed to be 68 percent.

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[3] Economic Report to Council 2000-2030 Regional Forecast, preliminary draft March 2002.
[4] SMSA four counties include Clackamas, Clark, Multnomah and Washington Counties.
[5] 2000-2030 Regional Forecast, preliminary draft March 2002.
[6] 2000-2030 Regional Forecast, preliminary draft March 2002.

Capture rate data is drawn from two sources; historic and future estimates. Historic estimates are available from 1980 up through year 2000. The basis for the capture rate is derived from historical data from 1980 through 1998. Historical data indicate a capture rate of 54 percent to 77 percent. The table listed below shows the range of capture rates.

Table 2
Metro Region Historical Capture Rates

Metro Capture Rates - 5 years:	1980-85	1985-90	1990-95	1995-00
Households	65.5%	53.7%	76.6%	68.8%
Metro Capture Rates - 10 years:		**1980-90**		**1990-00**
Households		58.2%		72.9%
Metro Capture Rates - 20 years:				**1980-00**
Households				67.8%

Future estimates of capture rates, based on specific land use assumptions, are an output from the MetroScope model.[7] Five potential growth case studies were run to test the effectiveness of a range of policy options in implementing the 2040 Growth Concept or making changes to enhance the effectiveness of these policies. Each case study was a test of a unique set of policy objectives. A Base Case study tested the impacts of the application of current 2040 Growth Concept policies. An I-5 Trade Corridor case study tested whether major transportation improvements to the I-5 trade corridor diminish or enhance the effectiveness and the implementation of the 2040 Growth Concept. A third case study tested whether developing a new complete community in the Damascus area would effectively accommodate a 20-year need for land. An Enhanced 2040 Centers case study tested whether additional policies and incentives would enhance the functionality of 2040 Centers while limiting UGB expansion.

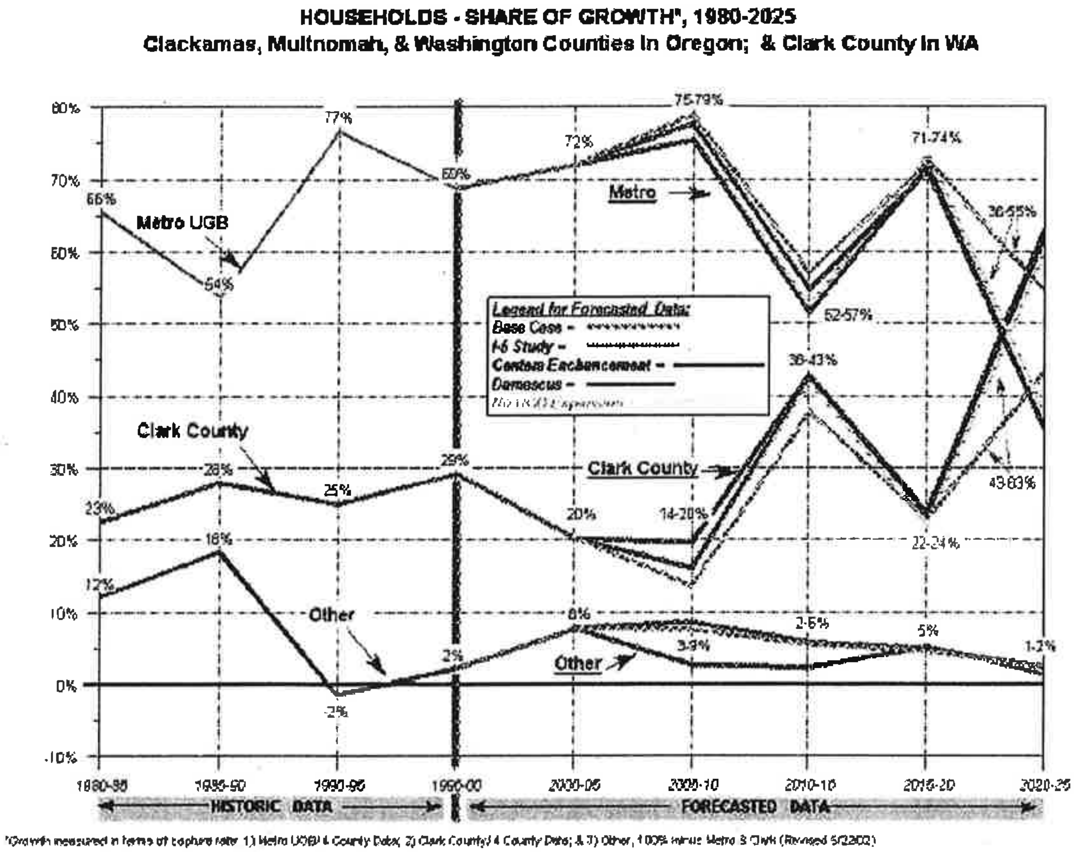
MetroScope case studies capture rates range from 52 percent to 79 percent depending upon the amount of land added to the UGB and the amount of capacity made available within the UGB. As experience and modeling has shown, capture rates can vary based on a number of different factors. The reasonable range of capture rates to assume based upon both historic and modeled rates, range from 65 to 75 percent.

The Capture Rate Graph (Figure 1 - Household-Share of Growth) illustrates a direct relationship between the capacity within the Metro UGB, Clark County's UGA and is reflected in capture rates. In other words, a policy that holds a tight Metro UGB pushes growth to Clark County, whereas a policy that allows a larger UGB means less proportional growth in Clark County.

It is assumed that the remaining residential growth will locate to Clark County, unincorporated portions of the tri-county area, and cities located beyond the Metro UGB (e.g., Banks, Barlow, Canby, Estacada, Gaston, Molalla, North Plains and Sandy).

[7] The MetroScope Model is a decision support tool developed to evaluate changes in economic conditions, land use trends and transportation activity. Five case studies were modeled and produced estimates of capture rates in five-year increments from 2000 up through 2025.

Figure 1



Magnitude of Capture Rate Choices

Capture rate changes produce substantial swings in the amount of households that need to be accommodated within the UGB. Three scenarios are illustrated in Table 3 that show the effect of differing capture rates on the regional forecast (65 percent, 70 percent, 75 percent) with the resulting change in demand from the recommended 68 percent capture rate.

Table 3

CAPTURE RATES	65%	70%	75%
Four-County Housing Forecast within the Metro UGB	202,800	218,400	234,000
4-County with 4% Vacancy Rate	210,900	227,100	243,400

Changes in the capture rate result in an increase in the need of approximately 3,200 dwelling units per 1 percent increase in the rate. Assuming a lower capture rate than previously will have consequences to neighboring communities, because the overall population within the four-county area is only partially affected by the size of the Metro UGB. If the capture rate in the Metro UGB is pushed downward, together with limits on the Clark County UGA, the demand for dwelling units is shifted to neighboring communities like Banks, Scappose, Canby, etc. Selection of the capture rate should take into consideration impacts on surrounding communities.[8]

Effects of the Capture Rate on Residential Refill Rates

Generally, there is an inverse relationship between residential refill rates and the capture rate, although this relationship can be affected by a number of different factors. Essentially, the higher the refill rate the less new vacant land (UGB expansion) Metro needs to add to accommodate growth. The lower the refill rate, the more land Metro will need to add to the UGB. This year, the decision process has benefited from the addition of a new tool – capture rate and refill rate outputs from the MetroScope model. As shown by MetroScope, limited UGB expansion results in higher market demand for refill but not at a sufficient rate to avoid shifting a share of growth outside the Metro UGB. Conversely, a larger expansion ensures growth is accommodated in the Metro UGB but undermines market demand for refill.

Some key refill rate findings from the MetroScope analyses suggest that:

- Higher refill rates are achievable through an aggressive program of incentives for development in designated mixed-use Centers. Selection of a refill rate should be tied to how aggressive a Centers incentive program is adopted.
- Higher than planned redevelopment and infill rates (refill) can be achieved but at the expense of lower capture rates and higher home prices.
- For residential purposes, maximizing the use of Centers substantially increases residential refill and reduces overall residential vacant land consumption.
- Demand for refill in Centers is highest in the central city areas.

Key Points:

- *The overall residential capture rate assumed in the 2002 Residential UGR is 68 percent*
- *A capture rate of 68 percent is assumed to indicate the average proportion of residential growth that will occur within the UGB until 2022. The rates are derived from the two decades of historic data and MetroScope modeling results.*
- *Historical capture rates from 1980-2000 ranged between 54 percent and 77 percent.*
- *Capture rates from MetroScope model case studies from 2000 - 2020 range from 52 percent to 79 percent.*
- *A reasonable range to consider for this Residential UGR is 65 percent to 75 percent.*

[8] For more detailed information about capture rates please refer to June 3, 2002 memo from Lydia M. Neill, Principal Regional Planner to Andy Cotugno, Planning Director, and the MetroScope findings report.

Chapter 4
Buildable Lands Analysis – Determining the Region's 20-Year Land Supply

Land Inside the UGB

The 2002 UGB contains 235,549 acres. December 1998 UGB amendments brought approximately 3,000 additional acres into the boundary.[9]

Vacant Land Inventory

Metro's Data Resource Center (DRC) has been producing a regional Vacant Land Study every other year since 1990. The most recent Vacant Land Study completed is based on digital aerial photography flown in July 2000. This study identifies fully and partially developed parcels within the Metro region. As part of updating the data for the 2002 Residential UGR, the supply of vacant land on hand is derived from the stock of vacant land data identified by the July 2000 data. Based on this careful inventory, there is a total of 43,900 gross vacant acres.[10]

Metro defines vacant parcels as tax lots with no improvement value or building(s). In addition, Metro has defined partially vacant parcels as those with an undeveloped portion of a lot that is larger than one-half acre.

In updating each year's vacant lands inventory, DRC staff focus on removing areas from the previous year's inventory that have become developed. Each parcel in the UGB is examined. Building permit data collected from local jurisdictions assist with this effort. County tax assessor data are also checked to ensure that the parcel in question has no improvement value located on it (an improvement value would indicate that the parcel is developed or at least partially developed).

In addition to removing developed areas from the vacant land data layer, staff may identify additional vacant lands that were undetected in the previous year's inventory. This occurred with the 1998 update. Metro's 2000 aerial photos have a higher level of resolution (one-foot pixels) than the 1998 aerial photos (two-foot pixels), allowing greater precision in the identification of vacant areas. Each year since Metro began measuring vacant lands the accuracy of Metro's vacant lands data has incrementally improved.

Metro's definition of vacant land follows very specific guidelines. The following points clarify important attributes of Metro's vacant land analysis methodology.

- Vacant lands do not indicate whether a vacant parcel is listed on the market to be sold and developed. The vacant lands inventory process does not include a qualitative judgement about a parcel's desirability for development, or identification of issues that would affect development.
- The vacant lands data alone do not necessarily indicate that the parcel is buildable. The Residential UGR starts with vacant lands, and using GIS, removes the areas that are considered environmentally constrained such as wetlands and floodplains (i.e., there is an important distinction between vacant lands and vacant *buildable* lands).

[9] Includes Pleasant Valley Maser Plan, Dammasch Town Center concept, South Hillsboro and excludes Stafford and Bethany which were remanded by the courts.
[10] Source: RLIS 2000 data.

Key Points:

- *Aerial photography was flown in July 2000.*
- *Partially vacant land is defined as vacant parcels with an undeveloped portion of the lot that is greater than one-half acre (over 20,000 square feet).*
- *Vacant land is defined as any undeveloped parcel/tax lot and any partially undeveloped lot with the undeveloped portion larger than one-half acre.*
- *Vacant land data do not imply a degree of development readiness or current marketability.*

Gross Vacant Acres to Gross Vacant Buildable Acres

Environmentally Constrained Land

Environmentally constrained land is deducted from Gross Vacant Land to arrive at Gross Vacant Buildable Acres (GVBA). Metro's Stream and Floodplain Protection Plan (Title 3 of the Functional Plan) was adopted by Metro Council in June 1998. It requires cities and counties within the Metro UGB to meet regional performance standards relating to water quality and floodplain management. This analysis assumes that all riparian areas beyond those defined in Title 3 are buildable. Environmentally constrained land is protected under Title 3 of the Metro Functional Plan. Through Metro's Title 3 process, 7,600 vacant acres[11] of environmentally sensitive land has been identified. Environmentally constrained lands include only water quality and flood management areas (as defined in Title 3 of the Functional Plan), consisting of:

Title 3 Restrictions

- 1996 flood inundation areas and FEMA floodplains.
- Wetlands, from an enhanced National Wetlands Inventory and local wetland inventories.
- Wetland Areas, 50 feet from the edge of wetland.
- Riparian Areas, variable riparian corridor between 15 feet and 200 feet depending on the area drained by the water feature and the slope of the land adjacent to the water.

Steep Slopes Beyond Title 3

The buildable lands analysis assumes that upland areas with slopes greater than or equal to 25 percent outside of adopted Title 3 riparian areas have development potential.[12] The development potential on steep slopes is assumed to be current zoning.

Development on Environmentally Constrained Land (Title 3)

Environmental constrained lands do not have the same development capacity as buildable lands. These types of land include steep slopes, flood plains, wetlands, natural resource and riparian areas.

Although environmentally constrained land is not included in the net vacant buildable land inventory, some low-density type development has historically occurred in these areas. Capacity on these lands is calculated by each environmental land component (i.e., floodplains, 1996 flood areas, and steep slopes outside of Title 3 regulated areas). Lots located wholly within Title 3 areas continue to be allotted one dwelling unit per tax lot, because Metro code allows this exemption to Title 3 limitations. Approximately 500 tax lots are located wholly within the Title 3 regulated areas and therefore would result in additional capacity of approximately 500 dwelling units which is accounted for on line 22 of Table 1.

[11] Source: RLIS 2000 data.
[12] The 1997 UGR assumed these areas were environmentally constrained. The June 1998 adoption of Title 3 regulations did not protect these lands unless falling within water quality and flood management areas.

Additional Technical Notes on Capacity Estimates

Steep Slopes

Steep slopes are defined as those areas greater than 25 percent slope. In the past (1997 UGR), these areas have been considered unbuildable. These lands are more expensive to develop, are less efficient to develop because of topographic constraints and may have life and property safety concerns due to geologic hazards. In the 1999 UGR Update it was stated that the historical rate of development in steep sloped areas was estimated by examining building permit data from 1995 through 1998. The historical rate and current zoned capacities on these lands were reported as approximately the same (6.4 dwelling units per 5 acres). Therefore, in the 2002 Residential UGR, current zoning is assumed. To the extent steep slopes are included in Title 3 coverage, they are treated as Title 3 areas (see above).

Floodplains

Floodplains are defined as areas located within the 100-year floodplain and indicated on the Federal Emergency Management Agency's (FEMA) maps[13], and/or the area inundated by the 1996 flood. Structures located in the floodplain can cause life and property losses in the floodplain and downstream. Most jurisdictions allow construction in the flood plain as long as the finished floor elevation is located at least one foot above the FEMA flood elevation. Title 3 allows construction in the floodplain with balanced cut and fill. Balanced cut and fill requirements may decrease future construction in the floodplain due to cost. Land within the 100-year floodplain and 1996 flood inundation area (located outside of the Title 3 water quality and riparian areas) are assumed to develop at zoned capacity.

Cities and Counties in Compliance with Title 3 Requirements[14]

Standard	No. Jurisdictions Applicable	No. Jurisdictions in Compliance	Percent Implemented
Floodplain	25	22	88%
Water Quality	26	19	73%
Erosion Control	27	25	93%

Key Points

- *Environmentally constrained lands do not have the same development capacity as buildable lands.*
- *These types of land include steep slopes, flood plains, wetlands, natural resource and riparian areas.*
- *Capacity in Title 3 regulated lands is estimated at 500 dwelling units based upon one unit per lot.*
- *Capacity on non-Title 3 regulated steep slope lands and floodplains and 1996 flood areas is based on current zoning.*

Gross-to-Net Reductions

GVBA are further refined to account for future streets, schools, parks, places of worship/fraternal organizations, and major utility easements over the 20-year planning period.

[13] Maps distributed by FEMA.
[14] As of July 25, 2002.

Federal, State, Municipal Exempt Land
A total of 1,700 acres of federal, state, county and city owned land have been removed from gross vacant buildable acres (GVBA).[15] The data was identified from tax assessor codes for exempt uses. No dwelling unit capacity is assumed on these lands because they are assumed to address public facility needs for cities, counties and federal agencies. Housing Authority and Portland Development Commission lands were not removed from gross vacant buildable acres because they are in public ownership to provide housing capacity. This method is consistent with that used in the 1997 UGR and subsequent updates.

Vacant Single Family – Platted Lots
All parcels less than 3/8 of an acre are temporarily set aside from the inventory of GVBA. These parcels do not receive reductions for future streets, parks, schools and places of worship/fraternal organizations, because they are assumed to have sufficient right-of-way already dedicated to serve them because of their small size and they are already platted to their minimum possible size. A total of 2,000 acres of small platted lots are temporarily removed from GVBA.[16]

In single family zones, capacity on these parcels is assigned one dwelling unit per parcel rather than the underlying zoning classification. The dwelling capacity (one per lot) on this subset of vacant land is later added back to the final supply estimates when the residential portion of net vacant buildable land is converted into a dwelling unit capacity estimate.

Lots less than 3/8 of an acre but zoned for non-residential or multi-family purposes are also not reduced in capacity by the gross-to-net reduction calculation for similar reasons as stated above. However, these individual parcels are included back into net vacant buildable acres to compute dwelling unit capacity for multi-family development and employment land supply respectively based upon the zoning classification assigned to that parcel. This is consistent with the method used in the 1997 UGR and subsequent updates.

Future Streets
As noted above no reduction for future streets is applied to parcels less than or equal to 3/8 of an acre in size. A 10 percent reduction is applied to parcels between 3/8 of an acre and one-acre. Staff assumes due to the smaller size of these parcels that the likelihood is great they are already served by some street access and that only limited further right-of-way would be required. An 18.5 percent reduction is applied to parcels larger than one acre. The total deduction for new streets is 4,900 acres.[17]

The 18.5 percent reduction is based on a study of subdivision development during 1997 and 1998 on all parent parcels larger than one acre. A total of 170 platted subdivisions were reviewed from each of the three counties. Of these subdivisions, the average amount of land used for streets was 18.5 percent. Although this rate is applied globally to all vacant land, it was derived from measuring only single family lots.

The 18.5 percent rate applies to all street classifications. Expansion of freeway and arterial streets suggested in the RTP will partially occur within existing rights of way or adjacent to already developed parcels. The RTP estimates that approximately 1,600 acres are required for these future expansions. The 18.5 percent assumption for all vacant land provides enough land for these acres because of the

[15] Source: RLIS 2000 data.
[16] Source: RLIS 2000 data.
[17] Source: 2000 RLIS data.

excess land assumed for multi-family and non-residential parcels that require substantially less than 18.5 percent for streets. These rates were used in the 1997 UGR and subsequent updates.

Review of the Street Right-of-way Widths
Metro Council has asked staff to review the local street allowance based on the implementation of the Transportation Planning Rule (TPR) to allow narrower streets. Most of the local governments have completed this work and allow a variety of street designs to be used in new subdivisions depending upon topography, functional classification, anticipated traffic volumes and adjoining uses. The recommended pavement width for narrow streets (curb to curb) is between 20 to 28 feet although right-of-way is needed to accommodate more than just curb to curb pavement width. Additional right-of-way is required to accommodate street trees in planter strips, sidewalks and driveway aprons that meet ADA standards. With additional storm water run-off concerns right-of-way widths are not likely to be reduced further although pavement widths may be reduced.

To evaluate whether the narrow street widths were being applied an additional analysis of newly dedicated right-of-way (2001) was conducted by DRC staff. A sample was collected of 395 right-of-way segments in Washington, Clackamas and Multnomah Counties within the UGB. Most right-of-way segments ranged from 30-65 feet in width with the most common being 50 feet. The second most frequent width was 35 feet. The average length was between 268 to 276 feet. Portland had the greatest number of new dedications. From this data it was difficult to discern whether the dedication was only for a portion of the width of the street (i.e., 35 feet of a 70 right-of-way). To examine whether the percentage of street right-of-way dedicated is adequate for different size parcels an additional study would need to be undertaken to examine subdivision plats. This information is not available from the RLIS database and would involve obtaining copies of the plats from each of the counties. For this report, the existing 0-10-18.5 percent deductions will be used. This assumption produces a deduction of a total of 4,900 acres for new streets.

Future Public Schools

Acres for New Schools
In order to estimate the amount of land dedicated for future schools, the ratio of students per acre by elementary, middle and high school is used to calculate the school land need. In past UGRs, this pencils out to 70 students per acre figured for an elementary school, 60 students per acre for a middle school and 55 students per acre for a high school. These ratios are based on the amount of land school district staff believe they will be able to obtain for each of the school types. There are three ways to approach how Metro estimates the amount of land necessary for future schools. One approach is based on what the school district wants to build. The second approach is based on what the school district can obtain under constrained land conditions, and the last approach is based on current conditions.

A projection of student population growth is estimated from the regional forecast. This projection is adjusted to coincide with the UGB capture rate. The estimates are also adjusted to account for the number of students believed to attend private schools or being home schooled. Approximately 90 percent of all students attend public schools.

Each of these options represents a different set of assumptions for how much land per student is required.

"Ideal" Site Size Requirements

	Students Per Acre Ratio	Site Size	Enrollment Size
High School	55	40 acres	2,200 students
Middle School	60	20	1,200
Elementary School	70	10	700

"Constrained" Site Size Requirements – 20% Denser than Ideal

	Students Per Acre Ratio	Site Size	Enrollment Size
High School	65	40 acres	2,600 students
Middle School	70	20	1,400
Elementary School	85	10	850

Actual Student Land Need Ratio, 2001

	Students Per Acre Ratio
High School	50
Middle School	40
Elementary School	52

The "constrained" option was selected with the addition of 200 acres for the 2002 Residential UGR. A total of 900 acres are needed for new schools.

Future Parks

History

The amount of land needed for development of future parks is computed based upon a park ratio of acres of parkland per 1,000 residents. The 1997 Update to the UGR was based on a 1998 survey rate of 20.9 acres per 1,000 residents. This ratio was updated from 14.4 acres per 1,000 that was used in the 1997 UGR. This ratio was based on an inventory of parks and open spaces completed in 1997 (Metro's Greenspaces Department). The park ratio included neighborhood parks, wildlife refuges and preserves, Metro and municipal open spaces, and regional parks. From this need, acquisitions inside and outside the UGB through the Greenspaces bond measure were subtracted producing a net set aside for parks. The 20.9 ratio used in the 1997 Update resulted in a need of 8,598 acres which was then reduced by 4,900 acres for parks and open space acquisitions (past and future) both inside and outside of the UGB. The total deduction for parks was 3,678 acres (3,700 rounded).[18]

Review by MPAC Parks Subcommittee

The MPAC Parks Subcommittee was charged with making an estimate recommendation for future park land needs. They explored five possible methods of estimating future parks and their likely impact on the housing and job capacity calculations within the Metro UGB.[19] A summary description of each approach follows:

1) Existing Ratio. This is an estimate based on the existing ratio of acres of parks to people and forecasting new parks from the forecast of new people in the region (20.6 acres per 1,000 residents). Using this method, future parks could consume as many as 10,860 acres.

2) Active Parks Ratio. This is an estimate based on active parks - the active parks being lands like playgrounds and ball fields, the passive parks being features like steep slopes, streams, etc. This

[18] Source: Technical Appendix to Dwelling Unit Capacity Estimates for the 1999 UGR, December 1999.
[19] For more information about the MPAC Parks Subcommittee report, refer to A Background Report for Estimating Future Parks and their Capacity Implications within the Metro UGB, June 19, 2002.

method yields an estimate of about 2,290 acres of new active parks. Passive park lands, likely to have little development potential, are not accounted for in this paper.

3) Historic Rate. This approach looks at the actual rate of addition of park and open spaces to the UGB for several different periods. This method yields an estimate of at least 8,000 acres of new parks land need.

4) Parks-to-Developed Land Ratio. This method estimates future parks based on the past ratio of parks to developed land. However, while it documents that there are about 16 acres of parks and open space for every 100 acres of developed land as of the year 2002, it does not yield a year 2022 estimate.

5) Fiscal Resource. This is an estimate based on the existing fiscal resources available to purchase new lands. This is estimated in large part based on estimates of existing system development charges as well as any dedicated local bond measures also available to purchase open space. This method yields an estimate of about 1,050 acres.

The MPAC Parks Subcommittee believes the best estimate for future parks is about 1,050 acres over the next 20 years. This estimate is based on what is financially justifiable by using available revenue sources (primarily system development charges). It should be noted that this estimate does not take into account the impact of future funding mechanisms that may be approved and implemented in the future. It is also based on acquisition of those types of parks that could be expected to be provided in conjunction with new development and that would need to be located on lands that could otherwise accommodate new jobs or housing. These lands would accommodate active parks that usually need relatively flat building sites to accommodate playgrounds, sports fields, etc. It was also the conclusion of the MPAC Subcommittee that this does not reflect the desired level of parks throughout the UGB. Subsequent to this, MPAC recommended 2,300 acres based on the expectation that resources exceed the base System Development Charges level, but Council selected 1,100 acres because they felt they couldn't count on the extra funds.

At this time, 1,050 acres are assumed to be needed for future parks, as recommended by the MPAC Parks Subcommittee. For purposes of the Residential UGR, 1,050 acres has been rounded to 1,100 acres.

Future Places of Worship and Fraternal Organizations

The total deduction for places of worship is 700 acres.[20] The land need for future places of worship and fraternal organizations are based upon a ratio of 1.4 acres per 1,000 persons which reflects existing conditions that was calculated in 1994 for the 1997 UGR. An estimate of the ratio applied to population projections and the amount of land for future need for places of worship and fraternal organizations are calculated and then the current vacant land holdings of these organizations are deducted from the future need. Rather than removing the specific parcels owned by places of worship and fraternal organizations, these parcels were retained as part of the region's buildable land supply, and 700 acres of land need was deducted proportionally from parcels of gross vacant buildable land, in the same manner as schools and parks. Approximately 85 percent of the need for these uses are estimated to occur in residential areas, with the remaining 15 percent in commercial areas (based on historic land holding patterns). The same assumption was used in the 1997 UGR and subsequent updates.

[20] Source: RLIS 2000 data.

Re-use and Redevelopment of Church Lands

Metro Council pointed out that there are a number of religious organizations that have developed affordable and senior housing on church owned lands that were previously committed for religious purposes. It appears that although this is occurring it is difficult to accurately measure how many of these instances have taken place. Staff has queried Metro Housing program staff and some local governments to get a sense of where these changes have taken place and the frequency of the occurrence.

Anecdotal evidence has indicated that churches are frequently broadening their mission and providing more social services, daycare and education. Although this has obvious benefits to the community, this may raise compatibility issues in residential neighborhoods where most churches are located. Most zoning codes currently permit church uses to occur in residential and commercial zones. In addition to providing some of the services mentioned above, there have been some instances where church sites are redeveloped for housing use.

Redevelopment of church sites may be most applicable in areas found in older neighborhoods that are losing membership as their membership ages. Although St. Anthony's in southeast Portland has been developed as a model for the Archdioceses of Portland that they hope can be replicated in other parts of the country the decision to undertake this type of development is up to the individual parish. Individual parishes within the Catholic Church are responsible for buying, selling and developing their land and there is no overall stated mission by the church to require or encourage this type of activity.

The Housing Technical Advisory Committee (HTAC) examined the St. Anthony's model and tried to assess the probability of replicating this elsewhere in the region. An initial search of church properties in RLIS as well as contacts with church groups proved difficult and was not pursued.

Because of the lack of evidence of a trend that these lands are fulfilling some of the housing demand it is recommended that redevelopment activity on these types of lands be monitored in the future to ascertain whether redevelopment of these sites is occurring by developing parking lots, excess land or converting church buildings to housing uses. In the meantime, selection of an appropriate refill rate could include a judgement of the rate of this redevelopment activity.

Major Utility Easements

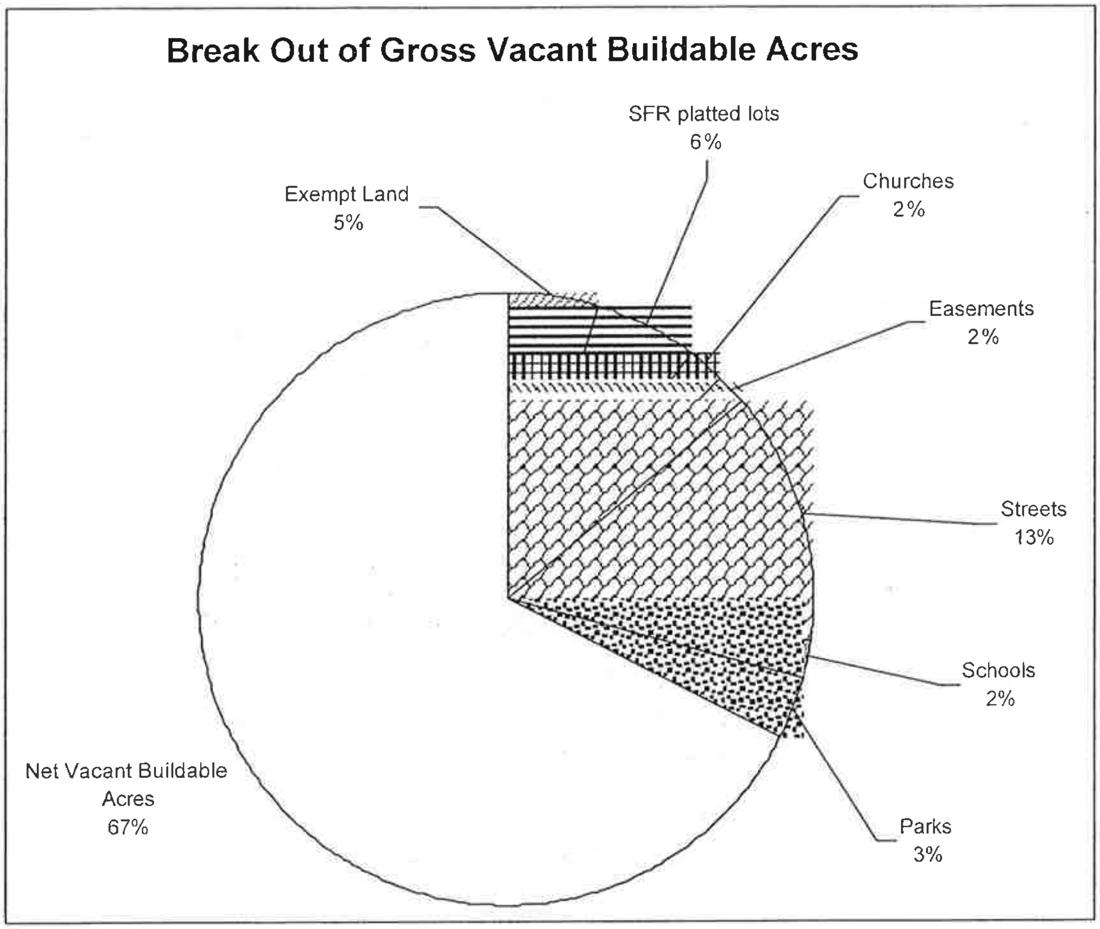
The total amount of actual land used for easements by natural gas, electric and petroleum utilities, and radio and TV towers is 700 acres.[21] Radio and TV tower tax lots were identified and removed from the buildable land inventory. Easements for major utilities consist of linear corridors of land based on specific width requirements for public safety. These include a 75-foot easement requirement for Bonneville Power Administration lines and natural gas lines, and a federal 50-foot standard for petroleum pipelines. Easements typically allow very limited uses and do not allow the construction of buildings in these areas and are therefore removed from the buildable land inventory. This deduction is a new factor that has been included to more fully approximate non-buildable land.

Gross vacant buildable land minus land needed for future streets, schools, parks, places of worship/fraternal organizations, and major utility easements yields Net Vacant Buildable Acres. The aggregate rate of reduction from GVBA based upon these various components is approximately 25 percent.

[21] Source: RLIS 2000 data.

Figure 2: Break Out of Total Gross Vacant Buildable Acres
Figure 2 graphically depicts the relative size of each category of land that is removed from gross vacant buildable acres.

Figure 2



Net Vacant Buildable Land

The region's dwelling unit capacity is estimated from net vacant buildable acres (NVBA). NVBA is broken out by residential uses according to the underlying zoning of each parcel. A total of 14,900 acres of NVBA is available for conversion to residential uses.

Land Adjustments

A new factor is reserved for adjustments to the buildable land supply so that the most accurate information is available for the 2002 Residential UGR. The vacant and buildable land supply is based on 2000 aerial photography that was flown in July 2000. There may be instances where local governments have adopted area plans, such as the Washington Square Regional Center, that increase the residential or employment capacity of lands that was not reflected in the 2000 land supply and 2000 zoning. In addition, federal, state or local governments may have sold vacant public properties that are now available for development such as the Dammasch Hospital site in Wilsonville. There also may be instances where the Standard Regional Zoning information has been incorrectly identified. A set of decision making rules help guide which lands will be considered for adjustments to the 2002 Residential UGR and which lands will be reconciled during the next legislative process.

A table of all changes is included as Appendix B to the Residential UGR. These changes are anticipated to be ongoing.[22]

Decision Rules for Buildable Land Supply Changes
All changes to the buildable land supply must have taken place by December 31, 2002. Any subsequent changes effective after this date would be picked up in a subsequent UGB analyses. A minimum of 20 acres is required because this analysis is conducted on a regional level. Changes would be made to the buildable land supply based on:

- Only those areas will be considered where formal land use action has taken place.
- Errors in a Standardized Regional Zone (SRZ) assignment.
- Mapping error; either an incorrect assignment to vacant or developed categories.
- Change in the categorization of land from public to private ownership, (minimum of 20 acres in size).

[22] For more information about land adjustments please refer to May 17, 2002 Memo.

Chapter 5
Residential Supply Analysis

Itemized Accounting of Residential Dwelling Unit Capacity

After adjusting GVBA by various gross-to-net factors (i.e., exempt land, platted lots, future streets, easements, schools, parks and places of worship), the amount of vacant land remaining becomes Net Vacant Buildable Acres (NVBA). The land that is zoned for residential purposes is separated to create the supply of vacant residential land for capacity calculation. This is the vacant land that residential dwelling units can be constructed upon. NVBA available to be converted to dwelling unit capacity totals 14,900 acres.

Dwelling Unit Capacity at Current Local Zoning Densities

Net vacant buildable acres are converted to dwelling unit capacity by aggregating local zoning classifications to Metro's Standard Regionalized Zones (SRZs). RLIS is the source for current local zoning (through 2001). SRZs normalize 746 different zoning categories across 24 cities and 3 counties. SRZs assume the average density in each zone when the assignments are made to the regionalized category. This density applied to the specific location of net buildable acre yields dwelling unit capacity. This is consistent with the method used in the 1999 UGR Update.

Standard Zoning Designations

A new list of standard zoning designations was included in the 1999 Update of the 1997 UGR. Metro staff defined a broader set of zoning designations, to capture a greater level of detail from approximately 746 different zoning categories that now exist throughout the region. The standard zoning designation list was last updated in 2002. The 26 standard regional zoning designations are shown below in Table 4.

Table 4 – Standard Regional Zoning Designations

Standard Regional Zone And Abbreviation	Dwelling Unit Per Net Acre
RRFU (Rural or Future Urban)	10.0
FF (Agricultural or Forestry)	10.0
SRF1 (Single Family 1)	2.0
SRF2 (Single Family 2)	3.0
SRF3 (Single Family 3)	4.5
SRF4 (Single Family 4)	6.0
SRF5 (Single Family 5)	7.5
SRF6 (Single Family 6)	10.0
SRF7 (Single Family 7)	16.5
MFR1 (Multi-family 1)	20.0
MFR2 (Multi-family 2)	40.0
MFR3 (Multi-family 3)	75.0
MFR4 (Multi-family 4)	100.0
MUC1 (Mixed Use Center 1)	14.1
MUC2 (Mixed Use Center 2)	25.9
MUC3 (Mixed Use Center 3)	58.8
CC (Central Commercial)	0
CG (General Commercial)	0
CN (Neighborhood Commercial)	0

Standard Regional Zone And Abbreviation	Dwelling Unit Per Net Acre
CO (Office Commercial)	0
IL (Light Industrial)	0
IH (Heavy Industrial)	0
IA (Industrial Area)	0
IMU (Mixed Use Industrial)	0
PF (Public Facilities)	0
POS (Parks and Open Space)	0

As was discussed above, SRZs represent a range of densities. The previous step uses the midpoint of the range. Dwelling capacity based on these current zoning densities is 108,700 units (prior to the adjustments noted below).

Key Points:

- *The 746 unique local zones have been collapsed into the 26 SRZs.*
- *Gross vacant buildable land minus land needed for future streets, schools, parks, places of worship/fraternal organizations, and major utility easements yields NVBA.*
- *A new deduction is being made for major utility easements in order to more fully account for all buildable lands.*
- *A new factor has been added to reflect adjustments to the 2002 buildable land supply so that the most accurate capacity information is available for the 2002 Residential UGR.*

Residential Development in Mixed Use Areas

Dwelling unit capacity is adjusted to account for additional units generated by residential development on vacant land in mixed-use zones. Additional housing unit capacity from residential development in mixed-use areas is estimated at 10,400 dwelling units.

Underbuild Rate

Underbuild represents a statistical estimate of the dwelling unit capacity lost due to residential development at less than maximum permitted densities in residential zones. The underbuild accounts for such factors as poor access, steep slopes, small or odd shaped lots, neighborhood common areas, greenways, storm water detention areas and many other site specific conditions, that make it difficult to develop at full capacity as indicated by the zoning.

Flexible local codes may allow the market to respond more efficiently to physical constraints. Higher market demand for residential lots may make it more economical to develop solutions to constraints. Higher land prices have the effect of decreasing underbuild because there is a greater profit incentive to use land more efficiently and build closer to maximum densities.

Under the Metro Code Section 3.07.120, regulations establish a minimum density requirement that specifies that residential development must at least be constructed at 80 percent of the maximum density. This requirement was adopted by Metro Council in November 1996 and is being implemented by local jurisdictions through code changes. In effect, the Functional Plan provides assurance that underbuild will be no more than 20 percent for residential development within the UGB. Because this is a regulated floor for zoning capacity the UGR assumes that 80 percent of capacity in residential zoning districts will be achieved. In the 1997 UGR, the Metro Council adopted a rate of 21 percent underbuild for single family residential development as a result of a study conducted in 1995. For this report, the underbuild rate is assumed to be 20 percent.

Underbuild is reported as a loss of 23,800 dwelling units from zoned capacity.

Residential Refill Rate

Residential refill is defined as development of new residential units on any lot defined in the Metro database as "developed." Refill is a term that includes both infill and redevelopment. Redevelopment occurs when a structure is removed and another built in its place. Infill occurs when more units are constructed on an existing developed site. Since "vacant" land includes any tax lot or any part of a tax lot that has a vacant portion larger than ½ acre, this includes development on an existing developed lot or partially developed lots with a vacant portion smaller than ½ acre.

Observed residential refill rates were obtained from a Technical Report Residential Refill Study conducted in February 1999 that reported a rate of 25.4 percent. This study was repeated in January 2000 and was entitled Report on the Residential Refill Study for 97-98 reported a rate of 26.3 percent. The studies found that a point estimate of the refill rate could vary based on economic cycles, policy changes and incentives. Policy changes and incentives can increase the rate and the rate is expected to increase over time. Data from these studies suggest that the amount of land added to the UGB is inversely related to refill rates. These rates are averages for the entire region, but reflect areas of the region that have refill rates that are much higher (central city and other areas with high demand and limited supply) and other areas are lower than the regional average. Areas with lower refill rates are most likely due to lessened demand, lower land prices, age of buildings and/or where there is a more readily available supply of vacant land. Development prefers greenfield or vacant sites to sites with constraints that must be resolved prior to development. Redevelopment issues include site contamination, building remediation or land assembly that increase development costs and add uncertainty to the process. These constraints may be offset by the fact that refill parcels are likely to have transportation access and utilities already available.

In the 1999 UGR Update, the Metro Council choose an aspirational refill rate of 28.5 percent. At the time this rate was adopted, existing experience from a study and adopted policies supported a refill rate between of 26.3 percent and 28.5 percent.

Residential Refill Rates

REFILL RATES	
Historical Refill Rates	25.4% to 26.3%
1999 UGR Rate	28.5%

The 2002 Residential UGR assumes a historical refill rate of 26.3 percent and proposes changes to increase the refill rate to 29 percent based on past trends, modeled rates, computation of accessory dwelling units and a combination of incentives and minor policy changes. ORS 197.296(6) provides the legal basis for this proposed increase.

> "197.296 (6) If the housing need determined pursuant to subsection (3)(b) of this section is greater than the housing capacity determined pursuant to (3)(a) of this section, the local government shall take one or more of the following actions to accommodate the additional housing need:
>
> (a) Amend its urban growth boundary to include sufficient buildable lands to accommodate housing needs for the next 20 years. As part of this

process, the local government shall consider the effects taken pursuant to paragraph (b) of this subsection. The amendment shall include sufficient land reasonably necessary to accommodate the siting of new public school facilities. The need and inclusion of lands for new public school facilities shall be a coordinated process between the affected public schools districts and the local government that has the authority to approve the urban growth boundary;

(b) Amend its comprehensive plan, regional plan, functional plan or land use regulations to include new measures that demonstrably increase the likelihood that residential development will occur at densities sufficient to accommodate housing needs for the next 20 years without expansion of the urban growth boundary. A local government or metropolitan service district that takes this action shall monitor and record the level of development activity and development density by housing type following the date of the adoption of the new measures: or

(c) Adopt a combination of the actions described in paragraphs (a) and (b) of this subsection."

Modeled Refill Rates

The MetroScope model produces forecasted refill rates as an output from the model. Rates from the model case studies are helpful in choosing a rate that best reflects the Metro Council's objectives and policy choices for the region. The MetroScope model rates range from 26.6 percent to 50.7 percent depending upon the policy assumptions imbedded in each case study. For example- the Centers and Hold the UGB case studies produced refill rates between 44-50 percent using a very aggressive incentive program that was spread across the region in most all regional and town centers. Even the Damascus case study produced higher refill rates that were spread over the region even though the targeted incentives were located in the Damascus area. Table 5[23] illustrates the different refill rates that could be used to estimate the potential for refill related development if additional capacity was provided through upzoning, incentives or implementation of other programs in different employment zones. For example, the use of incentives in Centers can boost the refill rate by making this type of land more attractive for development.

2040 Centers Implementation Strategy

Metro's consultants recommended that Metro policy focus on the implementation of Regional and Town Centers. The Centers policy needs to start with a recognition that the region's Centers are all evolving at different rates in terms of planning, market position and implementation. Metro can and should play a role in each of the three stages of Centers development. In broad terms, it is helpful to think about the evolution of Centers in three stages: planning, emerging and maturing. Implementation assistance can and should be tailored to each stage along the evolutionary cycle of Centers growth.

The study recommended that the definition of Centers in the Regional Framework Plan be enhanced to better define the concept of Centers without adding more regulatory language dictating densities, mix of uses or transportation requirements.

The primary policy change should focus on implementation. To date, development in Centers has been lacking due to a combination of market realities and the fact that Centers are the most difficult places in the region to do development. Metro policy can facilitate development in Centers through its role as teacher and coach. Amendments to the Functional Plan should provide flexibility for local governments

[23] Table excerpted from Table 3 Localized Refill Rates – MetroScope Case Studies, UGR Primer, June 3, 2002.

to encourage the types of development that is most appropriate for their communities while at the same time encouraging development in Centers. An in depth discussion of Metro's recommended policies are contained in the 2040 Refinement Report, Policy Recommendations.

The Residential UGR anticipated an additional 2.7 percent capacity in designated mixed-use Centers will be achieved through incentives, MTIP, and additional measures to achieve a final refill rate at 29 percent.

New policy directions for inclusion in the Metro Code or the Regional Framework that focus on developing successful Centers include:

- Refine the definition of a Center. The 2040 Growth Concept refers to a "Neighborhood Center" but does not expand on this. The hierarchy of Centers could be expanded to include this type of Center that is smaller than a Town Center.
- Develop additional policies to strengthen Center development. A regional strategy for Centers could include investment in Centers by Metro and efforts by Metro to secure complementary investments by others.
- Monitor and develop performance measures for Centers to determine whether strategies for Centers are succeeding and report the results to the region and the state.
- Develop an incentive program to assist in implementation.
- Focus appropriate types of development in Centers including corresponding policies in other areas such as restricting commercial uses in significant industrial areas.

Next Steps in the Evolution of Centers
A work program to implement the recommendations from the Centers studies and the MPAC Jobs Subcommittee will be developed. This will include development of new Centers policies. Issues that need further examination are:

- Determining the relationship between the Centers and Corridors
- Examining the relationship between the Centers and Employment and Industrial Areas
- Measuring performance
- Determining a process for categorizing and prioritizing the Centers
- Agency roles for Centers development
- Addressing regulations

Accessory Dwelling Units
In November 1996, Metro Council adopted the Functional Plan with a requirement that cities and counties not prohibit the construction of at least one accessory dwelling unit within any detached single family dwelling. Local Governments had a deadline to amend their codes accordingly by February 1999. Based on this requirement in the Functional Plan, the capacity analysis in the 1999 UGR Update provided for accessory units as a proportion of the total number of single family dwellings. In each successive preparation of the UGR all factors are evaluated by staff to determine if they can be supported by available data or if a new methodology can be developed to more accurately reflect market conditions. After review of the accessory dwelling unit factor staff recommended deleting this separate line item due to the fact that accessory dwelling units have proved difficult to count and track. Accessory dwelling units are more appropriately included as an incidental component of the refill rate and as part of the densities assumed on vacant land.

Why do we Expect Increases to Refill Rates in the Future?
The Residential UGR is forecasting a very small increase in the refill rate within the next 20 year period because of several factors. First, the magnitude of change of a refill rate from 26.3 percent to 29 percent is extremely small when the results of that change take place over a 20 year period. For

example, a 6,000 dwelling unit deficit (difference between 26.3 and 29 percent refill rate) over 20 years is only 300 units per year or when compared equally to 24 cities it amounts to an increase of 12.5 units per year. In summary this small increase in the refill assumption is valid for the following reasons:

- Past trends- Metro Refill Studies confirmed rates increasing from 25.4 to 26.3 percent
- 2040 continues to play out in Regional and Town Center development
- Model confirmation- MetroScope confirmed the rate of 26 percent with the Base case model run[24]
- MetroScope model runs confirm that incentives do indeed produce higher refill rates
- Incentives and policy adjustments will be targeted at areas where demand is greatest such as Regional and Town Centers that are performing well and the Central East Side Industrial District
- Accessory dwelling units are now included in the refill rate
- New Refill Study- will be performed as part of Performance Measures follow up work

When do we expect to see changes in the refill rate?

Undoubtedly time will pass before changes in the refill rate can be observed in either a localized basis or regionally. The reason for this delay is that policy changes take time to be drafted and implemented. In addition, the market needs time to respond to policy changes and the availability of incentives to create measurable results also takes time. Examples of incentive programs range from increased MTIP allocations, implementation of additional urban renewal districts, and availability of additional resources to recruit and locate target business in Regional and Town Centers. Selected policy changes in specific areas could raise the rates in those areas as well as the overall regional refill rate and justify the use of a higher refill rate in the 2002 Residential UGR. The Central east side Industrial district has a refill rate in the Base case of 40 percent which increases to upwards of 90 percent in the Centers and Hold the UGB cases. Granted these cases applied a very aggressive refill strategy that is not expected to be duplicated for this area but it shows the tremendous upside for realizing a higher refill rate (both localized and regionally). No other Center showed such a dramatic increase. For example- the City of Portland will be developing a work program to review the plan for the Central City area in 2003. This work is anticipated to take approximately one year to complete. Amending a plan that could allow more housing opportunities in this district generally takes 3-4 years to complete. Certainly this planning and allowance for market adjustments can be accomplished with the 20 year planning horizon and justify a slightly higher overall regional rate.

Based upon proposed adoption of a "Centers" strategy, including the application of MTIP funding to areas that are achieving increased centers development Metro is proposing a 29 percent refill rate.

[24] The difference between the observed rate of 26.3% and the Base case of 26.6% is probably not statistically significant.

Table 5: Localized Refill Rates – MetroScope Case Studies

Employment Zones	Areas[25]	Base Case	Damascus	Centers	Hold the UGB	Rate Differences Between Base and Hold UGB
106	Central Eastside	40.4	42.0	90.4	96.1	55.7
304, 306	Beaverton	52.1	54.1	68.1	67.7	15.6
202, 203	Clackamas TC	20.25	45.4	27.9	31.25	11.0
124	Gresham	15.6	20.1	36.6	38.0	22.4
311, 312	Hillsboro	34.2	38.75	45.1	44.7	10.5
206	Oregon City	19.8	35.7	39.3	38.8	19.0
101	Portland CBD	99.6	99.6	99.7	99.8	.2
303	Tigard	53.0	54.0	72.8	72.4	19.4
301	Tualatin	13.1	25.9	34.9	34.4	21.3
211	Wilsonville	11.5	18.0	16.8	20.3	8.8
213	West Linn	7.1	7.7	12.9	17.1	10.0
All zones	*Regional Rate[26]*	*26.6*	*32.3*	*44.0*	*50.7*	*24.1*

Key Points

- *Metro Refill Study confirms a refill rate between 26.3 and 30 percent.*
- *MetroScope model runs confirm that incentive programs can produce higher refill rates.*
- *A key finding from this research is that the region's needs and Metro's function have changed since the adoption of the existing policies related to the 2040 Growth Concept.*
- *Focus policy changes on implementation.*
- *By focusing on incentives in Centers we can achieve a refill rate of 29 percent.*
- *A work program to implement the recommendations from the Centers studies and the MPAC Jobs Subcommittee will be developed.*

[25] Areas are rough approximations of regional and town center boundaries. Regional and town center boundaries do not nest within MetroScope employment zones.

[26] Includes all zones not just those listed in the selected areas above.

Appendix A

Table Notes

1a-1b. Source: Metro Data Resource Center, Metro Report, Economic Report to the Metro Council, 2000-2030 Regional Forecast, March 2002, preliminary draft.

2. Source: Capture rate assumption derived from MetroScope base case study and the historical capture rate from 1980-98. The capture rate is defined as the proportion of housing (or employment) that locates inside the Metro UGB relative to the four-county area (Multnomah, Clackamas, Washington and Clark). Other case study options which were tested and investigated with the MetroScope real estate and land use model indicate a range of potential capture rates depending on different land use policy assumptions.

Case Study Option	Periodic Capture Rates (percent)					
Test Scenario:	2000-05	2005-10	2010-15	2015-20	2020-25	Entire 2000-25
Base Case	71.9	79.0	57.0	72.6	54.5	66.2
I-5 Transportation Study	71.9	79.0	57.0	72.6	54.5	66.0
Centers Enhancement	71.9	75.4	51.5	71.8	35.5	59.0
Damascus/New Community	71.9	77.7	54.9	71.1	35.6	60.0
No UGB Expansion	71.9	75.7	52.5	73.5	37.7	60.4

Source: MetroScope case studies

Metro Region Capture Rates

Metro Capture Rates - 5 years:	1980-85	1985-90	1990-95	1995-00
Households	65.5%	53.7%	76.6%	68.8%
Metro Capture Rates - 10 years:		1980-90		1990-00
Households		58.2%		72.9%
Metro Capture Rates - 20 years:				1980-00
Households				67.8%

Historical Capture 1980-98 = 70%

Source: Census reports, building permits, PSU population estimates as compile by Metro DRC.

3. Source: Metro DRC analysis as compiled from Portland General Electric vacancy data. We assume a vacancy rate of 4 percent based on the average historical trend. Vacancy rates vary widely from year-to-year based on available housing supply and the amount of current demand. Speculation by homebuilders in one period may tend to overbuild and create a surplus stock, which pushes up the vacancy rate. In periods of strong population growth, vacancy rates fall due to higher demand for housing. In slack periods vacancy rates may rise due to lower

population demand. The PGE data show vacancy rates swings of between 3.5 percent to 7.6 percent and the 2000 Census estimate of 6.2 percent. Finally, vacancy rates may never decrease close to zero because of "frictional vacancy." People change homes all the time, so in order to facilitate these moves, there necessarily has to be a percentage of the housing stock that remains unoccupied.

4. Dwelling Unit Demand is calculated from the household forecast with the 4 percent vacancy rate added to the projected change in household total to arrive at this figure.

5. Source: Metro RLIS, 2000. Vacant Land Analysis.

6a. Source: Metro RLIS, 2000. GIS tabulation of Title 3 regulation for water quality protection. This data layer includes five parts: 1) streams and rivers, 2) variable 75 to 200 foot riparian buffer (for water quality protection only), 3) 1996 flood area, 4) 100-year flood plain and 5) wetlands.

7. Gross Vacant Buildable Acres is calculated as the difference in gross vacant land less Title 3 setbacks for water quality protection.

8. Source: Metro RLIS, 2000. Land that is identified in the county assessors' records as tax exempt and owned by federal, state or municipal authorities is set aside from the buildable land and assumed to be reserved for future public facilities.

9. Source: Metro RLIS, 2000. Individual tax lots (i.e., platted lots) zoned for single family and under 3/8 acre are set aside from the supply of buildable land. We assume one dwelling unit for each lot. This is added back into the dwelling unit capacity estimate in line 23. – Lots are reported in acres and later translate to units.

10. Source: Metro RLIS, 2000. Estimated future land need for future churches is determined on a per capita basis of 1.4 acres per 1,000 future residents. This rate was determined in 1994 for the 1997 UGR.

11. Source: Metro RLIS, 2000. Actual GIS tabulation of known major easements for radio/TV towers, natural gas, petroleum and electricity lines intersecting with Metro's vacant land data. (Note: significant portions of the easements show development existing on it today.)

12. Source: Metro Data Resource Center analysis of street dedications in new subdivisions, unpublished GIS report, 1994. In this study, we determined that subdivisions or areas greater than one acre which have developed for residential purposes usually dedicate up to 18.5 percent of the initial buildable lot area for street. If the initial development site is under 3/8 acre, we found that the existing street network provided sufficient access to home sites. Development sites between 3/8 and one acre usually dedicated about 10 percent of the initial site area to streets.

13. Source: Interviews with local school district building facilities managers and site selection committees. The three methods assumed a different student per acre ratio for determining future school land need. The estimated land need ranged from 700 to 1,200 acres. ***(Sample may not be scientifically representative.)*** Council acknowledged a greater need for schools by choosing a deduction for future schools of 900 acres.

14. The 1997 UGR park ratio included neighborhood parks, wildlife refuges and preserves, Metro and municipal open spaces and regional parks.

The methods under consideration for calculating future parkland provide a range of values from 10,860, to 8,000, to 2,290 to 1,050 acres depending upon the ratio used. The MPAC Parks Subcommittee recommended a method based on the existing fiscal resources available to purchase new lands. This method yields an estimate of 1,050 acres (1,100 acres rounded).

15. Net Vacant Buildable Acres is a term of art in the Urban Growth Report. This estimate of land supply/inventory is the amount of vacant land that is available for accommodating future jobs and housing after deducting for the gross-to-net factors previously described.

16. Amount of Net Vacant Buildable Areas for accommodating future employment. – See the 2002-2022 Urban Growth Report: An Employment Land Need Analysis.

17. Amount of Net Vacant Buildable Areas for accommodating future housing.

18. Source: RLIS 2001 for zoning and 2000 Vacant Lands Analysis for buildable lands. The calculation of dwelling unit capacity is the product of residential land standardized regional zone designations that correspond to single and multi-family densities per local zones.

19. An estimate of the amount of vacant mixed use land designated in town centers and regional centers which will go toward brand new housing units. This figure does not account for mixed use redevelopment which will also add dwelling units to the region's capacity. The mixed use redevelopment amount is accounted for in line 21.

20. Based on what Metro's functional plan requires and regulates municipalities and counties to achieve at least 80 percent of their stated zoning densities.

21. Source: Metro Redevelopment Study, 1998. The latest actual readings of the amount of redevelopment is 25.4 percent (1994-96) and 26.5 percent (1996-98) of all new residential units are developed on parcels that Metro has identified as developed in its Vacant Land Inventory procedures.

MetroScope Case Study Options	**Estimated Refill Rate**
Base Case	26.6%
I-5 Transportation Study	26.6
Centers Enhancement	44.0
Damascus/New Community	32.3
No UGB Expansion	50.7

Metro Council in its prior decision assumed an "aspirational" residential refill rate of 28.5 percent.

22. Source: Metro RLIS, 2000. An actual count of the number of tax lots which are wholly inside the Title 3 Water Quality protection area.

23. Source: Metro RLIS, 2000. The actual number of tax lots under 3/8 of an acre regardless of single family zoning density is added back as the number of already platted lots.

24.- Land adjustments are the land capacity for those items not included in line 18.
24d. See Appendix B.

25. Dwelling Unit Capacity is the summation of all the adjusted dwelling unit factors from above.

26. Additional policy actions effectively increase the refill rate by 2.7 percent to a total of 29 percent.

27. Adjusted dwelling unit capacity takes into consideration the effects of the additional policy actions applied inside of the UGB.

28. The estimated need is the difference between supply (i.e., dwelling unit capacity) and demand. The amount is negative which indicates a shortage of capacity in the current UGB.

Appendix B

Land Adjustments

Criteria:

- changes between July 2000 and December 2001
- formal action has been taken
- error in a SRZ
- mapping error
- change in the categorization of land from public to private ownership and a minimum of 20 acres in size

Villebois
Tax Lots:
31W15 02800 42 acres
31W15 02900 130 acres

City has this zoned for public facilities. Although planning efforts have been undertaken, there is no adopted plan for rezoning the area at this time. There is a Master Plan that was adopted by resolution in 1997. It is not an element of the comprehensive plan nor has any rezoning taken place. At this time, there is a study of this area in progress which is refining the Master Plan and rezoning is anticipated early next year to start the PUD process.

Although it is not in the Comprehensive Plan, it is possible to assume 2,300 dwelling units for this area for two reasons.

First, there is a reference in the Wilsonville Comprehensive Plan that states that development of the area has to be in conformance with the Master Plan which calls for 2,300 dwelling units. Second, in selling the property, the State placed a condition that at least 2,300 housing units would be built there. Right now, there is no estimate of employment capacity but it is expected that the employment uses would serve the housing and not, due to transportation limitations, become a destination area. There is an intent to provide employment and some thought is being given to design a community that is very supportive of home base occupations.

The Metro SRZ is General Commercial; maybe more appropriate as SFR 7.

West Hayden Island
Tax Lots:

2N1E19 00100	37 acres
2N1E19 00200	1 acre
2N1E19 00300	54 acres
2N1E28 00200	87 acres
2N1E29 00200	23 acres
2N1E29 00300	410 acres
2N1E29 00400	15 acres
2N1E30 00100	11 acres
2N1E30 00200	78 acres
2N1E30 00300	28 acres
2N1E30 00400	4 acres
2N1E33B 00200	6 acres

2N1E33B 00300	27 acres
2N1E33B 00400	3 acres
2N1E33B 00500	12 acres
2N1E33B 01100	1 acre
2N1W24 00100	1 acre

Total approximate acres: 798

Zoning brought into the UGB for a marine terminal only. The City has maintained the County's agricultural/forestry zoning.

The Metro SRZ for this site is Agricultural or Forestry which assumes 10 units to the acre, need to amend the Metro SRZ to Heavy Industrial, Parks/Open Space or Public Facilities.

Marylhurst
Tax Lots:

21E14 00300	55 acres
21E14 00400	52 acres
21E14 00401	7 acres
21E14 00402	8 acres

Total approximate acres: 122

Zoning: Lake Oswego has zoned this property Office Commercial and Office Campus. The 1995 Master Plan allows for 680 dwelling units.

Current Metro SRZ is Office Commercial that does not assume housing, need to amend the Metro SRZ to MUC 1.

Rosemont School
Tax Lots – numerous starts with 1N1E15BD
The site is approximately 8 acres and will accommodate 165 dwelling units.

Current Metro SRZ is MFR 1; this is the correct SRZ.

Camp Withycombe
Tax Lots:

22E09A 00900	43 acres
22E09A 00901	5 acres
22E10 00601	123 acres
22E10 00602	27 acres
22E10 00691	37 acres

Total approximate acres: 235

The State of Oregon owns Camp Withycombe. The area including the firing ranges was purchased by ODOT for Sunrise Corridor. The land, suitable for development, which would remain after the highway is built, is likely to be less than 20 acres in size and have wetland and hazardous material issues. The remaining portion of the camp (other than the firing ranges) will continue to be used for military purposes.

Current Metro SRZ is Heavy Industrial, need to amend to Public Facilities.

Durham Quarry

Tax Lots:

2S113AC01200	8 acres	Tigard
2S113DB00100	20 Acres	Tualatin

There is a Mixed-use Overlay Zone on the Quarry. Through an IGA, Tualatin is dealing with the application. Housing is an allowed use at a range of 25-50 units per acre but not required. There will be approximately 3,000 jobs generated at full build out of the quarry. There has been some interest in developing housing but the bulk of the development is most likely to be commercial.

Current Metro SRZ is Mixed Use Industrial on the Tigard portion and General Commercial on the Tualatin portion. This needs to be amended to Office Commercial or, if we want to assume some housing will be developed, MUC 2.

Washington Square Regional Center

Tigard portion adopted in February 2002. As it is a Regional Center, it is included in the amendments even though it was adopted after December 2001. There are no changes to Washington County and Beaverton portions.

Added capacity of 1,500 housing units and 4,465 jobs, approximately 986 acres.

Amend the Metro SRZ.

Downtown Lake Oswego

Metro SRZ is Central Commercial, should be amended MUC 2.

Alpenrose Dairy

Tax Lots:

1S1E18 00100	51.4 acres
1S1E8CC 00100	.4 acres

It is used for industrial purposes but it is zoned and the comp plan designation is for low density housing. R-10 – 10,000 sq. ft. lots and R-7 – 7,000 sq. ft. lots.

Current Metro SRZ is either SFR4 or SFR5, needs to be amended to SFR3.

Rock Creek – Happy Valley

Tax Lots:

various12E36D, 22E01(A,B&D), 23E06(B&D)

Housing Capacity is 2,997

Job Capacity is 904

Current Metro SRZ is Rural Residential and Agricultural, needs to be amended to MUC 1, MUC 2, SFR 2 and SFR 5.

Coffee Creek Prison
Tax Lots:
Map 3S-1-3AB Tax Lots 500, 600, 700, 701, 702
Map 3S-1-3A Tax Lots 1300,1301, 1400, 1500, 1600, 1601
Map 3S-1-3AA Tax Lots 800, 900, 1000, to include the Bonneville Power Administration easement
119 Acres

At build out, the prison will house 1,252 inmates and employ 430 people.

Current Metro SRZ is Mixed Use Industrial, should be amended to SFR6.

Former Urban Reserve No. 55
300 Acres

The City has not rezoned this property. A consultant has been hired to prepare a plan for this area. The Court of Appeals decision was rendered in February 2002 and the City did not develop any plans during the appeal period.

Current Metro SRZ is Rural Residential, this is the correct SRZ at this time.

Appendix C

Document Reference Section

Many different documents were used for background information in creating the Residential UGR. For additional information please refer to the following list of documents:

- Economic Report to the Metro Council: 2000-2030 Regional Forecast – March 2002
- 2000 Vacant Land Supply Inventory
- UGR Primer – June 2002
- Centers Study – June 2002
- School Site Staff Report – July 2002
- Land Adjustments Memo – May 17, 2002
- Parks Subcommittee Report – June 2002
- MetroScope Findings Report – 2002

I:\gm\community_development\share\Reports\2002 Urban Growth Reportrevised.doc

Exhibit B

NOTICE OF PUBLIC H
REQUEST FOR CO

City of Sherwood Oregon

Notice Date: September 6, 2007
Please submit comments by: September 20, 2007

Notice is hereby given that the City of Sherwood Planning Commission is scheduled to conduct a Public Hearing on **Tuesday, October 9, 2007** at 7:00 PM at the Sherwood Civic Center, 22560 SW Pine Street, Sherwood, Oregon concerning PA 07-01 Former Driftwood Mobile Home Park Plan Amendment (Pfeifer). The Planning Commission will forward a recommendation to the City Council who will make the final decision on the proposed zone change after a second public hearing not yet scheduled.

Case File No.: PA 07-01

Tax Map/Lot: 2S130D001200
Property Address: 21305 SW Pacific Highway

Property Owner/Applicant: Donald and Virginia Pfeifer
2011 NE 164th Place
Portland, OR 97230

Representatives

Todd Mobley
Lancaster Engineering
321 SW 5th Avenue, Suite 400
Portland, OR 97204

Ed Sullivan, Esq.
Garvey, Schubery Barer
121 SW Morrison, Suite 1100
Portland, OR 97204

Leslie Ann Hauer, AICP
6100 Collins Road
West Richland, WA 99353

Staff Contact: Julia Hajduk, Planning Manager (503) 625-4204
hajdukj@ci.sherwood.or.us.

Proposal: The applicant has requested a comprehensive plan and zone map amendment to change the zone from Medium Density Residential Low (MDRL) to Retail Commercial (RC). The property was a former mobile home park which has since been vacated.

Applicable Code Criteria: The required findings for the Plan Amendment are identified in Section 4.203.02 of the Sherwood Zoning and Community Development Code (SZCDC); Applicable standards are: Comprehensive Plan, Part II, Chapter 4, Section E (residential), Section H (Economic Development Policies and Strategies), and Section I (Commercial); Metro Functional Plan Title 1; and Statewide Planning Goal 9, 10 and Goal 12.

COMMENTS – Former Driftwood Mobile Home Park Zone Change

- ☐ No comment.
- ☐ We encourage approval of this request.
- ☐ Please address the following concerns should this application be approved:

____

____

X☐ **We encourage denial of this request for the following reasons:**

It is my feeling from reviewing current city zoning that retail commercial zone exist in enough areas in town that our citizens are being served. It is my feeling that they will be served until all developable land has been developed. Further it is my opinion that the City is deficent in Office Commercial Zone. Office commercial zones provide more opportunities for family wage jobs in Sherwood so that sustainability goals can be met. Please see the attached excerpt from an analysis run fir property less then 2 miles from the subject parcel.

I would encourage the Planning Commission to deny this application in favor of Office commercial or to make sure that Office Commercial plays a large part in this development.

Please feel free to attach additional sheets as needed to complete your comments.

Comments by: ROSS SCHULTZ Date: 9/13/07

Address: 15653 SW ORIOLE CT Tel.:

SHERWOOD, OR Ema

JOHNSON
GARDNER

MEMORANDUM

DATE: March 6, 2007

TO: [redacted]
Sherwood, Oregon 97140

FROM: JOHNSON GARDNER, LLC

SUBJECT: Residual Office Demand Analysis for a Site in Sherwood, Oregon

JOHNSON GARDNER was retained to evaluate the residual office demand surrounding a [redacted] parcel in Sherwood. This analysis assumes the use of approximately 6 acres of the larger parcel for an office development.

The primary purpose of this analysis is to identify the residual office demand in the market area, which demonstrates the depth of support for developing new office space at the subject site. This is accomplished through an assessment of the current supply and demand characteristics in a delineated Primary Market Area. Demand projections are presented in five-year intervals between 2007 and 2027.

Our findings indicate a demand for community-level office space in the market area that significantly exceeds the supply, now and into the future. This report compares the forecasted demand with the existing inventory of office space in the area, as well as vacant, commercially-zoned parcels that may be developed with office space in the future.

I. EXECUTIVE SUMMARY

Based on our findings of supply and demand, we conclude that the subject site is a strong candidate for office development. The following factors support the development of office space at the site.

- Currently, the residual demand in the Primary Market Area is estimated at over 1,550,000 square feet of office space. This is more than enough to accommodate 100,000 square feet of office space (or more) at the subject site with significant demand left over.
- Over the next 20 years, the residual demand is projected to grow faster in absolute terms than supply in the area. Even assuming development of vacant commercial parcels, there will be more unmet residual demand for office space in 2027 than in 2007.
- There are no other vacant commercially-zoned parcels that are the size of the 6-acre subject site. The largest is 4.4 acres, and could accommodate an estimated 75,000 square feet of office space.

319 SW Washington Street, Suite 1020 Portland, OR 97204 503/295-7832 503/295-1107 (fax)

- Existing office space in the area averages 8% vacancy, below the 10% considered healthy in the office real estate market. In general, the southwest Metro area has seen swiftly falling vacancy rates with little additional office currently in the pipeline.

- The subject site is well-suited for office development. It has excellent access from the Tualatin-Sherwood Road, a major arterial route. It is also near the Pacific Highway, making a convenient commute from the north and south. A lack of visibility from Highway 99W will limit marketability somewhat, but the site's accessibility is seen as an asset.

- The site is centrally located to serve the Sherwood market, as well as south Tigard, west Tualatin, and the growing Newberg market. [redacted]

- [redacted]

Exhibit C

Oregon

Theodore R. Kulongoski, Governor

Oregon Department of Transportation
ODOT Region 1
123 NW Flanders St
Portland, OR 97209 - 4037
Telephone (503) 731-8200
FAX (503) 731-8259

File code: PLA9 2A - 91
ODOT Case No: 2672

November 1, 2007

City of Sherwood
Planning Department
20 NW Washington St.
Sherwood, OR 97140-7851

Attn: Julia Hajduk, Planning Manager

Re: PA07-01: Pfeifer Property Plan Amendment
Highway 99W and SW Edy Rd

Dear Julia,

We have reviewed the applicant's proposal to change the zoning from MDRL to Retail Commercial (RC). The site is adjacent to OR 99W. ODOT has jurisdiction of this State highway facility and an interest in assuring that the proposed zone change/comprehensive plan amendment is consistent with the identified function, capacity and performance standard of this facility. According to the 1999 Oregon Highway Plan (OHP), this facility is classified a Statewide Urban highway and the performance standard is 0.99 volume to capacity (v/c) ratio.

For zone changes and comprehensive plan amendments local governments must make findings that the proposed amendment complies with the Transportation Planning Rule (TPR) OAR 660-012-0060.

OAR 660-012-0060
1) Where an amendment to a functional plan, an acknowledged comprehensive plan, or a land use regulation would significantly affect an existing or planned transportation facility, the local government shall put in place measures as provided in section (2) of this rule to assure that allowed land uses are consistent with the identified function, capacity, and performance standards (e.g. level of service, volume to capacity ration, etc.) of the facility.

A plan or land use regulation amendment significantly affects a transportation facility if it would:
(c) As measured at the end of the planning period identified in the adopted transportation system plan:
(C) Worsen the performance of an existing or planned transportation facility that is otherwise projected to perform below the minimum acceptable performance standard identified in the TSP or comprehensive plan.

(2) Where a local government determines that here would be a significant effect, compliance with section (1) shall be accomplished though one or a combination of the following:
(a) Adopting measures that demonstrated allowed uses are consistent with the planned function capacity, and performance standards of the transportation facility

Lancaster Engineering prepared traffic impacted analysis for the proposed zone change. ODOT has reviewed the report submitted from July 2007, as well as addendums dated September 28, 2007 and

October 19, 2007 and the subsequent memorandums prepared by Chris Macieiewski PE, DKS Associates for the City.

The intersections of OR 99W at Tualatin-Sherwood Rd and Edy Rd are currently operating at or near capacity (1.0 v/c ratio). Under the "worst case" traffic generation for the existing zoning future year 2022, these intersections along with OR99W/Elwert Rd intersection are forecasted to be over capacity. The proposed zone change would increase the traffic impacts to these intersections, further degrading the volume to capacity ratios which constitutes a significant effect (*OAR 660-012-0060(1)(c)(C)*.

For zone changes and comprehensive plan amendments local governments must make findings that the proposed amendment complies with the Transportation Planning Rule (TPR) OAR 660-012-0060. There must be substantial evidence in the record to either make the finding of "no significant effect" on the transportation system, or if there is a significant effect assurance that the allowed land uses are consistent with the identified function, capacity, and performance standard of the transportation facility.

The applicant has identified a number of mitigation measures to try to offset the zone changes impacts. However, the identified measures have not adequately been analyzed to determine their impact on traffic signal progression along OR 99W through Sherwood or whether the proposed lane configurations pose geometric or operational issues at the highway intersections. Additionally, ODOT does not have the right of way for the proposed additional southbound right turn lane from OR 99W to Roy Rogers Rd and there may also be right of way constraints at Edy Rd and Sunset Blvd for the proposed improvements and no funding source for the necessary roadway improvements has been identified.

ODOT is in agreement with the concerns and conclusions made by Mr. Macieiewski regarding state highway intersections and the proposed mitigation measures. The proposed lane configuration at the OR 99W/Elwert Rd intersection would require split phasing of the signal timing which would require approval of the State Traffic Engineer. The proposed signal phasing change at the OR 99W/Edy Rd intersection also requires approval of the State Traffic Engineer as well as a progression analysis to ensure that the proposed phasing change would not adversely effect progression of traffic on the highway. Given that the various intersections on the highway are projected to be operating above capacity a SimTraffic queuing analysis should be performed to identify necessary storage lengths for lanes at the various study intersections.

The applicant has not indicated a willingness to construct the mitigation measures that they identified to mitigate for the proposed zone change impacts on state highway intersections. They have not adequately demonstrated that identified mitigation measures would be viable from operations or funding perspective to mitigate for the significant effect on OR 99W with the proposed rezone. Therefore, ODOT recommends that the City either deny the zone change or condition the zone change such that the number of trips that this property would generated would not exceed the "worst case" trip generation under the existing medium density residential zoning.

Gary Norris PE, Garry Struthers Associates, Inc has prepared the technical review for ODOT. Mr. Norris identified multiple deficiencies in the analyses prepared by Lancaster Engineering in his memorandum dated September 28, 2007. This memorandum was provided to the applicant. Mr. Norris has reviewed the addendum prepared by Lancaster Engineering on October 19, 2007 and the subsequent memorandum prepared by the Chris Macieiewski PE, DKS Associates for the City. His final memorandum is attached.

Thank you for the opportunity to review and comment on the proposed zone change application. Martin Jensvold PE, ODOT Region 1 Access Management Engineer has provided technical input for this letter. If you have any questions, I can be reached at 503-731-8258.

Sincerely,

Marah Danielson

Marah Danielson
Development Review Planner

C: Martin Jensvold PE, Lainie Smith, Seth Brumley, ODOT Region 1
Gary Norris PE, Gary Struthers and Associates
Chris Macieiewski, DKS Associates

Reconciliation of Land Demand and Supply

This section summarizes the findings presented in earlier sections regarding long-term (20-year) and short-term (less than year) land demand, and compares this need to the existing vacant land supply. Since refill and redevelopment adjustments were made to the employment forecasts, this section focuses on vacant land needs for the Sherwood UGB.

Commercial Land Needs

The demand analysis summarized earlier in this EOA indicates that the long-term vacant commercial land demand in Sherwood is expected to range from 15 acres in the low growth forecast, to 40 acres under the medium growth forecast, and up to 106 acres under the high-growth forecast (please refer to **Table 18A**).

With an existing vacant commercial land supply of approximately 13 acres, the long-term demand for vacant commercial land area can almost be met under the low growth scenario, but additional commercial zoned land would be required under the medium and high growth scenarios. In most instances the market will adjust to development pressure by subdividing larger parcels into smaller ones, but cannot always be counted on to aggregate tax lots to create large contiguous development opportunities. In Sherwood's case there appears to be an abundance of medium and large parcels that can be subdivided over time to meet development requirements—which could delay the need for a UGB expansion under the medium growth forecast.

Table 18A indicates that with either the medium or high-growth scenarios, additional commercial land should be added to the Sherwood UGB to accommodate future commercial retail and service land needs. The amount of required commercial land area ranges from 27 acres in the medium growth scenario to 93 acres in the high growth scenario. Preliminary recommended parcel (tax lot) configurations are summarized in **Table 18B**.

The demand analysis summarized earlier in this EOA indicates that the short-term vacant commercial land demand in Sherwood is expected to range from 4 acres in the low growth forecast, to 10 acres under the medium growth forecast, and up to 27 acres under the high-growth forecast. In light of the fact that there are several project ready and short term commercial tax lots within the existing city limits, the City should focus on commercial infill and redevelopment as a short term strategy, and plan for integrated commercial development within future master-planned employment and neighborhood districts, including Areas 48, 54-55, and 59.

Table 18A. Commercial 20-Year Land Demand Forecast

Sherwood Urban Growth Boundary

	Low Growth Forecast (acres)	Medium Growth Forecast (acres)	High Growth Forecast (acres)
Demand for Vacant Land (acres)	15	40	106
Less Supply of Vacant Land (acres)	13	13	13
Equals Net Land Need (demand less demand)*	**2**	**27**	**93**

Table 18B Commercial 20-Year Parcel Demand Forecast (tax lots)

Sherwood Urban Growth Boundary

Medium Growth Forecast, Parcel Distribution (tax lots)	Existing Supply of Vacant Tax Lots	Forecast of Demand (Tax Lots)	Forecast of Net Land Need (Tax Lots)
Less Than 1 acre	5	7	2
1 to 4 acres	11	1	(10)
5 to 9 acres	4	2	(2)
10 to 19 acres	0	1	1
20-49 acres	1	1	0
50+ acres	2	0	(2)
Total	**23**	**12**	**(11)**
High Growth Forecast, Parcel Distribution (tax lots)	Existing Supply of Vacant Tax Lots	Forecast of Demand (Tax Lots)	Forecast of Net Land Need (Tax Lots)

Less Than 1 acre	5	32	27
1 to 4 acres	11	9	(2)
5 to 9 acres	4	4	0
10 to 19 acres	0	3	3
20-49 acres	1	1	0
50+ acres	2	0	(2)
Total	**23**	**42**	**28**

** gross buildable acres. Note, numbers in parentheses denote a land supply surplus.*

Source: Otak, based upon findings included in demand and supply analysis.

Industrial Land Needs

The demand analysis summarized in **Table 19A** indicates that the long-term vacant industrial land demand in Sherwood is expected to range from 123 acres in the low growth forecast, to 276 acres under the medium growth forecast, and up to 415 acres under the high-growth forecast.

The existing 202 acres of vacant industrial/other employment land supply within the city limits is expected to meet the needs of long-term industrial land demand under the low growth scenario. However, additional vacant industrial land would need to be added to the Sherwood UGB to accommodate future industrial land needs for both the medium and high growth forecasts. The amount of additional required industrial land area ranges from 74 buildable acres in the medium growth scenario to 213 buildable acres in the high growth scenario. Preliminary recommended parcel (tax lot) configurations are summarized in **Table 19B**.

The demand analysis summarized earlier in this EOA indicates that short-term industrial land demand in Sherwood is expected to range from 31 acres in the low growth forecast, to 69 acres under the medium growth forecast, and up to 104 acres under the high-growth forecast. In light of the fact that there are several project ready and short term commercial tax lots within the existing city limits, the City should focus on retaining and expanding existing employers and developing existing vacant industrial areas as a short term strategy.

Long term strategies should include planning for new industrial sites (with integrated commercial and residential development) within future master-planned employment districts in Area 48.

DKS *Associates*
TRANSPORTATION SOLUTIONS

EXHIBIT E

MEMORANDUM

DATE: October 29, 2007

TO: Gene Thomas, City of Sherwood
Julia Hajduk, City of Sherwood

FROM: Chris Maciejewski, P.E.
Garth Appanaitis

SUBJECT: **Pfeifer Rezone Traffic Impact Study Review #2** P007233-001-000

Per your request of September 6, 2007, we have reviewed the traffic impact study material submitted for the proposed zone change for the Pfeifer property located at 21305 SW Pacific Highway. The reviewed material includes the original submission from July 2007, as well as addendums dated September 28, 2007 and October 19, 2007 that were in response to comments and request for additional information dated September 13, 2007. This review focused on determining if the City of Sherwood and OAR 660-012-0060 requirements were met.

Existing Conditions Data

Traffic counts were conducted for the PM peak hour during a weekday in June 2007. These counts were adjusted along Highway 99W to account for seasonal variations, which is required by ODOT. The study area description includes discussion of study roadway characteristics, including posted speed, number of lanes, the presence of bicycle lanes and sidewalks, and transit services. The functional class listed for each roadway on page 6 of the original submittal was updated, as requested, in the addendum dated September 28, 2007 to be based on the City's current Transportation System Plan.

Trip Generation Analysis

The traffic study includes estimation of the reasonable worst-case build out under existing and proposed zoning. The trip generation for existing zoning was updated in the September 28, 2007 addendum to include 46 single-family units (rather than 63 units) to be consistent with the existing zoning (MDRL).

The proposed zoning (RC) was estimated to have a reasonable worst-case build out of an 11 KSF (thousand square feet) Medical Office Building, a 77 KSF Shopping Center, and a 4.5 KSF

1400 SW Fifth Avenue
Suite 500
Portland, OR 97201

(503) 243-3500
((503) 243-1934 fax
www.dksassociates.com

Drive-in Bank. These retail uses are relatively high trip generators and are reasonable choices for a worst-case analysis. The amount of development equates to a floor-area-ratio (FAR) of 0.37. Typical retail developments in suburban areas have FARs ranging from 0.25 to 0.35. Therefore, the type of land use and the amount of land use utilized for this analysis are a reasonable worst-case.

Trip Distribution Analysis

The trip distribution estimates for the traffic impact analysis were based on study area traffic patterns. To confirm these patterns, we compared this distribution to select zone information created with Metro's 2030 Travel Demand Model (refined for the I-5 to 99W Connector Study Baseline Analysis). This comparison found the trip distribution utilized in the traffic impact study to be reasonable, with differences generally making the analysis conservative with higher trip distribution to Sunset Boulevard and Sherwood Boulevard.

Background Traffic Growth Estimates

The traffic impact analysis forecasts growth out 15 years, which goes slightly beyond the horizon year of the current City of Sherwood TSP (2020) to satisfy the 1999 Oregon Highway Plan requirement for land use regulation amendments to demonstrate adequate highway operations can be provided through the adopted local planning horizon or 15 years from the proposed date of the amendment, whichever is greater. The I-5 to 99W Connector Study Baseline Report was utilized, as requested, to develop 15-year background traffic growth estimates for individual study intersection approaches based on the 2005 and 2030 volume levels provided in the report. These growth rates were applied to existing 2007 counts to determine the background 2022 traffic levels.

Background Committed Roadway Improvement Projects

The traffic analysis for the proposed rezone assumes that all projects listed in the 2020 City of Sherwood TSP Table 8-11 were assumed to be funded and constructed by the year. However, the City of Sherwood TSP does not identify funding sources for transportation improvements (it was adopted before this was a requirement of the Transportation Planning Rule). Therefore, some of the TSP projects may not be reasonable to assume for this rezone analysis. Other sources such as the City of Sherwood CIP, Washington County CIP, ODOT STIP, or Metro RTP Financially Committed Scenario should be referenced to determine which projects are reasonable to assume.

Intersection Capacity Analysis

The intersection capacity analysis utilized 2000 Highway Capacity Manual Methodology, which is the appropriate analysis tool for this study. The analysis included scenarios for existing conditions, year 2022 with current zoning, and year 2022 with the proposed zoning. Where capacity deficiencies were identified, mitigation measures were proposed to either improve the conditions to operations standards or mitigate impact of the proposed rezone to be better than future background conditions.

Revised capacity analyses were included to address requests from the memorandum dated September 19, 2007. The updated analysis included refined traffic growth forecasts and incorporation of ODOT signal timing data for the study intersections along Highway 99W. The refined analysis impacted the results and findings. However, review of the capacity analysis identified several potential issues at intersections along Highway 99W that may need to be addressed for ODOT approval, including:

- ODOT signal timing parameters are included in the appendix and generally appear to be used in the analysis, including updates to cycle lengths and intersection phasing. However, the Synchro files indicate some inconsistency with the timing parameters such as lead/lag phasing, recall settings, and interval lengths.
- The proposed mitigation at Elwert Road/Highway 99W includes adding a left turn lane to Sunset Boulevard so that the approach has an exclusive left, shared left-through, and exclusive right turn lane. The analysis indicates that permitted left turn phasing would utilized, though with this configuration a split phase would be needed and may impact the results. The signal phasing at this location would need to be reviewed and accepted by ODOT staff.
- The proposed mitigation at Edy Road/Highway 99W includes adding a second left turn lane to the Sherwood Boulevard approach as well as implementing protected phasing. However, the Synchro analysis indicates that permitted-protected left turn phasing was utilized. This phasing is not consistent with ODOT practice for this lane configuration. The signal phasing at this location would need to be reviewed and accepted by ODOT staff.
- What is the effect of queuing on Edy Road if the proposed signal at Borchers Drive is assumed as a funded project?

Queuing Analysis

Queuing results from SimTraffic (averaged from 10 runs of the peak 15-minute period) were provided in the September 28, 2007 addendum. However, no findings or recommendations were included regarding locations where queue lengths exceed existing storage (or storage from financially committed improvements). Rather, the applicant stated that:

> "The queuing for the study intersections is not a reliable piece of information for the change in zoning, since it is based on a 15-year traffic forecast. The uncertainty of the future traffic volumes does not provide a good basis for determining the queue lengths at the study intersections. The information presented in the original report was provided for estimation purposes only."

We do not agree with this statement, as future year queuing analysis is a commonly used tool for transportation analysis and roadway improvement design. The traffic forecast information is a best estimate of future conditions. As the applicant does not oppose the use of the future volume information for capacity analysis, it seems their position on queuing analysis unfounded.

In addition, the addendum dated October 19, 2007 included updated intersection analysis based on adjusted traffic growth and utilization of ODOT signal timing information, there was no update to the queuing results provided September 28, 2007. Therefore, there are several deficiencies to the queuing analysis that need to be addressed for both ODOT and City approval of the analysis, including:

- Provide SimTraffic queuing information for the updated analysis.
- Identify where queuing deficiencies will be created by the proposed rezone (similar to the capacity analysis). Queuing deficiencies include queues that exceed storage pockets for turn lanes, or queues that back up into upstream signalized or roundabout controlled intersections.
- Propose mitigation measures to address queuing deficiencies.

Study Conclusions

The traffic impact study concludes that the proposed mitigation measures are adequate to mitigate the impacts of the proposed rezone. The mitigation measures listed in the October 19, 2007 addendum to the report include:

- Add a left turn lane to the Sunset Boulevard approach at Highway 99W/Elwert Road
- Add a left turn lane to the Sherwood Boulevard approach at Highway 99W/Edy Road and implement protected phasing.
- Add a southbound right turn lane on Highway 99W at Highway 99W/Tualatin Sherwood Road
- Add an eastbound right turn lane on Roy Rogers Road at Roy Rogers Road/Borchers Drive.

The following mitigation measures were not listed in the report but may be needed:

- A southbound right turn lane on Highway 99W at the site access was assumed in the capacity analysis but was not indicated in the list of improvements. This improvement may not be feasible due to the lane drop on Highway 99W in the access vicinity.
- Additional or revised mitigation may be required based on updating the analysis to address the items mentioned in the Capacity Analysis and Queuing Analysis section.

Therefore, the current materials submitted by the applicant are not adequate to verify compliance with OAR 660-012-0060. At this time, the proposed rezone is not recommended for approval.

If you have any questions, please feel free to call me.

Sherwood Planning Commission Meeting

Date: 11-13-07

- [x] Meeting Packet
- [x] Approved Minutes   Date Approved: ____________
- [ ] Request to Speak Forms

Documents submitted at meeting:

- Comments re: traffic noise impacts to Driftwood Mobile Home Park

Oregon
John A. Kitzhaber, M.D., Governor

Department of Transportation
Region 1
123 NW Flanders
Portland, OR 97209-4037
(503) 731-8200
FAX (503) 731-8259

6 November 1998

FILE CODE:

Paul Ripley
Driftwood Mobile Home Park
21305 Pacific Highway West (99W)
Sherwood, Oregon 97140

Subject: Traffic Noise Impacts to Driftwood Mobile Home Park

Dear Mr. Ripley,

Governor Kitzhaber asked me to respond to your recent contact with his office. I believe you had some initial discussions with Richard Beck in our Region 1 office on this subject. He is currently out on medical leave so I am not aware of what information he may have provided you. Therefore, I have personally researched the matter and can give you the following background and the actions to be taken.

The highway improvement that you referred to in your letter was the modification of the Six Corners intersection complex that was a part of an overall improvement to the Tualatin to Sherwood/Edy Road corridor. An Environmental Impact Statement (EIS) was prepared with the final document issued in June of 1990. I reviewed the acoustical analysis that was conducted for this document and found that it did not anticipate that project improvements would extend as far south on 99W as actually occurred. Therefore your mobile home park was not studied.

I visited your park after reviewing the "as built" construction plans for the Six Corners project. The plans show that the road was indeed elevated in front of the park but only about six inches. My guess is that the project's reestablishment of the highway shoulders and ditch gave the impression that the elevation change was considerably greater. This possibility seemed apparent from my field visit. I also talked to the construction project manager for the improvement and he confirmed my findings that the actual elevation of traffic was only six to eight inches. I then asked our acoustical engineer, Dave Goodwin, to visit your park (I believe you met him while he was out there). His professional opinion was that a six-inch elevation change would not cause a perceptible increase in noise impacts.

Despite the above conclusion, Dave and I both felt that a formal noise evaluation needs to be conducted for the mobile home park since it was not included in the initial study for the EIS. ODOT will perform this evaluation during the next two months. I will get back to you with the results.

In your letter to the Governor, you did not include your address or your phone number. I would appreciate you contacting me at 731-8235 so that I can get that information in case we need to get in touch with you during the noise study. I am hoping that the above general address for the mobile home park will get this letter to you.

Sincerely,

Jef Kaiser, Environmental /Major Projects Unit Manager

cc:
Dave Goodwin
Jane Rice
Cheryl Taylor

Oregon

INTEROFFICE MEMO

DATE: November 24, 1998

TO: Jef Kaiser, Major Projects Manager

FROM: David Goodwin, Senior Acoustical Specialist
Environmental Services

File Code: ENV 3

SUBJECT: Review of the noise complaint at the Driftwood Mobile Home Park
Tualatin/Sherwood Edy Road Project
Washington County

As the result of a noise complaint from the manager of the subject mobile home park, you asked me to review the file for this project. The purpose of that review was to determine if the park had been analyzed for noise impacts during the original noise study, and to determine if noise mitigation that is both reasonable and feasible could be built there.

A review of the Environmental Impact Statement determined that the park had not been studied for noise conditions because the original project did not include the area of the mobile home park. Having determined that, you asked me to determine if the park was noise impacted and to see if a noise barrier would be effective in eliminating that impact.

The first step in this process involved taking noise measurements at this location to determine if the homes are noise impacted with the existing wall in place. Noise measurements were made on or about November 4, 1998 which indicate traffic noise levels of Leq 66 dBA. These measurements verify that the first row of homes are noise impacted. The noise condition was then modeled, with the existing wall in place, using the traffic numbers present at the time of the noise measurement. The modeled noise level agreed within 1 decibel of the measured noise level. This close agreement verifies the accuracy of the traffic noise model at this location.

This site was then modeled with both a 10-foot and a 12-foot high noise wall located at the existing 6 foot high wall site. The 10 foot high wall did not provide adequate noise reduction and was dropped from further consideration. Reductions in noise with the 12-foot high wall ranged from 2-7 decibels. The lowest noise reductions are due to flanking noise coming around the end of the wall at the driveway locations and at the north and south end of the wall. The site was again modeled with the same 12-foot height but with 15-foot long wings at all wall ends. The wall design with wings resulted in noise reductions of 4-8 decibels with a minimum average reduction of at least 5 decibels. The homes with the lowest reductions were at the end of the walls.

This noise wall would consist of 3 segments, with a total wall length for all segments and wing walls of 525 feet. If a cost per square foot of $16.00 is assumed, the estimated cost of a replacement noise wall at this location is $101,000. Added to this figure would be the cost to do a location survey, any additional work by us and the Bridge Section's cost for final design. Our cost would be approximately $7,500.

In one of our field trips to the site, we noted the presence of over head high-tension power lines close to the location of this wall. You also mentioned you were aware of buried utilities at this location. The presence of the power lines and utilities could complicate the construction of this wall. The presence of these utilities could result in expensive utility relocation and/or a recommendation to construct a masonry block wall. Either of these factors could increase the cost of this wall. The utility question will need to be further addressed in the final design process.

If you have further questions or if we can be of additional assistance please contact me at (503) 986-3488.

Oregon
John A. Kitzhaber, M.D., Governor

Department of Transportation
Region 1
123 NW Flanders
Portland, OR 97209-4037
(503) 731-8200
FAX (503) 731-8259

1 December, 1998

FILE CODE:

Memo to: Kay Van Sickel, Region 1 Manager

From: Jef Kaiser, E/MP Unit Manager

Subject: Driftwood Mobile Home Park Noise Wall

The purpose of this memo is to request your approval to fund the subject noise wall at a cost of approximately $101,000 plus engineering.

To give you some background, in October of 98, the Director's Office referred a complaint from the mobile home park's manager to Region 1 for a direct response on behalf of the Governor. Our investigation revealed that the park had been affected by the 1993-4 Tualatin/Sherwood/Edy Road Project improvement of the Six-Corners Intersection on 99W. An EIS and noise study had been conducted for this project however due to the project limits being expanded during construction, the park was never included in the analysis.

I asked our acoustical engineer, Dave Goodwin, to do a preliminary evaluation to determine whether a noise wall would be effective. His conclusion was that a 12-foot high wall with 15-foot wings at its ends would result in an average reduction of at least 5 dBA which meets ODOT's criteria for acoustical effectiveness. Assuming a total cost of $130,000, this would result in an investment of $26,000 per affected residential unit which is considered to be cost-effective.

Since it was due to ODOT error that the park was omitted from the original evaluation and construction effort, I recommend approval of this wall and funding it for construction in 1999 if possible.

I have attached related correspondence for your use in considering this request.

FUNDING FOR WALL APPROVED: Kay Van Sickel
Kay Van Sickel, Region 1 Manager

Attachments (3)
Cc:
Dave Goodwin
Dave Williams
Tamira Clark

Form 734-1850 (1/98)

Oregon

INTEROFFICE

MEMO

3 December, 1998

Memo to: Walt Bartel, Project Delivery Manager
Tamira Clark, Program and Funding Services Manager
Dave Goodwin, Senior Acoustical Engineer

From: Jef Kaiser, E/MP Unit Manager

Subject: Driftwood Mobile Home Park Noise Wall

Kay Van Sickel has approved the construction of the subject noise wall as is documented in the attachments. The Region's objective is to try to ready this project for construction in 1999. In order to achieve this, I need your help.

Walt - Please assign a PDT to manage the design and construction activities for this project. Dave Goodwin and I can provide all of the background to get this person started.

Tamira - Please initiate the programming process for this work and determine when the funds would be available for construction. An account will need to be set up to support project development activities.

Dave – Please perform the necessary analysis to guide the design effort.

Thank you all. If I have left someone or something out that I should be requesting, please let me know. I will wait to hear from each of you before I write to the mobile home park manager and let him know that a wall is coming.

Cc: Ron Kroop
Cheryl Taylor

KAISER Geoffrey W * Jef

To: SELLERS Berri L; BARTEL Walter G; SIMPSON David R * Dave; CLARK Tamira J; GOODWIN David A
Cc: VAN SICKEL Kay
Subject: Driftwood Mobile Home Court Noise Wall, City of Sherwood

In October of 98, the Governor's Office asked us to respond to a noise complaint by the Manager of this Mobile Home Ct. (MHC), Paul Ripley. Mr. Ripley represented himself as speaking for the owner and the park's residents. Our investigation revealed that ODOT had erred in not including the MHC in the mitigation plan for the expanded Six-Corners Project. We then performed a noise study and determined that a 12-foot-high wall at a cost of $130k was effective and appropriate. Region Manager, Kay Van Sickel, subsequently approved the funding for the wall's construction in 1999. Cheryl Taylor of the Director's office contacted Mr. Ripley and received his concurrence in going ahead with the wall's construction. The project was assigned to Bob VanVickel for development and construction management. Bob was to develop a conceptual design then contact the MHC owner for wall acceptance. Approximately 2 months ago I received a call from Mr. Don Pfeifer who identified himself as the owner. Mr. Pfeifer wanted more information about the wall before making a decision to accept it. Today, I received another call from Mr. Pfeifer. Because of the wall's height, he has decided not to support its construction. By this memo, I am documenting the decision not to move ahead with the construction of this noise wall. I am mailing a copy of this message to Mr. Pfeiffer who will in turn inform Mr. Ripley of his decision. This project is withdrawn.

APPROVED
MINUTES

City of Sherwood, Oregon
Planning Commission Minutes
November 13, 2007

Commission Members Present:
Chair Patrick Allen
Jean Lafayette
Dan Balza
Adrian Emery
Lisa Walker
Matt Nolan
Todd Skelton

Staff:
Julia Hajduk, Planning Manager
Stephanie Guediri, Recording Secretary

Commission Members Absent:
None

Council Liaison – None Present

City Attorney – Chris Crean

1. **Call to Order/Roll Call** – Stephanie Guediri called roll. Todd Skelton was initially marked absent but subsequently arrived at 7:04 PM.

2. **Agenda Review** - Chair Allen announced that the Commission would be hearing the Former Driftwood Mobile Home Park Amendment but not the Oregon Street Industrial Park as it will be continued until a date certain. Chair Allen added that the Commission will vote on the Vice-Chair elections tonight. There were no changes to the agenda.

3. **Consent Agenda** – Minutes from the September 25th, 2007 session was approved by vote:
Yes – 5 No – 0 Abstain - 1

4. **Announcements** – Julia Hajduk announced that the Commission will need to bring the eco-friendly mail bags with them to every meeting. Julia updated the Brookman Road Steering Committee meeting which was changed to December 12th, 2007, due to the consultant's schedule. The open house on October 10th, 2007, was very successful with over seventy (70) attendants, including Jean Lafayette. Julia added that Heather Austin has returned to work and an Assistant Planner will be starting this Monday. In addition, Julia has advertised for a part-time Administrative position that will help more with the work that Planning wants to do. She reminded the Commission that there are training opportunities available to them through Oregon APA which will be the second Friday of every month from October to June at 10:00 AM. The Langer PUD modification is going back to the City Council on December 4th and the Snyder Park Lights project was appealed to LUBA but was subsequently withdrawn and this decision is now final. Chair Allen asked if there were any questions. There were none.

5. **Community Comments** – Chair Allen asked if there were any community comments on topics not on the agenda. There were none.

6. **New Business – Public Hearing – PA 07-01; Former Driftwood Mobile Home Park:** Chair Allen read the state mandated rules from a new script for the public hearing process.

He then asked Commissioners if there was any experté contact, conflicts of interest or bias to declare.

Dan Balza stated that he viewed the site by driving by. No members of the audience questioned a Commissioner's ability to participate.

Chair Allen opened the hearing at 7:10 PM.

Julia Hajduk, Planning Manager, explained that the request was for a zone change from Medium Density Residential Low to Retail Commercial. This site has been vacated for almost a year. Staff reviewed the plans, it appears that the zoning was applied primarily because the Mobile Home Park was there. She added that the zoning around the site include High Density Residential to the north, General Commercial to the southwest and Retail Commercial to the northeast as well as abutting Pacific Highway. Planning reviewed the Development Code and the Comprehensive Plan and find that the functional plan criteria were met according to METRO. The main issue was the Transportation Planning Rule. There are comments from ODOT and Chris Maciejewski from DKS that raise concerns and recommendations that the project should be denied unless a condition could be in place that limits them to the worse-case trips under the current zoning. Staff prepared a recommended Condition of Approval which allows future development to do improvements that would generally be required to comply with the Transportation Planning Rule.

Jean Lafayette requested clarification on the trips and the mitigation. Julia explained that anytime there is a zoning change, you must show compliance with the Transportation System Plan (TSP) and if you are making any intersection or road capacity worse than it currently is, you have to fix it or amend the TSP so there is a funding mechanism to fix it. The Transportation Planning Rule requires a twenty year worst-case scenario based on the zoning that's proposed. The worse case scenario causes those intersections to fail and therefore doesn't comply with the Transportation Planning Rule. ODOT and DKS felt that the applicant could have transportation planning rule compliance if they were capped on the number of trips that they could develop under. Staff recommended conditions that did that. We received ODOT comments today that show that they still have concerns about the condition. ODOT wants it to be a condition of approval and doesn't like the idea of it being recorded, but for us, it's essential that it's recorded so that it doesn't require institutional knowledge over time that this is a condition. Julia added that staff recommended that it's capped until a developer wants to do intersection and road capacity improvements in order to get more trips. This is acceptable to us but ODOT recommends that to go over the number of trips, a developer must go through a zone change process. If the Planning Commission concurs in concept with the recommendation of approval, we will coordinate with ODOT to get the details of a condition that caps the trips but also makes logical sense.

Julia handed out copies of Exhibit F to all Commissioners which consisted of ODOT's comments.

Chris Crean, City Attorney, referred to page nine (9) of the staff report which recommends that the Commission recommend approval of this to the City Council. He read from the staff report that ODOT was wary that the city was going to try to rely on a recorded covenant to enforce this land use decision. This is not the case. The city is having land use decisions recorded so subsequent purchasers know what restrictions are placed on the property, hence the recorded land use decision. Chris recommends that the Commission split the condition of approval to state that one contains the substance of what's there and by the way, the applicant has to record this. It also goes on to say that the trips shall be capped at 480 trips per day which is consistent with the request that was received from ODOT that the city either deny the application or cap the trips at the current maximum worse case scenario if it remains residential. Chris went on to point out that the conditions of approval limits the site to 480 trips per day unless transportation upgrades are installed that would increase capacity along 99W. Therefore, the trip cap is going to stay in place unless amendments are adopted in to the city's comprehensive plan redesignating things at which point the transportation planning rule would have to be complied with or improvements are made to 99W to increase capacity. ODOT's email indicates that they like the 480 trips per day but adds that if development exceeds 480 trips per day, this will require a zone change and plan amendment. ODOT doesn't state what type of zone change. If this application is approved, it will be rezoned to retail commercial. Chris thinks their concern is that they would not get notice of subsequent development on the site that could generate additional trips and degrade the facility.

Chair Allen presumes that ODOT would be aware of someone increasing capacity on their highway.

Chris states he doesn't think ODOT understands the notice provisions in the city code that would require that they receive notice of any development application on the property. This application is a rezone, not a development application of which ODOT would have adequate notice so they could participate in the process. The development application would be subject to the 480 trip cap unless they built new capacity on 99W. Julia allayed ODOT's concerns.

Julia added that she received the ODOT email at 4:00 that afternoon and didn't have an opportunity for legal staff to talk to each other. She went on to state that she received a written comment as well and would like to enter this in to the record as Exhibit G from Margaret Smith. Ms. Smith thinks the rezone will affect her view. Also, Ms. Smith wants the trees maintained between the properties and no road access through Madeira development to access the commercial property. Julia received another written comment and entered it in to the record as Exhibit H from Joe Broadhurst which explained that current commercial landowners know that there is plenty of commercial land available with Langer's 52 additional acres in town. The application is premature as there is no use proposed, just an increase in property value for applicant and a decrease for current landowners. He requests that the written record remain open for more concerns.

Chair Allen then asked that in the Economic Opportunity Analysis, on the table in the second page of Exhibit D, if the Langer property was inventoried as commercial. Julia replied that it was inventoried as Light Industrial. She added that nothing is decided on that and there are no land use proposals in front of Planning other than the PUD modification.

Jean Lafayette pointed out that the transportation considered that property commercial but Julia is stating that for this, it was considered light industrial. She requested clarification that it was treated differently in two parts.

Julia declined to talk about the Langer project at this hearing. She added that Tom Pessemier, City Engineer, testified that the Transportation System Plan looked at Adams' impact and did analysis on that being partially commercial for Langer.

Chair Allen asked about the size of the Langer property. Julia responded that it was 57 acres and all of it is potentially developable as commercial.

Chris Crean disagreed, stating that a substantial portion of phase 8 will be dedicated as wetlands.

Chair Allen is concerned that the criteria he has that there be a demonstrable need if we have a large block of land that wasn't assessed properly, this can impact the needs/circumstances.

Julia countered that it's close for moderate growth scenarios but for high growth, there is a large commercial demand in the long-term but confirmed the moderate growth was adopted as the preferred alternative.

Chair Allen stated that 27 acres is what the opportunity analysis states is the demand.

Jean Lafayette added that ODOT called out that the site cannot be used for commercial signs, should that not be in the condition?

Julia responded that it could be and her assumption was that this was entered as a fact/comment. She can certainly point that out as a condition. She added that this was in the outdoor/advertising signs comments and this was taken more as a heads up for the applicant and that this would be applied to any development application coming in.

Todd Skelton asked Chris that unless improvements were installed, the condition just states that "installed, funded or included" in the City's capital improvement plan. He is concerned that just because it's in the plan, this won't guarantee that it will happen.

Julia responded that there has to be a funding mechanism in place. Chris added that this becomes a concurrency issue and Sherwood doesn't have a requirement that a facility has to be built before you can approve development.

Chair Allen requested clarification that the Capital Improvement Plan is a funded plan over a period of time. Chris concurred.

Jean Lafayette asked how long does the plan look out for and Julia responded that it was a twenty year plan and any given development proposal must conduct a traffic analysis and make sure they are doing improvements.

Chair Allen disagreed. He doesn't believe that the CIP runs the same time frame as the TSP. Julia and Chris do not have details on this but will get an answer.

Jean Lafayette asked how 480 trips are calculated and Julia replied that there are 10 trips per unit and this zone has a maximum of 48 dwelling units. Jean Lafayette stated the applicant quoted 440 trips but Julia will confirm this number.

Chair Allen asked Commissioners if there were any additional questions of staff at this time prior to receiving the applicant testimony. There were none.

Ed Sullivan, Office Address at 121 SW Morrissey, Portland, OR, Representing Applicant, Don Pfeiffer. Mr. Sullivan asked Mr. Pfeiffer to speak first.

Don Pfeiffer, 2011 NE 164th Place, Portland, OR, 97230, owner of Driftwood Mobile Home Park. Mr. Pfeiffer gave a brief history of the proposal including the facts that in 1964, 41 spaces were built, in 1989, 15 spaces were added for a total of 56 spaces when the park was closed. To add the 15 spaces, the City asked him to change the zoning from High Density Residential to Medium Density Residential. In 2005, the park closed due to obsolescence. Mr. Pfeiffer submitted correspondence from ODOT and the Governor's office to show noise from Hwy 99W and nearby developments which made renting spaces difficult for five years. ODOT offered an alternative of a 12-foot high noise abatement wall with end wings. Mr. Pfeiffer states that this was an unattractive solution. He added that when he closed the park, he compensated some of the tenants in moving costs. He also paid for all of the demolition costs if the home could not be moved which saved the City of Sherwood embarrassment. The property is not suitable for housing due to noise, traffic and commercial uses, such as GI Joe's. The only reason the park is designated residential was because of the mobile home park. Mr. Pfeiffer is concerned about the condition that prior to zone change becoming final, it's a conflict to impose the 480 trips per day limitation if the property is to be rezoned commercially. A Medium Density Residential recorded condition would create an encumbrance on the property affecting its value and redevelopment potential. He suggests that the City and ODOT readdress these conditions when a redevelopment plan is submitted. He understands some conditions are required for zone changes.

Chair Allen asked if Sherwood needs the additional acreage of commercial land and Mr. Pfeiffer could not demonstrate the need for the land.

Ed Sullivan stated he relied on the Economic Opportunities Analysis and the three scenarios contained within and the Langer property. He thinks that with the actual development of the Langer properties, even with the storm drainage area, it would still leave enough land for commercial. He understands that we have to deal with the need for commercial but the Economic Opportunities Analysis provides the basis for the change.

Chair Allen asked if he knew the acreage breakdown of what would be developable as commercial in the Langer development and Mr. Sullivan responded no, but his understanding is that a large segment of it will be storm water improvements. Chair Allen added that anything south of thirty acres of storm water development would take up half.

Mr. Sullivan noted that since someone already asked for the record to be held open, he will look in to the matter further.

Jean Lafayette questioned Mr. Pfeiffer about when the City requested him to go from high density residential to medium density residential and he replied 1989 because he was putting in fifteen more spaces. She doesn't understand why it would go backwards and he said it was due to the double wide standards.

Todd Mobley, Lancaster Engineering, 321 SW 4th, Suite 400, Portland, OR 97204. Mr. Mobley stated he conducted the traffic impact study and coordinated with city staff and ODOT. He encountered a constrained transportation system in the twenty year analysis with a lot of congestion and a difficulty to accommodate increased traffic associated with worst-case commercial development. He ended up with a condition to limit the use on the site to what the existing zone would allow and that limitation negates any impact that could be associated with increased traffic on the site. The 480 trips was a result of our traffic study and we should rely on the development potential that could be realized with the existing zoning designation. The intent of this is to have the site generate no more trips than would be allowed under the existing zone. He hesitates to put too much stock in the 480 trips, it shouldn't generate any more trips than what should be allowed.

Chair Allen clarified that he is arguing that the condition should not be tied to a number but to what would be allowed by the zoning and Mr. Mobley concurred. Mr. Mobley added that the intent is what could be generated under the commercial zone doesn't exceed what you can do under the existing zone. He states the 480 trips is an assumed accuracy that may not be exactly correct.

Ed Sullivan added that the Transportation Planning Rule is not based on numbers but an increase over the existing allowed use. There can be other uses in the underlying residential zone and the notion is not to increase the impact but keep the existing traffic capacity and when more is necessary, you deal with that by conditioning approval of increased intensity with facilities to take care of the impact.

Chair Allen asked for an example of this and Mr. Sullivan replied a church in a residential zone is a conditional use.

Jean Lafayette asked about the condition and how it's worded. It says, "installed, funded or included in the capital improvement plan." We have other applications so how does this work if a turn lane is added, do you get credit for increasing the capacity? Mr. Sullivan responded yes but on-site mitigation doesn't count so if you do something and add the right of way, it doesn't count. But it will count if there is an increased capacity to the city. The rollback for the systems development charges is used to fund the capital improvement program which is five to ten years rather than the full twenty. The money goes in as the building permits are applied for and that fund is used to increase capacity city-wide and the capital improvement plan makes a difference in where the city chooses to make those improvements.

Jean Lafayette tried to think of an example such as a U-turn lane in someone else's mitigation, due to the CAP ordinance there was a huge agreement between ODOT and the existing property owners that 43 trips per acre would be allowed for commercial and everyone else would be excluded such as IP and Residential. You're saying that commercial will take the 43 trips? No, replied Mr. Sullivan who added that the capacity has to be on-line and we don't get to build at all over and above the trip capacity of the 46 units, or 480 trips, until somebody increases the capacity. We could do that ourselves or wait for the Capital Improvement Program to kick in or for ODOT to make changes.

Chair Allen clarified that had this been zoned commercially in the first place, it wouldn't be entitled to more than 250 trips (peak PM) give or take based on the 43 trips per acre. Mr.

Sullivan states that the 480 is per day. He added that they would have gotten a lot more had it been zoned commercial.

Commissioner Lafayette restated that with ODOT's calculations from years ago, there was a huge agreement at that time and CAP had two things come out of it: a limitation of 43 trips and mitigation that had to occur. So if someone increases capacity for their development, how do you get the benefit?

Mr. Sullivan replied only if the overall capacity to accommodate their development and ours.

Jean Lafayette gave the example of Home Depot going in on 99W and the capacity will increase. Their mitigation measures say that because they are putting Wendy's in the middle of Home Depot's parking lot, this will increase traffic so they'll have to do mitigation. They add a turn-lane to increase capacity and increase trips so if there net is zero, do you benefit from that?

No, replied Mr. Sullivan as there would have to be an increase in capacity that would accommodate our needs. The problem is mitigation comes in big chunks, not 10 trips worth of mitigation. He added that proportional share agreements could be set up ahead of time so each development pays a portion. He added that the SDC charges get put in a fund and the capital improvement fund directs where the money goes. No increased burden on the city's system is the end result. That's what these conditions are about, how to word it. Oregon's position is that you don't get the use until you have the capacity.

Mr. Sullivan wrapped up his comments by stating that Sherwood is a destination for travel but Highway 99W are not sufficiently improved to handle the traffic generated by the existing plus potential new uses. The city's strategy uses different monies to handle this. The transportation planning rule states that you don't get anything that will affect a transportation facility unless you have the improvements in place or limit the use. He continued to discuss SDC funding and the limitations of the transportation generation of a commercial use on the site until adequate facilities are provided. Granting our request will have no adverse transportation impacts on the situation and gives us the opportunity to deal with public agencies to secure the necessary improvements. The redesignation is appropriate from a Planning point of view but not a transportation point of view. He asked for the Planning Commission to recommend approval with the condition.

Chair Allen opened the hearing to public testimony, beginning with proponents of the application. There were none.

He then opened the hearing to opponents. Robert James Claus had filled out a blue card but declined to comment.

Susan Claus, 2224 SW Pacific Highway, Sherwood, OR 97140. (tape stopped, transcription is from staff recollection) Ms. Claus indicated that this shouldn't have limits. She requested that the Commission either approve it or not. She also raised concern about the CAP.

Julia stated that November 27th will be the next Planning Commission meeting. If you want to have an opportunity to compile and review, she recommends continuing it until the December 11th meeting.

Chair Allen is interested to see revised staff comments or applicant comments on how to deal with the Economic Opportunities Analysis and the fact that it didn't deal with the potential use of a substantial portion of the Langer property as commercial. Chair Allen also needs a clarification on the time horizon on the Capital Improvement Plan.

Lisa Walker requested information on the Langer property, possibly some meeting minutes and CAP discussions.

Jean Lafayette moved that the Planning Commission continue the public hearing on the former Driftwood Mobile Home Park Plan Amendment (PA07-01) to December 11th and that the written record remain open for seven days until November 20th, and the applicant's response remain open until the close of the business day on November 27th.

Lisa Walker seconded.

Vote was taken:
Yes - 7 No - 0 Abstain - 0

Motion carried.

Chair Allen called the public hearing of Oregon Street Industrial Park Site Plan (SP 07-08) to order and that this item will be abbreviated due to the mutual request of staff and the applicant to continue. Chair Allen reread the state mandated rules from a new script for the public hearing process. No Commissioner disclosed any ex parte, bias or conflict of interest. Jean Lafayette indicated that she attended public meetings with DEQ but Chris Crean confirmed that it was procedural and there was no need for her to recuse herself.

Jean Lafayette moved that the Planning Commission continue Oregon Street Industrial Park Site Plan (SP 07-08) to November 27th.

Seconded (Commissioner who seconded was inaudible on tape).

Vote was taken:
Yes - 7 No - 0 Abstain - 0

Planning Commission vice-chair nominations and elections were conducted.

Dan Balza nominated Jean Lafayette. Lisa Walker seconded. Jean Lafayette accepted the nomination.

Vote was taken:
Yes - 6 No - 0 Abstain - 1 (Jean Lafayette)

Chair Allen confirmed that the next meeting will be November 27th.

7. Comments by Commission - Regarding upcoming Commission agenda items, Julia updated the Planning Commission that Heather will start working on the commercial industrial standards and will look forward to a work session on that. Julia added that Old Town fees are approximately $5,000.00 for any site plan review even if it's just a use change. Julia wants to look at if it's possible to change fees and/or the process for certain types of applications. There may be code amendments involved. Julia would also like some work sessions in the future about reviewing the notice process and requirements to make it more inclusive.

Chair Allen wants to schedule preparation for the Council SWOT (strength, weakness, opportunities, and threats) and goal setting.

Lisa Walker wants to advertise in the newspaper about the process for notification and a bit about the Planning Commission and Julia confirmed that staff is trying to be responsive to suggestions.

8. Next Meeting - November 27th, 2007: SP 07-08; Oregon Street Industrial Park Site Plan.

9. Adjournment – Chair Allen adjourned the session at 8:43 PM.

End of Minutes.