Talley Way Corridor Transportation Study

Prepared for:

City of Kelso, WA

Adopted by the City of Kelso City Council
July 21, 2009

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June 23, 2009

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PROJECT SUMMARY

The intent of this document is to guide the City of Kelso in planning, designing, and constructing multi-modal transportation improvements in the Talley Way corridor area. This document looks at the following items and provides overall review and guidance:

- Traffic Data: Review the available traffic data and provide a recommendation for lane configuration.
- Access Management: Provide guidance for implementing the City's access management plan.
- Roadway Typical Section: Review a typical section consistent with a minor arterial roadway section.
- Bridge Assessment: Review the existing bridge and examine replacement or widening of the structure.
- Stormwater Management: Determine the necessary steps to develop a stormwater management plan.
- Budgets: Develop project budget and schedules for corridor improvements.
- Funding Strategies: Develop funding strategies for corridor improvements.

As the roadway improvements occur along this corridor, the implementation strategies developed in this document will need to be revised and updated to accurately reflect the current situation. These strategies and guidelines are not static. The assumptions and guidelines will need to be revised and updated accordingly as the corridor develops or if this project is developed in multiple phases. In other words this document cannot be considered the final solution or answer given the revolving nature of project needs including: funding requirements, environmental changes, property development along the corridor, and other unforeseen items.

1 PROJECT DESCRIPTION

The Talley Way corridor runs through an industrial area located south of the city center and accesses I-5 via the SR432 Talley Way interchange. The corridor is currently a two lane section with typically no curb and some ditch sections along the roadway. There are currently no signalized intersections and the side streets are stop controlled.

The City of Kelso anticipates growth in this area and increased traffic volumes predominantly from new development near the new SR-432/I-5/Talley Way interchange. This document reviews the existing conditions, proposed development(s), and future plans for the area and provides documentation on the steps to improve the Talley Way corridor.

2 SUMMARY OF FINDINGS

The following summarizes the recommendation or findings in a bullet point format. The complete text and discussion can be found in the appendices following this section.

2.1 TRAFFIC ANALYSIS

- Given the estimated volumes, a three-lane roadway section should provide for adequate operations through year 2030 throughout the study corridor.
- The potential development south of the interchange will have operational impacts to the ramp terminal intersection with Talley Way and will be addressed with a proposed interchange improvement project.
- A signal would not be warranted at the intersection of Colorado Street and 13th Avenue for any of the analyzed scenarios.

2.2 ROADWAY CONCEPTS

- Further study of potential roadway alignments will be needed when the impact from the airport expansion is known and the SR 432 interchange is built.
- A ditch section accommodates the industrial nature of this corridor and provides a cost effective solution for storm runoff and water quality treatment issues.
- Use of the full 100 foot width Right of Way (ROW) is recommended:
  - The proposed 3-lane section with a ditch uses the entire 100 foot ROW width and any decrease in ROW width would reduce options for the stormwater quality or conveyance system along this corridor.
  - Allows for the greatest flexibility for future needs. Although not anticipated, this width would allow for potential widening of roadway for right turn lanes, additional or dual left turn lanes, etc...
- Expanding the existing ROW on the south end of Talley Way to create a consistent 100 ft ROW section throughout the corridor is recommended.
- The proposed 3-lane section is slightly modified from a standard City of Kelso section and either a variance to the standard or a modification to the standards would be needed.

2.3 ACCESS MANAGMENT PLAN

- Developing an access management plan to be implemented with the reconstruction of Talley Way will enable the City of Kelso and business owners to better define and designate driveways and create a safer and more efficient roadway that can benefit all users.
- While determining spacing standards and design criteria for public and private access points is a key element of an access management plan, understanding the needs of a business and the limitations of internal site circulation must also be considered in the process.
- Where possible, efforts should be made to meet both the design standards on safe spacing and the access needs of the individual parcels.

- Developing roadway standards that are specific to industrial areas should be considered.
- "Longview-Kelso Urban Area Access Management for Roads and Streets" identifies recommended access spacing standards for public streets and driveways.
- Access standards need to address heavy vehicle needs (i.e. truck turning radii, on-site circulation, need for multiple access points, etc.)
- Existing lot sizes may not permit compliance with minor arterial standards in all cases and may warrant considering “industrial” classification standard.

2.4 TALLEY WAY BRIDGE ASSESSMENT

- Further study is recommended which should include a review of the applicable design codes and application, construction issues, and maintenance of traffic, comparative benefits and costs.
- Preliminary review indicates the existing bridge may be maintained under the following scenarios:
  - New and separate structure adjacent to the existing bridge (with minimum 5 to 6 foot separation)
  - Widen to one side (essentially a new structure adjacent to the existing; this option depends on the recommended alignment and typical section)
- Some initial concerns include bridge rail upgrades, seismic upgrades, and cross slope grade issues, among others.
  - Replacement of the bridge would be recommended if new alignment across the Coweeman River is proposed.

2.5 STORMWATER MANAGEMENT PLAN

- A stormwater management plan will enable the City of Kelso and business owners to better manage the entire drainage area by preventing future drainage problems, addressing existing drainage problems, preserving the natural and beneficial functions of the drainage system and preserving and enhancing stormwater quality.
- Further evaluation will be needed to determine if an open ditch system, closed pipe system, or a combination of the above is the most appropriate conveyance system for the corridor.
- Further study is needed to review an open conveyance system along Talley Way, which may include a water quality component such as a swale, media filter drain, compost amended vegetated filter strip, etc., to treat roadway runoff.
- Initial stormwater quality options for the corridor are listed below:
  - Additional review of a “regional” facility option is needed to determine the placement and area to be treated by such options as a created wetland, pond treatment, etc., potentially near the Baker lift station.

- Another option for review is an open conveyance system along Talley Way such as a swale or filter strip that is intended to serve as a "regional" treatment system to treat both roadway and other areas.

2.6 DESIGN AND CONSTRUCTION SCHEDULE AND BUDGETS

- The schedule and costs are conceptual in nature and will need to be updated as the project progresses or as elements in the corridor change.
- The current planning level construction costs range from $7.4 to $11.8 million based on the alignment and bridge replacement options.
- The project may be able to meet the overall goal of the corridor by constructing improvements in phases as external factors impact the corridor.
- The completion of the following items will help to solidify the direction and overall costs for the Talley Way corridor project and these include:
  - Completion of a Stormwater master plan for the corridor and basin.
  - Completion of an access management plan for the corridor.
  - Determination of the impacts to the corridor by the airport expansion.
  - Completion of the final design of the SR 432 interchanges by WSDOT to determine if there are impacts to the alignment and other elements of this project.

2.7 FUNDING STRATEGIES

- To increase the chance of leveraging various funding sources in the future, develop a persuasive discussion that highlights and connects numerous issues which include the following:
  - Transportation
  - Storm water
  - The airport
  - New development to the south

- Discuss the funding strategy with local, state and federal officials to assess their willingness to help, hear their suggestions, make revisions and prepare for next steps. This is an excellent area in which the city council can help.
- Nurture a Talley Way coalition of public and private interests to support the project and gauge their interests. The coalition might include the following:
  - The City
  - Airport interests
  - Property owners adjacent to Talley Way
  - Development interests south of Highway 432
  - Community groups such as the Kelso-Longview Chamber of Commerce
  - Any organized supporters of trails, bike paths, and natural stormwater treatment. Initially, this group might meet infrequently. As events unfold that indicate possible funding opportunities, the group can gather more often.

- The City must develop solid technical information to assess choices. In preparing to request funding, knowing how much to request and avoiding amending (increasing) the request in the future, are very important. In the event opportunities arise in which segments of the project might proceed, basic project phasing estimates should be developed (i.e. the airport expands and a portion of Talley Way is rebuilt).

3 APPENDICES

Appendix A – ROADWAY CONCEPTS

Appendix B – TRAFFIC ANALYSIS

Appendix C – ACCESS MANAGEMENT PLAN

Appendix D – TALLEY WAY BRIDGE ASSESSMENT

Appendix E – STORMWATER MANAGEMENT

Appendix F – DESIGN AND CONSTRUCTION SCHEDULE AND BUDGETS

Appendix G – FUNDING STRATEGIES

APPENDIX A

ROADWAY CONCEPTS

TECHNICAL MEMORANDUM

Roadway Concepts
Talley Way Corridor Transportation Study Implementation Plan

Prepared by David Evans and Associates, Inc.

June 23, 2009

The purpose of this memorandum is to provide a brief summary of issues and a general discussion regarding the alignment options reviewed and the typical sections developed. The attached exhibit graphically shows the alignments and the typical sections reviewed.

Given the preliminary nature of this study and the current unknowns with the expansion of the Kelso-Longview Airport, a detailed alignment study was not performed. This study did review or prepare options that are reasonable given our current level of understanding and included three basic alignment options that are detailed below.

The general assumptions for the alignment(s) are as follows:

- minor arterial using 2 travel lanes, 1 center lane, 2 bike lanes and sidewalks
- design speed of 35 mph
- per Kelso design manual use AASHTO criteria. Guidance in AASTHO for horizontal curves found under exhibit 3-16 min. radii and superelevation for low-speed urban street with a normal crown (per Kelso Design Manual 2.5%).

Since a three lane section was found to be adequate under the traffic analysis section, this study focused on two 3-lane typical section options which are described below.

ALIGNMENT OPTION 1: EXISTING TALLEY WAY ALIGNMENT

This option follows the existing Talley Way alignment throughout the entire corridor and generally widens the roadway equally on each side of the current roadway. This option has minimal impacts on the adjacent properties and, excluding issues with the Talley Way Bridge, would be the least expensive option.

This alignment follows the City of Kelso design manual for a minor arterial, and has a consistent 35 mph design throughout the corridor. This is accomplished by meeting the guidance of AASHTO for design of low speed urban streets with a normal crown. The alignment as shown matches up with the existing bridge over the Coweeman River, however minor adjustment could easily be made to help facilitate the construction and/or staging of a new or widened bridge.

In general, this is the recommended alignment assuming there is no reason to shift the alignment for any reason (i.e. airport expansion, development needs, or some other unforeseen issue).

AIRPORT EXPANSION ALIGNMENTS

The expansion of the Kelso-Longview Airport may necessitate the relocation or realignment of the southern end of Talley Way. If the airport expands to the south, this would probably require the road to be shifted to the east. The extent of the shift and whether it is required will not be known until after this study is completed. Two alignment options have been reviewed from a concept level and are presented below:

ALIGNMENT OPTION 2: RELOCATION OPTION – EXISTING BRIDGE LOCATION

As mentioned above, this alignment assumes a shift to the east at the south end of the project which will need to be confirmed when the airport master plan is completed. In addition, the exact requirements and extent of the alignment shift need to be confirmed at that time as well.

The intent of this alignment option is to line up the relocated roadway with the current bridge location. This option could be used if the bridge were to be widened at its current location or if the bridge is replaced at its current location.

The curvature of the existing roadway would need to be adjusted or increased in order to meet the alignment of the roadway at the existing bridge. From reviewing guidance shown in AASHTO for low speed urban streets with a normal crown, the roadway as shown does not meet the City's standard 35 mph design speed for a minor arterial and the alignment as shown would require a design variance. The posted speed for the roadway at the south end would likely be reduced or, at a minimum, the curves would have warning signs posted. As shown, the reduction in speed is not significant (only 5 mph to 30 mph), but it would require a variance or change from the standard.

ALIGNMENT OPTION 3: RELOCATION OPTION – NEW BRIDGE LOCATION

Similar to the option above, the extent of the alignment shift required by the airport expansion will need to be confirmed.

The intent of this alignment option is to remove the location of the existing bridge as a constraint in order to develop an alignment that meets a 35 mph design speed. This option could be used if a replacement bridge over the Coweeman River is anticipated.

As can be seen on the exhibit, this alignment is smoother and does meet a 35 mph design speed. The replacement of the bridge at a different location has advantages; however it is also the most costly. In general, the staging of the traffic and construction of the bridge would not be an issue with this option. A new bridge could be constructed adjacent to the existing bridge with little impact to the existing traffic flow. When the bridge is completed, the traffic could be shifted to the new bridge and demolition of the old bridge could occur.

This alignment will need to be reviewed when the SR 432 interchange alignment is final and that project is built. Early indication regarding the SR 432 ramp alignment appears this proposed alignment is viable and has merit.

TYPICAL SECTION

For this study, two 3-lanes typical sections were reviewed: 1) a curb and gutter section, and 2) a ditch section. The five lane section is shown for reference only and was not considered as an alternative.

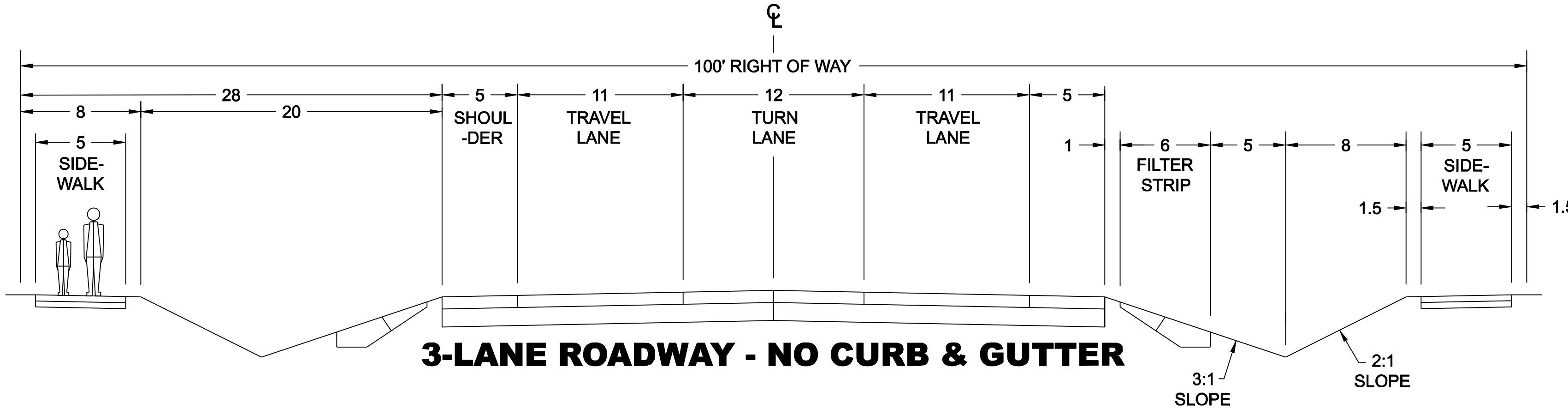
Given the preliminary nature of this study, a detailed analysis of the ditch section was not performed; however some preliminary calculations show the section can easily convey and treat the stormwater from a 3-lane roadway section. Further study will be needed to determine the quantity of off-site flow (flow coming from non-roadway sources) to determine if a ditch section has adequate capacity to handle that additional flow and still meet the water quality needs for the corridor. As described in another section, a storm water master plan be should be developed to review those specific issues pertaining to the conveyance and treatment of the stormwater for this corridor.

The existing right of way width is generally 100 feet wide; however the width reduces to 60 feet wide at the south end of this project and to 80 feet wide along Colorado Street. As can be seen on the typical section, the proposed 3-lane section with a ditch uses the entire 100 foot ROW width and any decrease in ROW width would reduce options for the stormwater quality or conveyance system along this corridor. The creation of a consistent 100 ft. ROW width throughout the corridor allows for the greatest flexibility for future needs. Although not anticipated, this width would allow for potential widening of roadway for right turn lanes, additional or dual left turn lanes, or other unforeseen items.

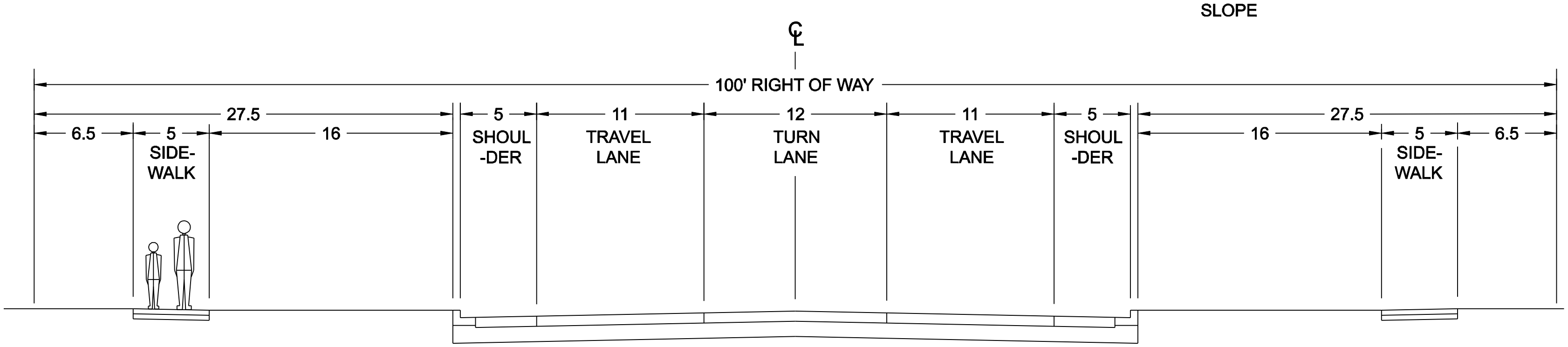
For the reasons mentioned above, this study recommends expanding the existing ROW on the south end of Talley Way and along Colorado street at the north end of the corridor to create a consistent 100 ft. ROW section throughout the corridor. The proposed 3-lane section is slightly modified from a standard City of Kelso section and either a variance to the standard or a modification to the standards would be needed.

RECOMMENDATIONS

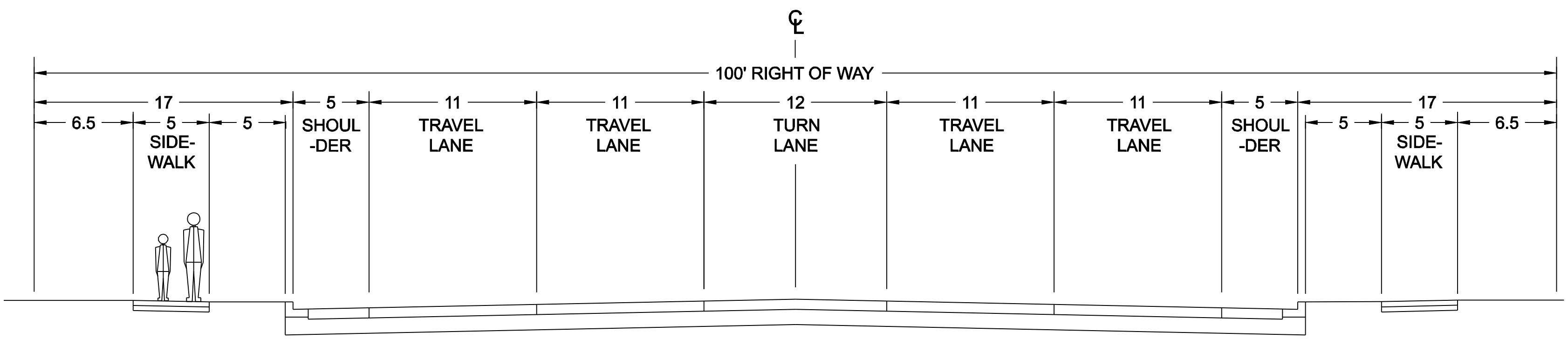
- Further study of potential roadway alignments will be needed when the impact from the Airport Expansion is known and the SR 432 interchange is built.
- A ditch section accommodates the industrial nature of this corridor and provides a cost effective solution for storm runoff and water quality treatment issues.
- Use of the full 100 foot width Right of Way (ROW) is recommended.
    - The proposed 3-lane section with a ditch uses the entire 100 foot ROW width and any decrease in ROW width would reduce options for the stormwater quality or conveyance system along this corridor.
    - Allows for the greatest flexibility for future needs. Although not anticipated, this width would allow for potential widening of roadway for right turn lanes, additional or dual left turn lanes, etc...
- Expanding the existing ROW on the south end of the Talley Way and along Colorado Street to create a consistent 100 ft. ROW section throughout the corridor is recommended.
- The proposed 3-lane section is slightly modified from a standard City of Kelso section and either a variance to the standard or a modification to the standards would be needed.



3-LANE ROADWAY - NO CURB & GUTTER



3-LANE ROADWAY SECTION WITH CURB & GUTTER

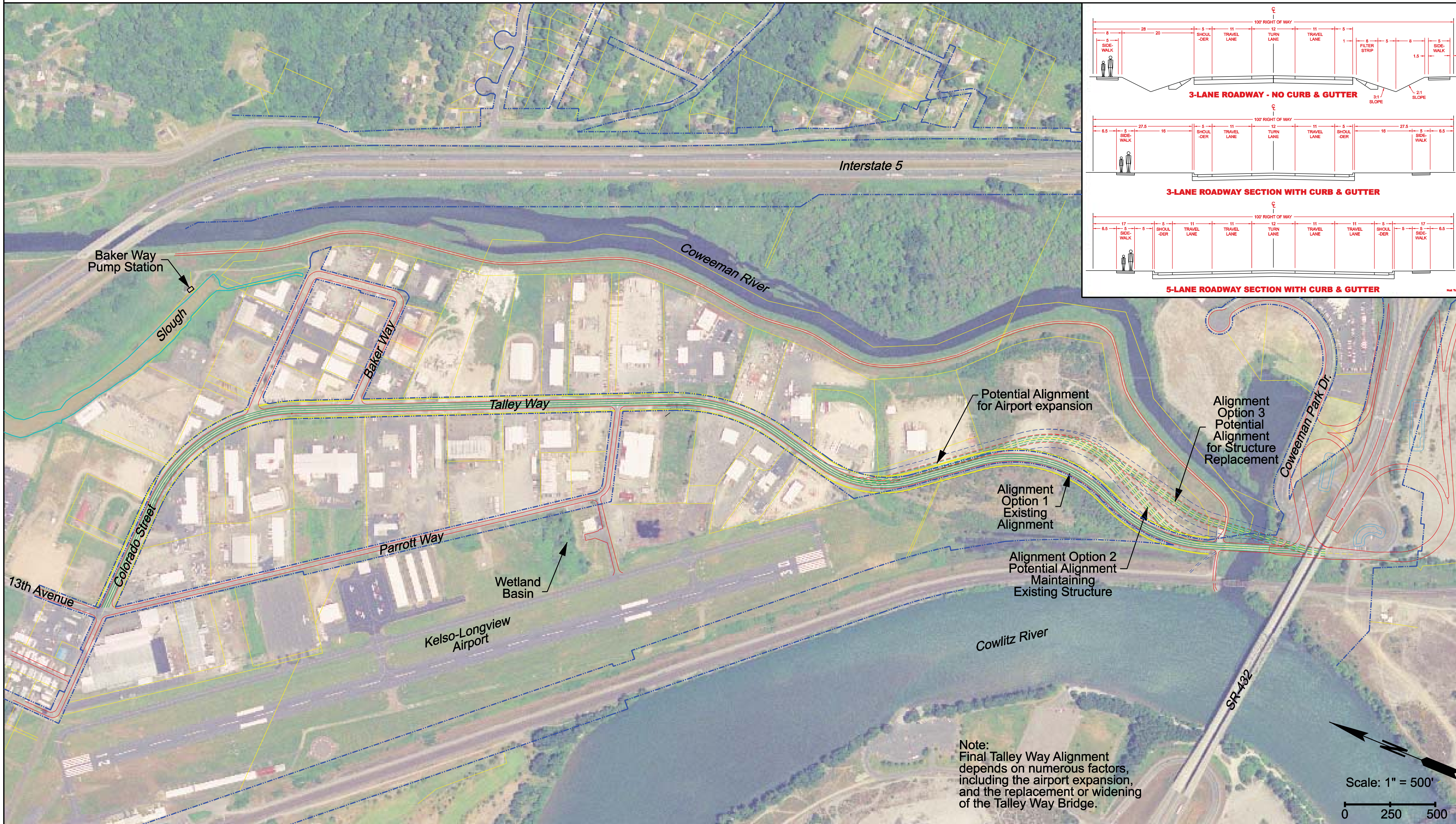


5-LANE ROADWAY SECTION WITH CURB & GUTTER

(NTS)

TALLEY WAY CORRIDOR
TRANSPORTATION STUDY
POTENTIAL STREET SECTIONS

TALLEY WAY CORRIDOR TRANSPORTATION STUDY



APPENDIX B

TRAFFIC ANALYSIS

DRAFT TECHNICAL MEMORANDUM

Summary of Traffic Operations
Talley Way Corridor Transportation Study Implementation Plan

Prepared by David Evans and Associates, Inc.

May 12, 2009

This memorandum summarizes findings from the traffic analysis performed for the Talley Way Corridor Study Implementation Plan. An analysis of operations has been conducted for existing (2008) and future (2030) conditions for the section of Talley Way between SR-432 WB ramps and Colorado St. at 13th Ave. System elements such as lane configurations and traffic control devices were also evaluated in conjunction with several growth scenarios to provide recommendations for a range of possible outcomes.

Traffic Volume Development

Existing (2008) and future (2030) traffic volumes were developed by merging data collected from several sources. The following sections describe data collection sources and volume development methodology.

Existing Traffic Volumes

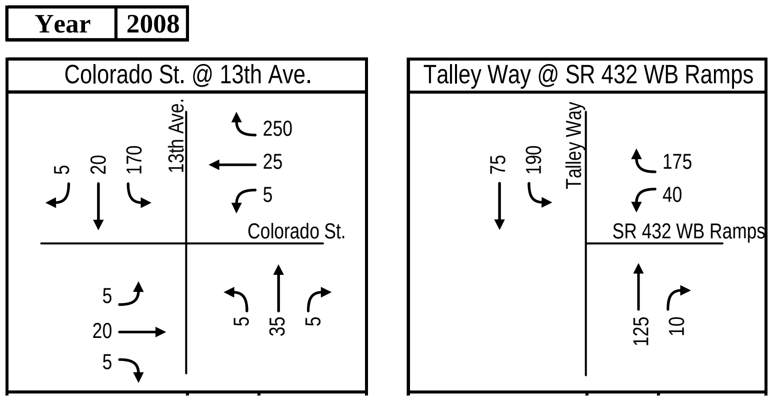
At the northern study area intersection of Colorado Street and 13th Avenue, two-hour evening peak-period traffic count data were collected in October, 2007. The turning movement volumes for the PM peak hour were extracted from the count data. The traffic count showed that the PM peak hour is 4:00 to 5:00 p.m. In addition, the intersection traffic counts identified heavy truck and pedestrian volumes. Peak hour turning movement count summaries for this intersection are presented in Attachment A, which were used to establish existing PM peak hour turning movement volumes.

For the southern study area intersection of Talley Way and the SR-432 westbound (WB) ramps, a recent traffic impact analysis (TIA) was used to help develop PM peak hour turning movement volumes. The TIA, dated September 2008, was conducted for “Madison Development” by Skillings Connoly, Inc. for a proposed retail development on the Seagle property to the south of Talley Way/SR-432 WB ramps. The TIA developed used 2005 peak hour counts as a basis for their analysis. Roadway (link) traffic volumes from the corresponding TIA report were used to help develop turning movement volumes. A graphic from the TIA report that illustrates link volume data is presented in Attachment A.

Additional traffic volume data was collected along the Talley Way mainline between study intersections for an entire week in January, 2009. This data helped balance vehicular volumes between study intersections and establish heavy vehicle percentages.

The balanced turning movement volumes used for analysis of existing conditions, and a basis for future volume development are shown in the following exhibit. The existing average daily traffic (ADT) volumes are estimated at 5,800 vehicles along Talley Way over the bridge.

Estimated PM Peak Hour Traffic Volumes



Future Traffic Volumes

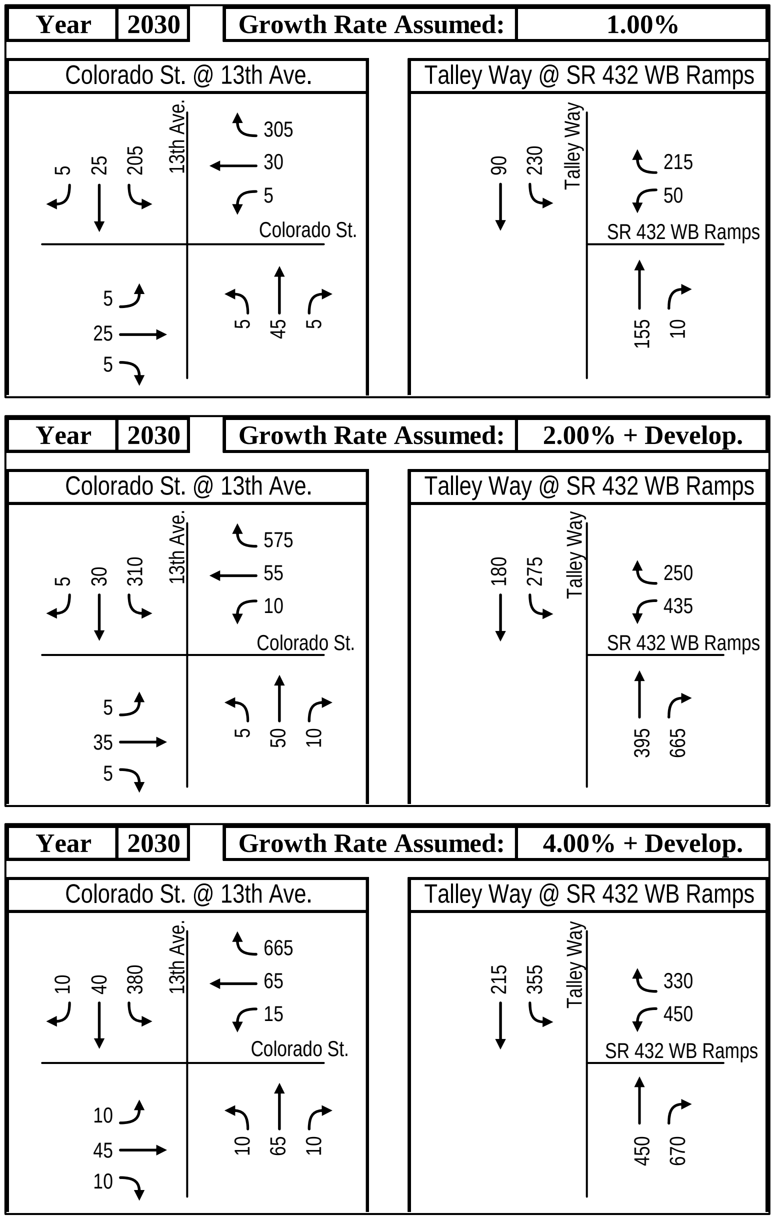
To evaluate a range of possible growth scenarios, three growth rates were considered for the study area. These growth rates were derived from population growth projections for Cowlitz County prepared by the Washington State Office of Financial Management in October 2007. In addition to the proposed base growth rates, estimated traffic volumes that would be generated by the potential retail development at the Seagle property south of the SR-432 interchange (See Attachment A) were incorporated into the medium and high growth-rate scenarios. The straight-line growth scenarios evaluated for year 2030 traffic operations are summarized below:

- Low – 1% growth per year (without inclusion of proposed retail development)
- Medium – 2% growth per year (with the inclusion of proposed development)
- High – 4% growth per year (with the inclusion of proposed developments)

The estimated average daily traffic (ADT) volumes along Talley Way over the bridge are 6,900 vehicles for the low-growth scenario, 11,000 vehicles for the medium-growth scenario, and 12,550 vehicles for the high-growth scenario. All three growth scenario forecasts are within the volume range typical for a three-lane arterial roadway

The estimated turning movement volumes based on these growth assumptions are shown in the following exhibit.

Estimated PM Peak Hour Traffic Volumes



Operational Analyses

Using the existing (2008) and future (2030) traffic volumes discussed in the previous section, operational analyses were conducted to evaluate the performance of study intersections under various growth scenarios. The results of these analyses help identify appropriate lane configurations and traffic control devices. The Talley Way corridor currently has a two-lane cross-section with no signalized intersections and stop-controlled side streets.

In the following sections two evaluation criteria are used to measure intersection performance. One of these criteria is level of service (LOS), which is primarily based on factors such as delay, travel speed, frequency of interruptions in traffic flow, and relative freedom for traffic maneuvers. Six LOS standards have been established ranging from LOS A, where traffic is relatively free flowing, to LOS F, where the street system is totally saturated and traffic movement is very difficult to negotiate.

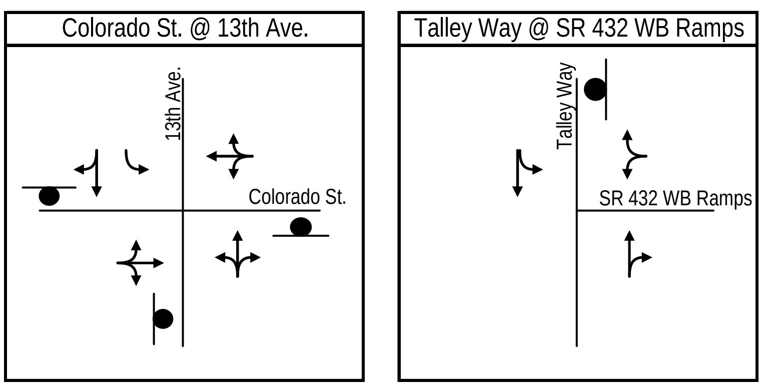
The other criterion used to evaluate intersection performance involves a comparison of traffic volume demand to intersection capacity. This comparison is presented as a volume-to-capacity (v/c) ratio. A v/c ratio between 0.0 and 1.0 indicates that volume is less than capacity. When the v/c ratio is low, nearer to 0.0, traffic conditions are generally free flowing with little congestion and low delays for most intersection movements. As the v/c ratio approaches 1.0, traffic becomes more congested and unstable with longer delays. If the v/c ratio is over 1.0, the traffic volume demand is greater than capacity and almost all vehicles would experience significant delays.

The following section summarizes the analysis of existing conditions. Synchro operational outputs are provided in Attachment B.

Existing Conditions

Before evaluating the operations at the study intersections, it is important to consider the existing lane configurations and traffic control devices that influence intersection performance. The following exhibit illustrates these factors.

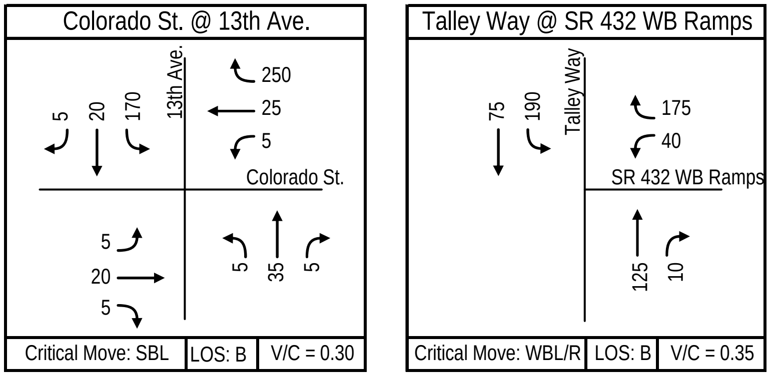
Existing Lane Configurations



With the relatively low PM peak hour traffic demand the study intersections provide for adequate operations, even with stop-controlled side streets for the existing (2008) year. The intersection of Colorado Street and 13th Avenue currently operates at a LOS B, with a v/c ratio of 0.30. The critical movement for this intersection is the southbound-left turning movement; however, it operates well within the available capacity. The intersection of Talley Way and SR-432 WB Ramps currently operates at a LOS B, with a v/c ratio of 0.35. The critical movement for this intersection is the westbound-left/right turning movement, which also operates well within available capacity. These existing operations are illustrated in the following exhibit.

Estimated PM Peak Hour Traffic Volumes & Operations

Year	2008



Queuing under existing conditions is minor. At both intersections, 95th percentile queues are estimated at less than 50 feet for all approaches.

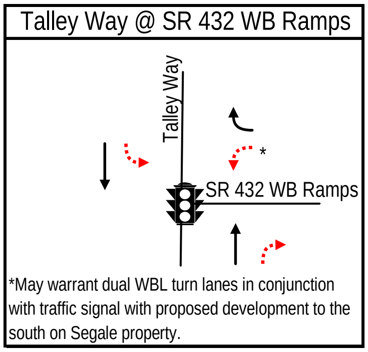
In addition to the specific intersection analysis above, the relative delay was estimated for a vehicle turning left from a typical driveway along the Talley Way corridor. For existing conditions, the average delay for an exiting left-turn movement is estimated at less then 12 seconds indicating a LOS B condition.

Future Conditions

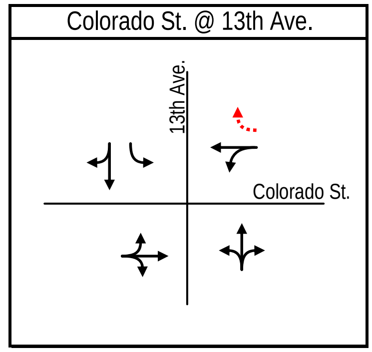
As previously discussed, operations for three growth scenarios were evaluated to understand the range of impacts to the transportation system. These scenarios include low, medium, and high growth rates. The low growth scenario assumes a straight-line growth rate of 1% per year. The medium growth scenario assumes a straight-line growth rate of 2% per year, but also includes potential trips generated from retail development at the Seagle property south of the SR-432 interchange. The high growth scenario assumes a straight-line growth rate of 4% per year, and similar to the medium growth scenario, also includes potential development related trips.

While existing lane configurations were used to evaluate current operations, some lane modifications were assumed for future operations analyses. A three-lane typical section was assumed for the mainline corridor for all analysis scenarios, and Washington State Department of Transportation (WSDOT) proposed lane configurations were assumed for the intersection of Talley Way and SR-432 WB Ramps. While WSDOT plans to install a traffic signal at the intersection of Talley Way and SR-432 Ramps as part of the interchange improvements, analyses were conducted assuming stop and signalized control to evaluate scenario-specific needs. For the intersection of Colorado Street and 13th Avenue, a three-lane mainline cross-section was assumed which would optimize traffic operations. The assumed lane configurations for the first phase of analyses are illustrated in the following exhibit; however, individual lane configuration recommendations are provided for each alternative.

Washington DOT Proposed Lane Configurations (09/01/08)



Assumed Lane Configuration Based Upon 3-Lane Mainline

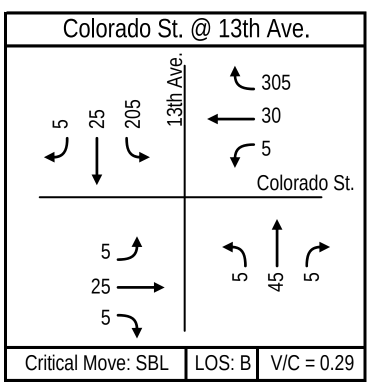


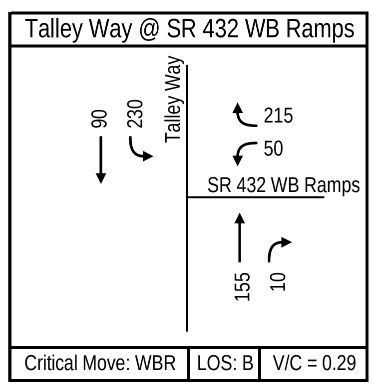
Year 2030: Low-Growth Scenario

Analysis for the low-growth scenario assumes a straight-line growth rate of 1% per year, and no additional development-related trips. With the relatively low anticipated PM peak hour traffic demand, the study intersections provide for adequate operations, even with stop-controlled side streets (a traffic signal was not assumed for this scenario) for the future (2030) year. The intersection of Colorado Street and 13th Avenue would operate at a LOS B, with a v/c ratio of 0.29. The critical movement for this intersection is the southbound-left turning movement; however, it would operate well within the available capacity. The intersection of Talley Way and SR-432 WB Ramps would operate at a LOS B, with a v/c ratio of 0.29. The critical movement for this intersection would be the westbound-right turning movement, which also operates well within available capacity. These anticipated operations are illustrated in the following exhibit.

Estimated PM Peak Hour Traffic Volumes & Operations

Year	2030	Growth Rate Assumed:	1.00%





Queuing under this scenario would be minor. At both intersections, 95th percentile queues are estimated at less than 50 feet for all approaches.

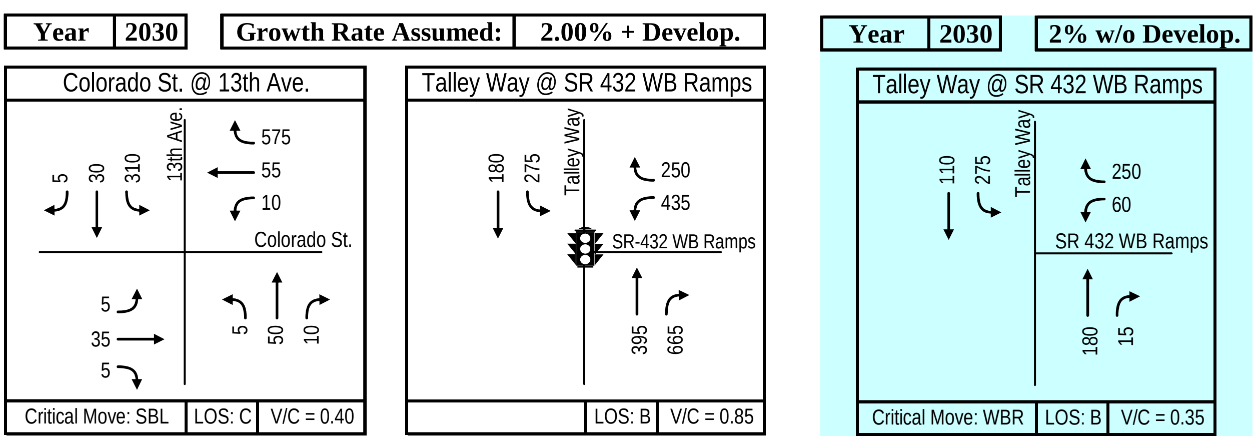
The relative delay was estimated for a vehicle turning left from a typical driveway along the Talley Way corridor. For existing conditions, the average delay for an exiting left-turn movement is estimated at less then 12 seconds. For this low-growth scenario the estimated delay would be only slightly over 12 seconds, also indicating a LOS B condition.

Finding: Estimated growth from this scenario would have a relatively low impact on the transportation system. The lane configurations assumed for future conditions analysis (as previously described) would provide for adequate traffic operations throughout the Talley Way corridor. The intersection of Talley Way and SR-432 WB Ramps would operate adequately without a traffic signal installation.

Year 2030: Medium-Growth Scenario

Analysis for the medium-growth scenario assumes a straight-line growth rate of 2% per year, and additional development-related trips. Based on these assumptions, the anticipated PM peak hour traffic demand would allow for adequate operations at both intersections given the assumed lane configurations and traffic control devices for the future (2030) year. The intersection of Colorado Street and 13th Avenue would operate at an acceptable LOS C, with a v/c ratio of 0.40. The critical movement for this intersection is the southbound-left turning movement; however, it would operate within the available capacity and with modest delays. The intersection of Talley Way and SR-432 WB Ramps would operate adequately if a traffic signal is installed with LOS B and a v/c ratio of 0.85. If a signal were not installed, this intersection would operate at LOS F, with a v/c ratio of 1.66, which would be a direct result of trips generated from the proposed retail development to the south of the intersection. Anticipated operations are illustrated in the following exhibit.

Estimated PM Peak Hour Traffic Volumes & Operations



Queuing (95th percentile) under this medium-growth scenario would be minor at the intersection of Colorado Street and 13th Avenue (less than 75 feet for all approaches). However, 95th percentile queues would be moderate at the intersection of Talley Way and SR-432 Ramps. For that intersection, 95th percentile queues are estimated at 350 feet for the westbound-left movement, and 250 feet for the southbound-left movement. Queues along the westbound approach would sometimes extend past the access to Coweeman Park Drive.

If dual westbound left-turn lanes were installed on the WB SR-432 ramps at Talley Way in conjunction with a traffic signal, estimated operations would improve to LOS B, with a v/c ratio of 0.69. This would reduce 95th queues to less than 150 feet for the westbound-left movement and 200 feet for the southbound-left movement, and would minimize queuing that would block access to Coweeman Park Drive. This improvement should only be considered if the proposed development occurs to the south of this intersection. This westbound left-turn lane modification would require an additional receiving lane on the south leg of the intersection (for a total of two southbound travel lanes) for an approximate length of 400-500 feet. The addition of dual southbound left-turn lanes would not be warranted based on vehicular demand and associated delay/queuing.

The intersection of Talley Way and SR-432 Ramps was also evaluated without the proposed development. The result of this analysis shows that the intersection of Talley Way and SR-432 WB Ramps would operate adequately without a traffic signal at LOS B (LOS C for WBL lane), with a v/c ratio of 0.35. The critical movement for this intersection would return to the westbound right-turn movement, which would operate within available capacity.

The relative delay was estimated for a vehicle attempting a left turn from a typical driveway along the Talley Way corridor. For existing conditions, the average delay for an exiting left-turn movement is estimated at less then 12 seconds. For this medium-growth scenario the estimated delay would be 18 seconds indicating an acceptable LOS C condition.

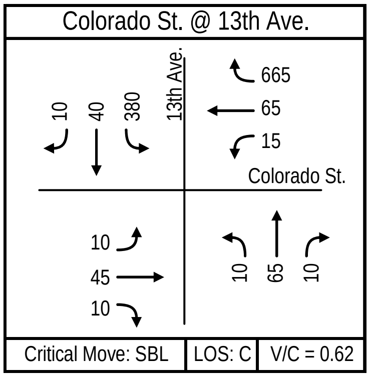
Finding: Estimated growth from this scenario would have a moderate impact on the transportation system. The lane configurations assumed for future conditions analysis (as previously described) would provide for adequate traffic operations along the Talley Way corridor with the assumed traffic signal installation at the Talley Way and SR-432 WB Ramps intersection. If the proposed development on the Seagle property does not occur, the intersection of Talley Way and SR-432 WB Ramps would operate adequately without a traffic signal installation.

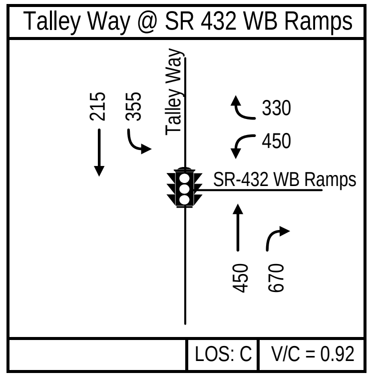
Year 2030: High-Growth Scenario

Analysis for the high-growth scenario assumes a straight-line growth rate of 4% per year, and additional development-related trips. Based on these assumptions, the anticipated PM peak hour traffic demand would allow for an adequate LOS at both intersections given the assumed lane configurations and traffic control devices for the future (2030) year. The intersection of Colorado Street and 13th Avenue would operate at an acceptable LOS C, with a v/c ratio of 0.62. The critical movement for this intersection is the southbound-left turning movement; however, it would operate within the available capacity. The intersection of Talley Way and SR-432 WB Ramps would operate with an adequate LOS C, but with a v/c of 0.92 (approaching intersection capacity). If a signal were not installed, this intersection would operate at LOS F, with a v/c ratio of 2.53, which would be a direct result of trips generated from the proposed retail development to the south of the intersection. Anticipated operations are illustrated in the following exhibit.

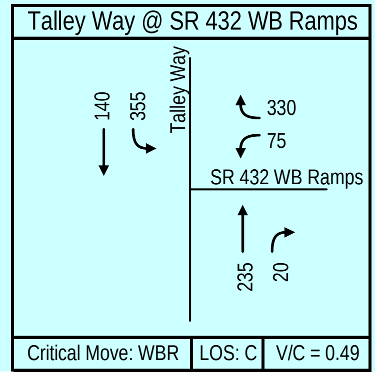
Estimated PM Peak Hour Traffic Volumes & Operations

Year 2030 **Growth Rate Assumed:** 4.00% + Develop.





Year 2030 **4% w/o Develop.**



The intersection of Talley Way and SR-432 Ramps was also evaluated without the proposed development. The result of this analysis shows that the intersection of Talley Way and SR-432 WB Ramps would operate adequately without a traffic signal at LOS C (LOS D for WBL lane), with a v/c ratio of 0.49. The critical movement for this intersection would return to the westbound-right-turn movement, which would operate within available capacity.

Queuing (95th percentile) under this high-growth scenario would be minor at the intersection of Colorado Street and 13th Avenue (less than 125 feet for all approaches). However, 95th percentile queues would be moderate at the intersection of Talley Way and SR-432 Ramps. For that intersection, 95th percentile queues are estimated at 425 feet for the westbound-left movement, and 300 feet for the southbound-left movement would sometimes extend past the access to Coweeman Park Drive.

If dual westbound left-turn lanes were installed on the WB SR-432 ramps at Talley way in conjunction with a traffic signal, estimated operations would improve to LOS B, with a v/c ratio of 0.78. This would reduce 95th queues to less than 150 feet for the westbound-left movement and 250 feet for the southbound-left movement, and would minimize queuing that would block access to Coweeman Park Drive. This improvement should only be considered if the proposed development occurs to the south of this intersection. This westbound left-turn lane modification would require an additional receiving lane on the south leg of the intersection (for a total of two southbound travel lanes) for an approximate length of 400-500 feet. The addition of dual southbound left-turn lanes would not be warranted, based on vehicular demand and associated delay/queuing.

The relative delay was estimated for a vehicle attempting a left turn from a typical driveway along the Talley Way corridor. For existing conditions, the average delay for an exiting left-turn movement is estimated at less then 12 seconds. For this high-growth scenario the estimated delay would be 20 seconds.

Finding: Estimated growth from this scenario would have a moderate impact on the transportation system. The lane configurations assumed for future conditions analysis (as previously described) would provide for adequate traffic operations along the Talley Way corridor with the assumed traffic signal installation at the Talley Way and SR-432 WB Ramps intersection. If the proposed development on the Seagle property does not occur, the intersection of Talley Way and SR-432 WB Ramps would operate adequately without a traffic signal installation. At the Talley Way and SR-432 WB Ramps intersection, lane modifications may be considered for improved operations. Further investigation suggests that additional intersection improvements (over the base assumptions) should only be considered if the proposed development occurs on the Seagle property south of the interchange.

Signal Warrant Analysis

Although WSDOT plans to install a traffic signal at the intersection of Talley Way and SR-432 WB Ramps as part of interchange improvements, signal warrants (volume based) were reviewed for years 2008 and 2030 at the currently unsignalized intersections of Talley Way/SR-432 WB ramps and Colorado Street/13th Avenue to evaluate scenario-specific needs.

The volume-based warrants that were considered include:

- 8-Hour Volumes
  - Minimum Vehicular Volume
  - Interruption of Continuous Traffic
- 4-Hour Volumes
- 1-Hour Volume
  - Peak Hour Volume
  - Peak Hour Delay (Still would need delay check to meet warrant)

Before installing a traffic signal, it is generally desirable for the 4-hour volumes and/or 8-hour volumes warrant to be met. Signals are not generally installed on the basis of peak hour warrants alone because the time savings benefit for the side streets during the peak hour needs to be weighed against the higher delays incurred for the mainline movements throughout the day.

Based on analysis results, a traffic signal would not be warranted at the intersection of Colorado Street and 13th Avenue for any of the growth scenarios. This finding is supported by the low delay estimates for the traffic operations under all growth scenarios.

A traffic signal would be warranted at the intersection of Talley Way and SR-432 WB Ramps for any growth scenario which includes the potential retail development to the south of the interchange; however, without the development, volumes would only meet the peak hour warrants. This indicates that any of the assumed growth rates (low, medium and high) alone would not require a signal at this intersection without the inclusion of retail development.

The following exhibit summarizes warrant results for each scenario.

TRAFFIC SIGNAL WARRANTS - BASED ON 2003 MUTCD

INTERSECTION INFORMATION

Major Street Name: Talley Way
Minor Street Name: SR-432 WB Ramps

	8-Hour		4-Hour	Peak Hour	
	#1A	#1B	#2	#3A	#3B
2008 Existing	NO	NO	NO	NO	NO
2030 (2% w/o Dev.)	NO	NO	NO	YES	NO
2030 (2% with Dev.)	YES	NO	YES	YES	YES
2030 (4% w/o Dev.)	NO	NO	NO	YES	NO
2030 (4% with Dev.)	YES	NO	YES	YES	YES

INTERSECTION INFORMATION

Major Street Name: Colorado Street
Minor Street Name: 13th Avenue

	8-Hour		4-Hour	Peak Hour	
	#1A	#1B	#2	#3A	#3B
2008 Existing	NO	NO	NO	NO	NO
2030 (4% with Dev.)	NO	NO	NO	YES	YES

As traffic signal warrants would not be met for either study intersection in the medium or high-growth scenarios without development related traffic, a signal would not be warranted in the low-growth scenario either.

With the installation of a traffic signal at the Talley Way and SR-432 WB ramps intersection, a significant performance improvement would be anticipated for the high-growth scenario with development. For the high-growth scenario with development, a traffic signal would provide for an estimated LOS C, with a v/c ratio of 0.92. This would be a significant improvement over operations without a signal (LOS F, v/c 2.53). If dual westbound left-turn lanes are installed on the WB SR-432 ramps at Talley way in conjunction with a traffic signal, estimated operations would improve to LOS B, with a v/c ratio of 0.78. Once more, these improvements would only be required if the proposed development occurred to the south of the interchange.

Key Findings and Recommendations

This memorandum summarizes findings from the traffic analysis performed for the Talley Way Corridor Study. An analysis of operations has been conducted for existing (2008) and future (2030) conditions for the section of Talley Way between SR-432 WB ramps and Colorado St. at 13th Ave. System elements such as lane configurations and traffic control devices were also evaluated in conjunction with several growth scenarios to provide recommendations for a range of possible outcomes. Based on the conducted analyses, the following key findings have been identified.

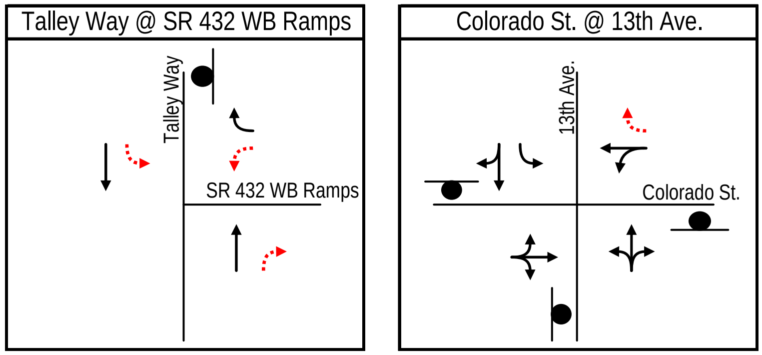
Key Findings

- Given the estimated peak-period and average daily traffic (ADT) volumes, a three-lane roadway section should generally provide for adequate operations through year 2030 throughout the study corridor.
- The proposed lane configurations assumed during analysis (described in the Operational Analysis: Future Conditions section of this memo) should provide for adequate operations for the low-growth scenario, or the medium and high-growth scenarios without the additional retail development-related trips.
- With the inclusion of the proposed retail development on the Seagle property (south of SR-432 WB Ramps), dual westbound left-turn lanes might eventually be considered in conjunction with a traffic signal on the WB SR-432 ramps at Talley Way. This westbound left-turn lane modification would require an additional receiving lane on the south leg of the intersection (for a total of two) with an approximate length of 400-500 feet. If these improvments are needed they will be addressed under WSDOT's proposed interchange improvement project.
- The addition of dual southbound left-turn lanes would not be warranted, based on vehicular demand and associated delay/queuing.
- A signal would not be warranted at the intersection of Colorado Street and 13th Avenue for any of the analyzed scenarios.

Recommendations

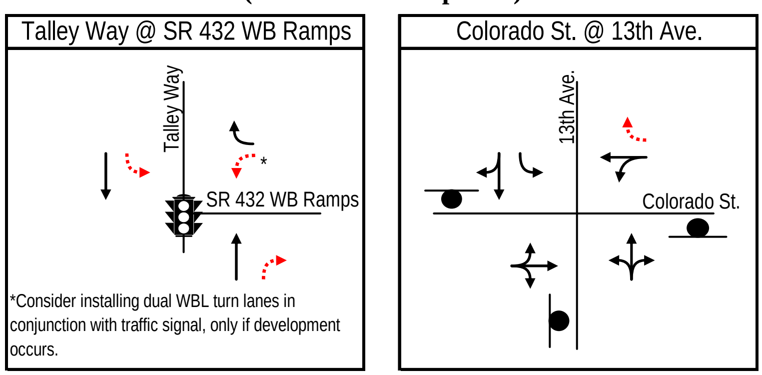
- Implement a three-lane roadway typical section for the corridor
- For any scenario that *does not include* additional retail development to the south of the interchange, implement lane configurations and traffic control devices described in the Operational Analysis: Future Conditions section of this memo and illustrated in the following exhibit.

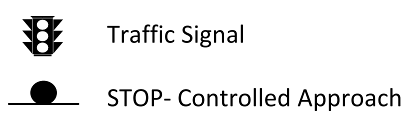
<u>Proposed Lane Configurations & Traffic Control Devices</u>
<u>(without retail deveopment)</u>



- For any scenario that *includes* additional retail development to the south of the interchange, install a traffic signal at the intersection of Talley Way and SR-432 WB ramps, and *consider* installing dual westbound left-turn lanes on the WB SR-432 ramps at Talley way, as illustrated in the following exhibit. As mentioned above these improvements would be part of the WSDOT's interhcnage improvement project.
    - This would provide a LOS B, and v/c ratio of 0.78 for the most aggressive growth scenario.
    - This westbound left-turn lane modification would require an additional receiving lane on the south leg of the intersection (for a total of two) with an approximate length of 400-500 feet.

<u>Proposed Lane Configurations & Traffic Control Devices</u>
(with retail deveopment)





Attachments/Enclosures:
Attachment A: Traffic Volume Worksheets
Attachment B: Synchro Operational Outputs

Attachment A:
Traffic Volume Worksheets

Title1 : 2-8
Title2 : Talley Way
Title3 : Tennant Way to P

Site: Talley Way

Direction: S

Titles	Class	Bikes	Cars & Tlrs	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi
	Gap [Secs]	5- 9	10- 14	15- 19	20- 24	25- 29	30- 34	35- 39	40- 44	45- 49	50- 54	55- 59	60- 64	65- 99

Monday 1/26

Vehicles 1,732 | AM Peak Hour : 11:00 Factor : 0.87 | PM Peak Hour : 04:30 Factor : 0.92

Errors: Axles Used : A: 97.00 % B : 97.00 % | Avg Axles/Vehicle : 2.26 | Avg Two Axle Spacing : 10.2 ft.

Speed: Avg Speed : 37.4 MPH | Percentiles : 10%: 32.0 15%: 33.3 50%: 37.8 85%: 42.5 90%: 43.6

Class %	0.7	51.4	25.4	1.5	11.3	2.0	0.0	1.9	1.7	1.5	0.1	0.2	2.4
Gap %	22.5	15.4	13.3	9.5	6.6	4.6	4.1	3.0	2.9	2.3	2.6	1.6	11.6

Tuesday 1/27

Vehicles 2,296 | AM Peak Hour : 08:30 Factor : 0.90 | PM Peak Hour : 04:30 Factor : 0.92

Errors: Axles Used : A: 96.00 % B : 96.00 % | Avg Axles/Vehicle : 2.28 | Avg Two Axle Spacing : 10.3 ft.

Speed: Avg Speed : 34.8 MPH | Percentiles : 10%: 28.4 15%: 30.2 50%: 35.6 85%: 39.8 90%: 41.4

Class %	0.3	51.2	26.6	1.5	11.8	2.0	0.0	1.4	1.5	1.3	0.1	0.0	2.2
Gap %	21.1	13.8	10.6	8.9	7.5	6.3	4.6	3.9	3.2	2.5	1.9	1.8	13.9

Wednesday 1/28

Vehicles 2,590 | AM Peak Hour : 07:45 Factor : 0.78 | PM Peak Hour : 04:15 Factor : 0.90

Errors: Axles Used : A: 96.00 % B : 96.00 % | Avg Axles/Vehicle : 2.31 | Avg Two Axle Spacing : 10.2 ft.

Speed: Avg Speed : 36.7 MPH | Percentiles : 10%: 31.3 15%: 32.4 50%: 37.1 85%: 41.3 90%: 42.8

Class %	0.8	51.4	26.0	1.6	11.0	2.2	0.2	1.6	1.5	1.8	0.1	0.0	1.8
Gap %	22.1	15.1	11.2	9.1	7.6	5.4	3.3	3.9	2.3	3.3	2.3	1.5	12.8

Thursday 1/29

Vehicles 2,684 | AM Peak Hour : 07:45 Factor : 0.81 | PM Peak Hour : 04:30 Factor : 0.92

Errors: Axles Used : A: 95.00 % B : 95.00 % | Avg Axles/Vehicle : 2.31 | Avg Two Axle Spacing : 10.3 ft.

Speed: Avg Speed : 36.9 MPH | Percentiles : 10%: 31.4 15%: 32.5 50%: 37.2 85%: 41.7 90%: 43.1

Class %	0.8	51.1	26.3	1.3	11.7	1.6	0.0	1.6	2.0	1.3	0.0	0.1	2.1
Gap %	25.1	15.1	10.8	8.3	7.1	4.9	3.4	4.2	2.7	2.3	2.1	1.3	12.7

Friday 1/30

Vehicles 2,726 | AM Peak Hour : 08:00 Factor : 0.86 | PM Peak Hour : 04:45 Factor : 0.91

Errors: Axles Used : A: 96.00 % B : 96.00 % | Avg Axles/Vehicle : 2.28 | Avg Two Axle Spacing : 10.2 ft.

Speed: Avg Speed : 37.3 MPH | Percentiles : 10%: 31.8 15%: 32.9 50%: 37.5 85%: 42.3 90%: 43.5

Class %	0.5	52.5	27.2	1.3	10.4	1.5	0.0	1.6	1.5	1.5	0.1	0.1	1.8
Gap %	24.0	14.5	11.7	9.7	7.2	5.5	4.7	2.8	2.5	2.5	1.4	1.2	12.3

Saturday 1/31

Vehicles 1,392 | AM Peak Hour : 11:00 Factor : 0.92 | PM Peak Hour : 01:15 Factor : 0.90

Errors: Axles Used : A: 97.00 % B : 97.00 % | Avg Axles/Vehicle : 2.15 | Avg Two Axle Spacing : 10.0 ft.

Speed: Avg Speed : 37.1 MPH | Percentiles : 10%: 31.4 15%: 32.7 50%: 37.5 85%: 42.4 90%: 43.6

Class %	0.1	57.6	26.8	1.6	9.4	1.1	0.1	0.6	1.4	0.5	0.1	0.0	0.4
Gap %	11.9	9.8	9.1	6.9	7.1	5.8	4.4	4.1	3.7	3.6	2.9	3.5	27.1

Sunday 2/1

Vehicles 884 | AM Peak Hour : 11:00 Factor : 0.82 | PM Peak Hour : 01:30 Factor : 0.86

Errors: Axles Used : A: 99.00 % B : 99.00 % | Avg Axles/Vehicle : 2.12 | Avg Two Axle Spacing : 9.8 ft.

Speed: Avg Speed : 37.5 MPH | Percentiles : 10%: 32.2 15%: 33.6 50%: 37.9 85%: 42.7 90%: 43.7

Class %	0.2	64.1	23.2	1.5	7.6	1.6	0.0	0.3	0.5	0.6	0.0	0.1	0.3
Gap %	10.7	6.1	5.0	5.9	4.9	5.3	3.3	4.9	4.0	3.4	3.0	2.3	41.3

Monday 2/2

Vehicles 667 | AM Peak Hour : 07:45 Factor : 0.72 | PM Peak Hour : * Factor : *

Errors: Axles Used : A: 95.00 % B : 95.00 % | Avg Axles/Vehicle : 2.44 | Avg Two Axle Spacing : 10.3 ft.

Speed: Avg Speed : 37.7 MPH | Percentiles : 10%: 32.6 15%: 34.1 50%: 37.9 85%: 42.5 90%: 43.6

Class %	0.4	52.6	31.6	0.7	9.6	1.2	0.0	1.0	0.6	0.3	0.0	0.3	1.5
Gap %	21.9	16.2	9.9	8.7	6.7	3.6	3.9	3.7	2.4	2.0	2.4	1.2	17.6

Heading1

Heading2

Heading3

Title1 : 2-8 Site: Talley Way

Title2 : Talley Way

Title3 : Tennant Way to P Direction: N

Titles	Class	Bikes	Cars & Tlrs	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi
	Gap [Secs]	5- 9	10- 14	15- 19	20- 24	25- 29	30- 34	35- 39	40- 44	45- 49	50- 54	55- 59	60- 64	65- 99'
Monday 1/26	Class %	0.6	50.4	30.7	1.2	10.6	1.4	0.0	1.8	1.2	0.8	0.2	0.2	0.9
	Gap %	23.1	17.5	10.7	10.0	6.9	5.4	4.6	4.5	2.1	1.9	1.4	2.1	10.0
Tuesday 1/27	Class %	0.4	48.1	28.4	1.6	13.0	1.9	0.0	1.5	1.5	1.3	0.2	0.0	2.1
	Gap %	18.0	12.8	10.2	7.1	7.6	6.5	4.3	4.2	2.9	3.1	2.7	2.1	18.4
Wednesday 1/28	Class %	0.7	49.0	27.9	1.7	11.4	2.1	0.2	1.7	1.4	1.8	0.2	0.1	2.0
	Gap %	20.9	13.2	11.0	8.3	6.1	6.8	4.0	4.2	3.3	2.7	2.5	2.1	15.0
Thursday 1/29	Class %	0.5	48.9	28.1	1.5	12.2	1.5	0.1	1.5	1.9	1.9	0.1	0.0	1.8
	Gap %	21.2	13.4	9.9	9.8	6.6	6.3	4.6	3.5	3.2	1.7	1.8	1.6	16.3
Friday 1/30	Class %	0.9	48.4	28.1	1.6	12.3	1.4	0.0	1.8	2.1	1.6	0.1	0.0	1.6
	Gap %	19.7	14.7	10.2	9.6	7.5	5.6	4.7	3.8	2.7	2.6	2.1	2.0	14.7
Saturday 1/31	Class %	0.1	56.8	27.9	1.3	9.5	0.8	0.3	0.8	1.5	0.6	0.1	0.1	0.2
	Gap %	11.5	9.2	7.6	7.4	5.2	5.6	5.0	4.9	4.0	3.4	2.7	2.9	30.6
Sunday 2/1	Class %	0.1	60.0	27.0	1.6	7.4	1.2	0.2	0.5	0.6	0.7	0.0	0.0	0.6
	Gap %	6.4	5.8	6.1	3.3	4.6	4.3	4.7	3.7	3.6	4.1	2.2	2.1	49.2
Monday 2/2	Class %	0.4	38.2	23.1	3.0	13.7	3.4	0.2	2.6	3.2	4.5	0.0	0.2	7.5
	Gap %	10.3	9.7	8.6	7.5	7.2	6.1	5.8	4.2	3.1	2.2	1.9	1.7	31.7

Day	Vehicles	AM Peak Hour	AM Factor	PM Peak Hour	PM Factor	Axles Used A	Axles Used B	Avg Axles/Vehicle	Avg Two Axle Spacing	Avg Speed	10%	15%	50%	85%	90%
Monday 1/26	1,922	11:00	0.92	05:15	0.77	97.00 %	97.00 %	2.26	10.2 ft.	37.0 MPH	31.8	33.0	37.4	41.9	43.1
Tuesday 1/27	2,261	08:30	0.90	05:15	0.86	96.00 %	96.00 %	2.28	10.3 ft.	35.1 MPH	29.6	30.7	35.8	39.8	41.5
Wednesday 1/28	2,656	09:30	0.98	05:00	0.77	96.00 %	96.00 %	2.31	10.2 ft.	36.4 MPH	31.1	32.1	36.9	40.7	42.4
Thursday 1/29	2,645	09:30	0.79	05:15	0.93	95.00 %	95.00 %	2.31	10.3 ft.	36.1 MPH	31.0	31.9	36.7	40.3	42.1
Friday 1/30	2,660	09:30	0.85	04:45	0.88	96.00 %	96.00 %	2.28	10.2 ft.	36.7 MPH	31.4	32.4	37.2	41.5	42.9
Saturday 1/31	1,420	10:45	0.83	03:30	0.93	97.00 %	97.00 %	2.15	10.0 ft.	36.0 MPH	30.6	31.6	36.9	41.3	42.7
Sunday 2/1	813	10:45	0.88	02:00	0.72	99.00 %	99.00 %	2.12	9.8 ft.	36.9 MPH	31.4	32.6	37.4	42.2	43.5
Monday 2/2	468	08:15	0.91	*	*	95.00 %	95.00 %	2.44	10.3 ft.	36.7 MPH	31.3	32.2	37.0	41.6	43.2

Heading1

Heading2

Heading3

Title1 : 2-8 Site: Talley Way

Title2 : Talley Way Date: 01/26/09

3 : Tennant Way to P

Interval Begin	Mon 26 S	Mon 26 N	Tue 27 S	Tue 27 N	Wed 28 S	Wed 28 N	Thu 29 S	Thu 29 N	Fri 30 S	Fri 30 N	Sat 31 S	Sat 31 N	Sun 1 S	Sun 1 N	Weekday Avg. S	Weekday Avg. N
12:AM	*	*	21	33	18	48	20	35	16	36	21	45	17	17	18	38
01:00	*	*	7	16	9	27	7	26	18	38	23	31	5	8	10	26
02:00	*	*	19	25	12	27	17	33	10	23	4	34	8	12	14	27
03:00	*	*	9	33	10	19	10	28	7	8	10	10	6	4	9	22
04:00	*	*	17	20	13	18	16	18	15	19	15	8	6	4	15	18
05:00	*	*	38	20	34	26	38	24	36	28	10	12	6	9	36	24
06:00	*	*	70	66	66	61	65	62	45	48	10	15	3	10	61	59
07:00	*	*	134	95	144	104	151	99	127	83	19	23	11	6	139	95
08:00	*	*	204	108	237	132	243	129	227	130	49	32	23	16	227	124
09:00	*	*	183	114	194	153	203	139	189	148	65	55	33	28	192	138
10:00	30	24	111	102	155	162	143	153	153	145	68	73	34	35	118	117
11:00	153	132	123	107	132	147	165	137	168	143	88	75	66	48	148	133
12:PM	163	184	136	125	169	164	180	162	172	175	139	121	88	74	164	162
01:00	159	165	123	157	176	169	180	174	189	190	123	128	100	78	165	171
02:00	195	157	168	145	175	192	192	164	189	207	133	136	83	98	183	173
03:00	198	202	168	168	161	178	195	199	208	215	133	127	85	75	186	192
04:00	209	249	209	225	240	214	226	271	243	240	115	143	61	65	225	239
05:00	223	297	201	267	215	300	240	307	258	287	103	120	57	50	227	291
06:00	175	251	147	196	174	224	148	230	184	226	92	70	41	29	165	225
07:00	93	120	87	107	103	124	99	110	113	106	54	55	44	41	99	113
08:00	44	62	45	51	52	65	49	61	60	74	43	34	35	37	50	62
09:00	36	43	24	35	42	46	48	33	33	41	35	27	33	31	36	39
10:00	30	28	30	31	33	28	24	36	30	33	16	22	26	21	29	31
11:00	30	17	33	22	33	38	29	18	53	24	29	29	16	23	35	23
Totals	1,738	1,931	2,307	2,268	2,597	2,666	2,688	2,648	2,743	2,667	1,397	1,425	887	819	2,551	2,542
Combined	3,669		4,575		5,263		5,336		5,410		2,822		1,706		5,093	
Split %	47.4	52.6	50.4	49.6	49.3	50.7	50.4	49.6	50.7	49.3	49.5	50.5	52.0	48.0	50.1	49.9
AM																
Peak Hr	11:00	11:00	08:00	09:00	08:00	10:00	08:00	10:00	08:00	09:00	11:00	11:00	11:00	11:00	08:00	09:00
Volume	153	132	204	114	237	162	243	153	227	148	88	75	66	48	227	138
PM																
PeakHr	05:00	05:00	04:00	05:00	04:00	05:00	05:00	05:00	05:00	05:00	12:00	04:00	01:00	02:00	05:00	05:00
Volume	223	297	209	267	240	300	240	307	258	287	139	143	100	98	227	291

Heading1

Heading2

Heading3

Title1 : 2-8 | Site: Talley Way

Title2 : Talley Way | Date: 02/02/09

3 : Tennant Way to P

Interval	Mon 2		Tue 3		Wed 4		Thu 5		Fri 6		Sat 7		Sun 8		Weekday Avg.	
Begin	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N
12:AM	6	11	*	*	*	*	*	*	*	*	*	*	*	*	6	11
01:00	10	11	*	*	*	*	*	*	*	*	*	*	*	*	10	11
02:00	5	5	*	*	*	*	*	*	*	*	*	*	*	*	5	5
03:00	10	12	*	*	*	*	*	*	*	*	*	*	*	*	10	12
04:00	8	11	*	*	*	*	*	*	*	*	*	*	*	*	8	11
05:00	43	23	*	*	*	*	*	*	*	*	*	*	*	*	43	23
06:00	77	75	*	*	*	*	*	*	*	*	*	*	*	*	77	75
07:00	136	95	*	*	*	*	*	*	*	*	*	*	*	*	136	95
08:00	228	139	*	*	*	*	*	*	*	*	*	*	*	*	228	139
09:00	144	85	*	*	*	*	*	*	*	*	*	*	*	*	144	85
10:00	0	1	*	*	*	*	*	*	*	*	*	*	*	*	0	1
11:00	0	0	*	*	*	*	*	*	*	*	*	*	*	*	0	0
12:PM	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Totals	667	468	0	0	0	0	0	0	0	0	0	0	0	0	667	468
Combined	1,135		0		0		0		0		0		0		1,135	
Split %	58.8	41.2	0.0	.0	0.0	.0	0.0	.0	0.0	.0	0 0	.0	0.0	.0	58.8	41.2
AM																
Peak Hr	08:00	08:00	*	*	*	*	*	*	*	*	*	*	*	*	08:00	08:00
Volume	228	139	*	*	*	*	*	*	*	*	*	*	*	*	228	139
PM																
PeakHr	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Volume	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

Attachment B:

Synchro Operational Outputs

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	40	175	125	10	190	75
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	44	192	137	11	209	82
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	643	143			137	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	643	143			137	
tC, single (s)	6.6	6.4			4.3	
tC, 2 stage (s)						
tF (s)	3.7	3.5			2.4	
p0 queue free %	87	77			84	
cM capacity (veh/h)	344	854			1332	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	236	148	291
Volume Left	44	0	209
Volume Right	192	11	0
cSH	669	1700	1332
Volume to Capacity	0.35	0.09	0.16
Queue Length 95th (ft)	40	0	14
Control Delay (s)	13.3	0.0	6.3
Lane LOS	B		A
Approach Delay (s)	13.3	0.0	6.3
Approach LOS	B		

Intersection Summary			
Average Delay	7.3		
Intersection Capacity Utilization	44.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	20	5	5	25	250	5	35	5	170	20	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.73	0.73	0.73	0.85	0.85	0.85	0.88	0.88	0.88	0.86	0.86	0.86
Hourly flow rate (vph)	7	27	7	6	29	294	6	40	6	198	23	6
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	29			34			250	86	31	258	236	176
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	29			34			250	86	31	258	236	176
tC, single (s)	4.1			4.6			7.1	6.5	6.9	7.2	6.7	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.7			3.5	4.0	3.9	3.6	4.2	3.3
p0 queue free %	100			100			99	95	99	70	96	99
cM capacity (veh/h)	1597			1317			678	801	884	652	632	872

Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2
Volume Total	41	329	51	198	29
Volume Left	7	6	6	198	0
Volume Right	7	294	6	0	6
cSH	1597	1317	794	652	669
Volume to Capacity	0.00	0.00	0.06	0.30	0.04
Queue Length 95th (ft)	0	0	5	32	3
Control Delay (s)	1.2	0.2	9.8	12.9	10.6
Lane LOS	A	A	A	B	B
Approach Delay (s)	1.2	0.2	9.8	12.6	
Approach LOS			A	B	

Intersection Summary			
Average Delay	5.4		
Intersection Capacity Utilization	40.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	75	25	275	190	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	82	27	299	207	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	562	209	212			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	562	209	212			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	90	98			
cM capacity (veh/h)	478	831	1358			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	87	326	212
Volume Left	5	27	0
Volume Right	82	0	5
cSH	794	1358	1700
Volume to Capacity	0.11	0.02	0.12
Queue Length 95th (ft)	9	2	0
Control Delay (s)	10.1	0.8	0.0
Lane LOS	B	A	
Approach Delay (s)	10.1	0.8	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	41.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	50	215	155	10	230	90
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	55	236	170	11	253	99
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			TWLTL
Median storage veh)						2
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	775	170			170	
vC1, stage 1 conf vol	170					
vC2, stage 2 conf vol	604					
vCu, unblocked vol	775	170			170	
tC, single (s)	6.6	6.4			4.3	
tC, 2 stage (s)	5.6					
tF (s)	3.7	3.5			2.4	
p0 queue free %	86	71			80	
cM capacity (veh/h)	393	824			1294	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	55	236	170	11	168	183
Volume Left	55	0	0	0	168	84
Volume Right	0	236	0	11	0	0
cSH	393	824	1700	1700	1294	1294
Volume to Capacity	0.14	0.29	0.10	0.01	0.20	0.20
Queue Length 95th (ft)	12	30	0	0	18	18
Control Delay (s)	15.6	11.1	0.0	0.0	8.5	4.8
Lane LOS	C	B			A	A
Approach Delay (s)	12.0		0.0		6.6	
Approach LOS	B					

Intersection Summary			
Average Delay	7.0		
Intersection Capacity Utilization	30.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	25	5	5	30	305	5	45	5	205	25	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.73	0.73	0.73	0.85	0.85	0.85	0.88	0.88	0.88	0.86	0.86	0.86
Hourly flow rate (vph)	7	34	7	6	35	359	6	51	6	238	29	6
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	35			41			119	98	38	130	102	35
vC1, stage 1 conf vol							51	51		47	47	
vC2, stage 2 conf vol							67	47		83	55	
vCu, unblocked vol	35			41			119	98	38	130	102	35
tC, single (s)	4.1			4.6			7.1	6.5	6.9	7.2	6.7	6.2
tC, 2 stage (s)							6.1	5.5		6.2	5.7	
tF (s)	2.2			2.7			3.5	4.0	3.9	3.6	4.2	3.3
p0 queue free %	100			100			99	94	99	71	96	99
cM capacity (veh/h)	1589			1309			866	810	876	820	771	1043

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	48	41	359	62	238	35
Volume Left	7	6	0	6	238	0
Volume Right	7	0	359	6	0	6
cSH	1589	1309	1700	821	820	806
Volume to Capacity	0.00	0.00	0.21	0.08	0.29	0.04
Queue Length 95th (ft)	0	0	0	6	30	3
Control Delay (s)	1.1	1.1	0.0	9.7	11.2	9.7
Lane LOS	A	A		A	B	A
Approach Delay (s)	1.1	0.1		9.7	11.0	
Approach LOS				A	B	

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	35.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	90	35	335	230	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	98	38	364	250	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				TWLTL	None	
Median storage veh)				2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	693	253	255			
vC1, stage 1 conf vol	253					
vC2, stage 2 conf vol	440					
vCu, unblocked vol	693	253	255			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	88	97			
cM capacity (veh/h)	574	786	1310			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	103	38	364	255
Volume Left	5	38	0	0
Volume Right	98	0	0	5
cSH	771	1310	1700	1700
Volume to Capacity	0.13	0.03	0.21	0.15
Queue Length 95th (ft)	12	2	0	0
Control Delay (s)	10.4	7.8	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	10.4	0.7		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	31.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	435	250	395	665	275	180
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	478	275	434	731	302	198
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			TWLTL
Median storage veh)						2
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1236	434			434	
vC1, stage 1 conf vol	434					
vC2, stage 2 conf vol	802					
vCu, unblocked vol	1236	434			434	
tC, single (s)	6.4	6.4			4.3	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.5			2.4	
p0 queue free %	0	53			71	
cM capacity (veh/h)	287	582			1027	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	478	275	434	731	302	198
Volume Left	478	0	0	0	302	0
Volume Right	0	275	0	731	0	0
cSH	287	582	1700	1700	1027	1700
Volume to Capacity	1.66	0.47	0.26	0.43	0.29	0.12
Queue Length 95th (ft)	746	63	0	0	31	0
Control Delay (s)	345.1	16.6	0.0	0.0	10.0	0.0
Lane LOS	F	C			A	
Approach Delay (s)	225.2		0.0		6.0	
Approach LOS	F					

Intersection Summary			
Average Delay	71.4		
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	35	5	10	55	575	5	50	10	310	30	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.73	0.73	0.73	0.85	0.85	0.85	0.88	0.88	0.88	0.86	0.86	0.86
Hourly flow rate (vph)	7	48	7	12	65	676	6	57	11	360	35	6
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	65			55			177	153	51	193	157	65
vC1, stage 1 conf vol							65	65		88	88	
vC2, stage 2 conf vol							111	88		105	68	
vCu, unblocked vol	65			55			177	153	51	193	157	65
tC, single (s)	4.1			4.5			7.1	6.5	6.6	7.2	6.7	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.7	
tF (s)	2.2			2.6			3.5	4.0	3.7	3.5	4.2	3.3
p0 queue free %	100			99			99	93	99	53	95	99
cM capacity (veh/h)	1537			1339			808	774	919	772	737	1005

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	62	76	676	74	360	41
Volume Left	7	12	0	6	360	0
Volume Right	7	0	676	11	0	6
cSH	1537	1339	1700	796	772	766
Volume to Capacity	0.00	0.01	0.40	0.09	0.47	0.05
Queue Length 95th (ft)	0	1	0	8	63	4
Control Delay (s)	0.8	1.2	0.0	10.0	13.7	10.0
Lane LOS	A	A		A	B	A
Approach Delay (s)	0.8	0.1		10.0	13.3	
Approach LOS				A	B	

Intersection Summary			
Average Delay	4.8		
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	15	110	35	625	345	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	120	38	679	375	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				TWLTL	None	
Median storage veh)				2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1136	380	386			
vC1, stage 1 conf vol	380					
vC2, stage 2 conf vol	755					
vCu, unblocked vol	1136	380	386			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	82	97			
cM capacity (veh/h)	407	667	1173			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	136	38	679	386
Volume Left	16	38	0	0
Volume Right	120	0	0	11
cSH	619	1173	1700	1700
Volume to Capacity	0.22	0.03	0.40	0.23
Queue Length 95th (ft)	21	3	0	0
Control Delay (s)	12.4	8.2	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	12.4	0.4		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	47.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	450	330	450	670	355	215
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	495	363	495	736	390	236
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			TWLTL
Median storage veh)						2
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1511	495			495	
vC1, stage 1 conf vol	495					
vC2, stage 2 conf vol	1016					
vCu, unblocked vol	1511	495			495	
tC, single (s)	6.5	6.4			4.3	
tC, 2 stage (s)	5.5					
tF (s)	3.6	3.5			2.4	
p0 queue free %	0	32			60	
cM capacity (veh/h)	195	537			973	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	495	363	495	736	390	236
Volume Left	495	0	0	0	390	0
Volume Right	0	363	0	736	0	0
cSH	195	537	1700	1700	973	1700
Volume to Capacity	2.53	0.68	0.29	0.43	0.40	0.14
Queue Length 95th (ft)	1046	127	0	0	49	0
Control Delay (s)	742.4	24.6	0.0	0.0	11.1	0.0
Lane LOS	F	C			B	
Approach Delay (s)	438.7		0.0		6.9	
Approach LOS	F					

Intersection Summary			
Average Delay	140.1		
Intersection Capacity Utilization	78.3%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	45	10	15	55	665	10	65	10	380	40	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.73	0.73	0.73	0.85	0.85	0.85	0.88	0.88	0.88	0.86	0.86	0.86
Hourly flow rate (vph)	14	62	14	18	65	782	11	74	11	442	47	12
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			TWLTL							
Median storage veh)					2							
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	65			75			231	196	68	244	203	65
vC1, stage 1 conf vol							96	96		100	100	
vC2, stage 2 conf vol							135	100		144	103	
vCu, unblocked vol	65			75			231	196	68	244	203	65
tC, single (s)	4.1			4.5			7.1	6.5	6.8	7.2	6.7	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.7	
tF (s)	2.2			2.6			3.5	4.0	3.8	3.5	4.2	3.3
p0 queue free %	99			99			98	90	99	38	93	99
cM capacity (veh/h)	1537			1314			752	745	854	710	705	1005

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	89	82	782	97	442	58
Volume Left	14	18	0	11	442	0
Volume Right	14	0	782	11	0	12
cSH	1537	1314	1700	757	710	750
Volume to Capacity	0.01	0.01	0.46	0.13	0.62	0.08
Queue Length 95th (ft)	1	1	0	11	109	6
Control Delay (s)	1.2	1.8	0.0	10.4	18.1	10.2
Lane LOS	A	A		B	C	B
Approach Delay (s)	1.2	0.2		10.4	17.1	
Approach LOS				B	C	

Intersection Summary			
Average Delay	6.3		
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	15	145	50	625	425	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	158	54	679	462	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				TWLTL	None	
Median storage veh)				2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1255	467	473			
vC1, stage 1 conf vol	467					
vC2, stage 2 conf vol	788					
vCu, unblocked vol	1255	467	473			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	74	95			
cM capacity (veh/h)	377	596	1089			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	174	54	679	473
Volume Left	16	54	0	0
Volume Right	158	0	0	11
cSH	565	1089	1700	1700
Volume to Capacity	0.31	0.05	0.40	0.28
Queue Length 95th (ft)	33	4	0	0
Control Delay (s)	14.2	8.5	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	14.2	0.6		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	450	330	450	670	355	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	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
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1703	1324	1696	1583	1480	1652
Flt Permitted	0.95	1.00	1.00	1.00	0.15	1.00
Satd. Flow (perm)	1703	1324	1696	1583	231	1652
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	495	363	495	736	390	236
RTOR Reduction (vph)	0	61	0	486	0	0
Lane Group Flow (vph)	495	302	495	250	390	236
Heavy Vehicles (%)	6%	22%	12%	2%	22%	15%
Turn Type		pm+ov		Perm	pm+pt	
Protected Phases	8	1	2		1	6
Permitted Phases		8		2	6	
Actuated Green, G (s)	22.8	39.5	23.0	23.0	43.7	43.7
Effective Green, g (s)	22.8	39.5	23.0	23.0	43.7	43.7
Actuated g/C Ratio	0.31	0.53	0.31	0.31	0.59	0.59
Clearance Time (s)	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
Lane Grp Cap (vph)	521	773	524	489	415	969
v/s Ratio Prot	c0.29	0.09	0.29		c0.21	0.14
v/s Ratio Perm		0.14		0.16	c0.34	
v/c Ratio	0.95	0.39	0.94	0.51	0.94	0.24
Uniform Delay, d1	25.3	10.4	25.1	21.1	19.2	7.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	27.3	0.3	26.0	0.9	29.0	0.1
Delay (s)	52.6	10.7	51.1	22.0	48.2	7.6
Level of Service	D	B	D	C	D	A
Approach Delay (s)	34.9		33.7			32.9
Approach LOS	C		C			C

Intersection Summary			
HCM Average Control Delay	33.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	74.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	450	330	450	670	355	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3303	1324	1696	1583	1480	1652
Flt Permitted	0.95	1.00	1.00	1.00	0.18	1.00
Satd. Flow (perm)	3303	1324	1696	1583	285	1652
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	495	363	495	736	390	236
RTOR Reduction (vph)	0	68	0	467	0	0
Lane Group Flow (vph)	495	295	495	269	390	236
Heavy Vehicles (%)	6%	22%	12%	2%	22%	15%
Turn Type		pm+ov		Perm	pm+pt	
Protected Phases	8	1	2		1	6
Permitted Phases		8		2	6	
Actuated Green, G (s)	15.2	31.5	22.6	22.6	42.9	42.9
Effective Green, g (s)	15.2	31.5	22.6	22.6	42.9	42.9
Actuated g/C Ratio	0.23	0.48	0.34	0.34	0.65	0.65
Clearance Time (s)	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
Lane Grp Cap (vph)	760	711	580	541	480	1072
v/s Ratio Prot	c0.15	0.10	0.29		c0.20	0.14
v/s Ratio Perm		0.12		0.17	c0.33	
v/c Ratio	0.65	0.41	0.85	0.50	0.81	0.22
Uniform Delay, d1	23.0	11.3	20.2	17.2	12.9	4.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	0.4	11.7	0.7	10.1	0.1
Delay (s)	25.1	11.7	31.9	18.0	23.0	4.9
Level of Service	C	B	C	B	C	A
Approach Delay (s)	19.4		23.6			16.2
Approach LOS	B		C			B

Intersection Summary			
HCM Average Control Delay	20.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	66.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX C

ACCESS MANAGEMENT PLAN

TECHNICAL MEMORANDUM

Access Management Process
Talley Way Corridor Transportation Study Implementation Plan

Prepared by David Evans and Associates, Inc.

June 23, 2009

This memorandum presents the elements and considerations for developing an access management plan for the Talley Way corridor. As part of preparing the memorandum, the Longview-Kelso Urban Area Access Management for Roads and Streets document was reviewed along with Chapter 3 of the City of Kelso Engineering Design Manual. A summary of the plan review is included for reference at the end of this memorandum.

Need for Developing an Access Management Plan

Talley Way is classified as a minor arterial roadway and serves primarily industrial uses between Colorado Street and SR-432. The roadway is currently two lanes wide with few curbs and no sidewalks. Most of the businesses and vacant parcels fronting Talley Way do not have clearly defined driveways along Talley Way

With the reconstruction of Talley Way to minor arterial standards that include two through travel lanes, a two-way center turn lane, and sidewalks, an access management plan will need to be an integral part of the planned improvement. The access management plan will enable the City of Kelso and business owners to better define and designate driveways to create a safer and more efficient roadway that can benefit all users when Talley Way is improved to urban standards.

Elements of an Access Management Plan

The primary goal of an access management program is to enhance mobility and improve safety by limiting the number of traffic conflicts associated with cross streets and driveways. Traffic conflicts can be reduced by controlling the frequency, location and orientation of access points along the arterial or by separating the conflict areas through traffic operations improvements. The strategy for developing a plan for Talley Way should be a balanced, comprehensive program that provides reasonable access while maintaining the safety and efficiency of traffic movement. Standards should be developed for managing driveway spacing, driveway width, number of driveways per property frontage, driveway sight distance, joint driveways, cross access, and other access management techniques.

As the access management plan for Talley Way is developed, business owners should be consulted in designating the location and type of driveways. Understanding the needs of a business and the limitations of internal site circulation must be considered in the process. Where possible, efforts should be made to meet both the design standards on safe spacing and the access needs of the individual parcels.

Minimum Driveway Spacing

Regulating the minimum spacing of driveways and public street intersections along Talley Way will reduce the frequency of conflict by separating adjacent, basic conflict areas and limiting the number of basic conflict points per length of roadway.

Access spacing standards for minor arterial roadways vary by jurisdiction and typically range from 300 to 600 feet, depending on posted speed, number of travel lanes, etc. The Kelso-Longview plan includes recommended driveway spacing of 360 feet and unsignalized intersection spacing of 650 feet for minor arterials. These standards may be appropriate for Talley Way but the plan should examine parcel size and the spacing between intersecting roadways before establishing target spacing standards.

In cases where standard access spacing cannot be met due to the specific characteristics of a business and its use, the spacing should not be reduced below the safe stopping sight distance for the posted speed on the roadway. Safe stopping sight distance shall be consistent with AASHTO guidelines[1].

Driveway Design

Regulating driveway design will reduce conflict areas along the Talley Way corridor. Maximum width should be a function of the types of vehicles using a facility as well as the nature of the development to be serviced. Consideration must be given to operating conditions, volume, geometry, sight distance, angle of intersection, and alignment (horizontal and vertical). A standard City of Kelso driveway approach is generally not suitable for the larger vehicles and the City may want to consider using the road approach designs used by WSDOT as shown on exhibit 1340-5 at the end of this memorandum.

Factors to consider for driveway design width on a minor arterial are:

- Width - Recommended driveway widths generally range from a minimum width of 15 feet to a maximum of 40 feet. For driveways that accommodate large trucks, corner radii on driveways should also be considered.
- Direction - Both two-way and one-way driveways could be permitted on Talley Way but appropriate signage is needed to indicate one-way travel. Internal site circulation may be a factor in determining whether a single two-way driveway or a pair of one-way driveways is most appropriate.
- Angle - Two-way driveways should meet the street at a 90-degree angle while one-way driveways can be permitted at a 60-degree angle.
- Maneuvering – All driveways should accommodate direct forward in/out movements with no backing or other maneuvering permitted within the street right-of-way.

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[1] American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets, 2004.

Number of Driveways per Property Frontage

Minimizing the number of driveways per length of street reduces the number of basic conflict points, the frequency of conflicts, and the severity of conflicts. There are many different ways to minimize the number of driveways per length of roadway. The number of access points per property frontage can be restricted through the following techniques:

- Limit the number of driveways per property frontage to a single drive, unless the frontage exceeds ¼ mile.
- Restrict access from development located on the corner of a public street intersection to access on the cross-street only.
- Designate the number of driveways permitted to each existing property before development, and deny additional driveways regardless of future subdivision of that property.
- Encourage businesses to share driveways when practical.

Joint and Cross Access

Permitting joint driveway access and allowing cross access between parking lots are also methods of controlling street access. Joint driveways reduce the number of driveways along the roadway by combining the driveways of adjacent properties into one driveway. Cross access can reduce the number of parking lot accesses needed by allowing circulation between lots without using the street system. Joint and cross access can be developed through the following techniques:

- As construction plans are developed or at the permit-authorization stage, encourage adjacent property owners to consider joint-use driveways in lieu of separate driveways. Driveway pairs with more than 50 vehicles using each driveway per hours are good candidates for this technique.
- As construction plans are developed or at the permit-authorization stage, consolidate existing access to sites whenever separate parcels are assembled under one purpose, plan entity, or usage.

Driveway Sight Distance

Adequate intersection sight distance must be provided at all existing and future signalized and unsignalized intersections, including driveways. Access driveways should not be permitted where the sight distance is not adequate to allow a motorist to come to a safe stop. Access driveways should be designed such that they provide adequate intersection sight distance per AASHTO guidelines[2] and should consider both passenger vehicles and trucks. The guidelines

[2] American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets, 2004.

recommended minimum sight distances for a typical vehicle to either safely cross the roadway or safely merge with mainline traffic when turning left or right from a stopped position at the access point.

Internal Design and Circulation Plans

As the access management plan for Talley Way is developed, adequate internal on-site circulation needs to be considered for all adjacent properties. An internal design and circulation plan should be required during all future site plan approval and access permitting processes. Sites having direct access to Talley Way should be designed so that they provide adequate handling of limited parking and maneuvering areas, minimize internal interference by supplying queue storage areas for egress movements, and distribute ingress vehicles into the main circulation patterns with minimal hesitation and confusion. Internal site design should address the following factors:

- Driveway throats should be designed long enough to allow free movement on and off the roadway.
- Wherever possible, the long sides of rectangular parking areas should be parallel.
- Curved, triangular, and other irregularly-shaped parking areas should be avoided.

Visual Clues of the Driveway

Visual clues of driveways help reduce the severity of driveway conflicts. This is accomplished by increasing driver perception time thereby limiting maximum deceleration requirements of the mainline roadway vehicles.

As the access management plan for Talley Way is developed, driveways should be designed so that they are readily visible to the approaching drivers in the through traffic lanes. Visual clues should provide information as to both the location and geometry of the driveway to the driver. The driver should be able to locate and identify the driveway at a distance that is at least equal to the decision sight distance (the perception-reaction distance plus the distance required to maneuver to a turn at a speed of ten miles per hour or less).

If circumstances exist so that adequate sight distance cannot be provided, advance warning will be required. Consideration must be given to the geometric and grade layout, traffic level, and roadway type. Recommended visual cues include flashing beacons, warning signs, contrasting pavements, reflective treatments, driveway lighting, or any combination of the above. Installation of warning devices must adhere to recommendations outlined in the MUTCD[3].

Other Considerations

Although Talley Way is designated as a minor arterial, it travels through a primarily industrial area. Some jurisdictions have developed roadway standards that are specific to industrial areas.

[3] Manual on Uniform Traffic Control Devices, 2003.

These standards can take into consideration the roadway users and a geometric needs specific to industrial development.

For example, the City of Vancouver has three industrial street standards including principal industry, secondary industry, and local industry roadways. Elements of these standards include, minimum right-of-way, lane widths, median widths, parking, roadway widths, design speeds, minimum and maximum grades, design volumes, access spacing, design ESAL section, minimum pavement section, sidewalks, and intersection radii.

Conclusions

Developing an access management plan to be implemented with the reconstruction of Talley Way will enable the City of Kelso and business owners to better define and designate driveways and create a safer and more efficient roadway that can benefit all users. While determining spacing standards and design criteria for public and private access points is a key element of an access management plan, understanding the needs of a business and the limitations of internal site circulation must also be considered in the process. Where possible, efforts should be made to meet both the design standards on safe spacing and the access needs of the individual parcels.

Longview-Kelso Urban Area
Access Management for Roads and Streets

In 2002, the Cities of Kelso and Longview and Cowlitz County teamed with the Cowlitz-Wahkiakum Council of Governments (CWCOG) to develop an access management program for their roads and streets. The result of this effort was a proposed Access Management Ordinance developed for the Kelso-Longview urban area. Based on a review of the Kelso municipal code, it does not appear that this ordinance was adopted; however, several of the recommendations from the report are discussed below.

The report includes definitions for functional classification, including the minor arterial classification applicable for Talley Way. The document defines a minor arterial as follows:

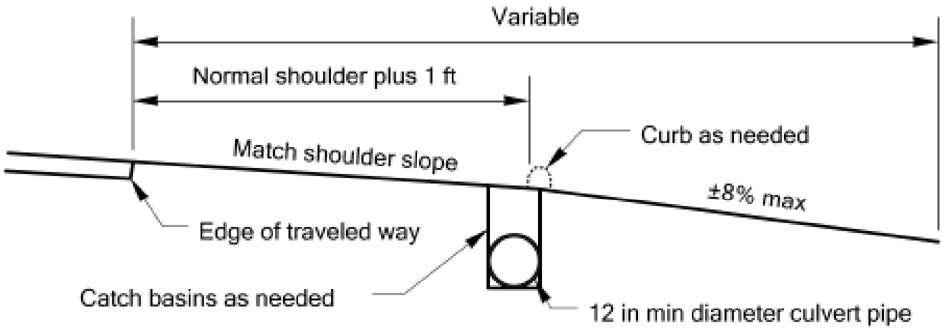
- The purpose of a minor arterial is to provide movement within sub-areas of the city, and to distribute trips from neighborhood collectors and principal arterials. Minor arterials serve through traffic and can provide direct access to commercial, industrial and multi-family development but generally do not provide direct access for residential properties.
- For minor arterial roadways, access to adjacent land use is balanced with through-traffic movement. Partial access control is required.

The report also identifies access standards for each functional classification of roadway for different categories of accesses. The recommended spacing guidelines for a minor arterial are:

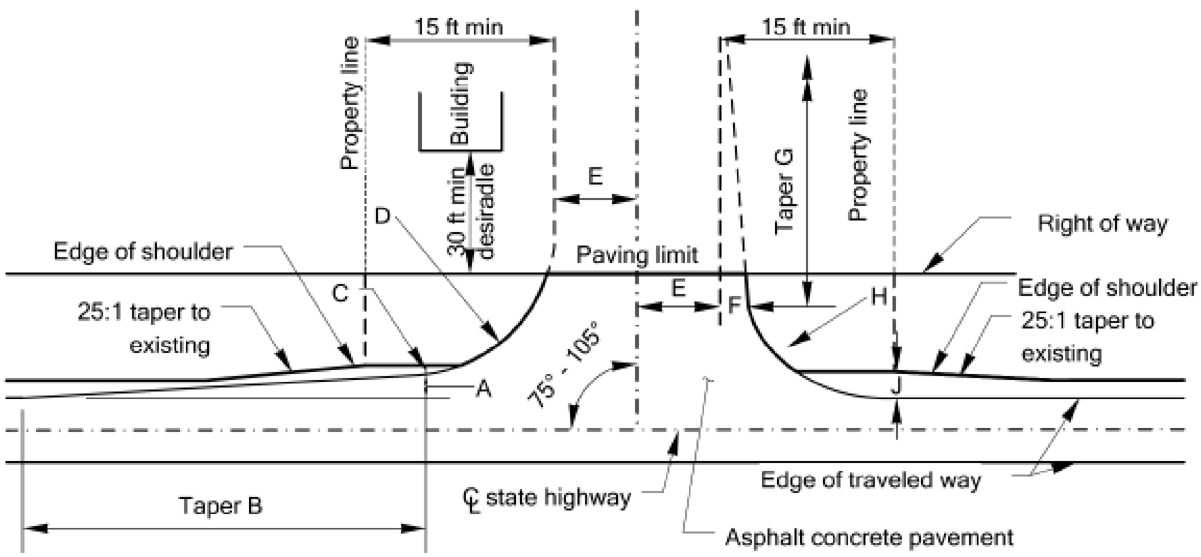
- Signalized Access Spacing – No less than ¼ mile
- Unsignalized Intersection Spacing – 650 feet
- Driveway Spacing – 360 feet (for 35 mph)
- Corner Standards – Driveways on corner parcels shall be placed on the roadway with the lower classification with minimum access set-back from corner of 100 feet
- Restrictive Median Curbs – Restrictive median curbs shall be used to restrict turning and crossing movements on minor arterials if driveway spacing and corner standards cannot be met (length to be sufficient to restrict turning or crossing movements) or at intersections with left-turn lanes (length equal to left-turn lane storage length)

In addition to spacing standards, the report also recommends that each individual property should be permitted one access. Furthermore, if the property has frontage along two streets, access should be from the lower classification street unless approved through the variance process.

Variances to the access management standards may be granted. Factors that may justify a variance may include topography, right-of-way, existing construction or physical conditions, or other geographic conditions that impose an unusual hardship on the applicant, and an equivalent alternative which can accomplish the same purpose is available. Variances may need to be supported by a traffic impact study.



Profile Controls



Condition	A	B	C	D	E	F	G	H	J
Primary SU and less	—	—	[1]	30	15	—	—	30	[1]
Primary combination Vehicle WB 40	—	—	[1]	65	15	—	—	55	[1]
	4	25	[2]	50	15	7	25	45	[1]
Primary combination Vehicle WB 50 and doubles	—	—	[1]	70	20	—	—	50	[1]
	4	25	[3]	55	20	—	—	50	[1]

Notes:

[1] Normal shoulder width (see Chapter 1140).

[2] Normal shoulder width less A.

[3] For larger vehicles, use turning templates (see Chapter 1310).

[4] Vertical curves between the shoulder slope and the road approach grade not to exceed a 3¼-inch hump or a 2-inch depression in a 10-ft cord.

General:

Values given are in ft.

Road Approach Design Template D1

Exhibit 1340-5

APPENDIX D

TALLEY WAY BRIDGE ASSESSMENT

TECHNICAL MEMORANDUM

Bridge Assessment
Talley Way Corridor Transportation Study Implementation Plan

Prepared by David Evans and Associates, Inc.

May 12, 2009

This memorandum presents the elements and assessments of the Talley Way Bridge across the Coweeman River at the south end of this project. As part of preparing the memorandum, the following documents were reviewed:

- As-built Existing Bridge Plans, Coweeman River Bridge, 1960
- City of Kelso, Talley Way Bridge No. 202, Load Rating, July, 2007
- Bridge Inspection Report, Kelso 202, Talley Way, 12/16/2008
- Underwater Inspection Report, KELSO 202, Talley Way, 10/20/2002
- Bridge Photos

CONFIGURATION OF THE BRIDGE IN THE RECONSTRUCTION OF TALLEY WAY

The current plan for Talley Way shows two 11 foot wide through travel lanes and one 12 foot wide two-way center turn lane, two 5 ft. wide bike lanes, totaling 44 feet between curbs, and two 6 ft. wide raised sidewalks for a total of 56 feet between railings. At the south end Talley way crosses the Coweeman River on an existing bridge and immediately intersects ramp lanes for SR 432. The section on the bridge calls for the same travel and bike lane and sidewalk configuration except that the two-way center turn lane becomes a southbound left turn lane. The existing bridge, at 28 feet between curbs, provides only enough width for two traffic lanes, one bike lane, with one 4 ft. wide raised sidewalk for a total of 32 feet. Therefore the existing bridge must be widened, replaced, or augmented by an adjacent independent new bridge to carry the additional lanes and sidewalk.

CONDITION OF THE EXISTING BRIDGE

From a review of the above documents the following deficiencies have become apparent:

1. The bridge load rating summary and its following pages of program output pinpoint a shear weak point in all four of the box girder webs in spans 1 and 3 (total of 8 locations) which result in the low rating factors (RF) for shear and a Sufficiency Rating of 49.98 on the Bridge Inspection Report. The zone of substandard shear capacity is localized over a short length at each of these locations, and is due to a reduction in shear reinforcement capacity before reduction of the shear demand. No damage or distress has been noted during the bridge's nearly 50 year history.
2. The existing bridge was designed in 1960 when little or no seismic analysis/design was done. The existing end piers use battered piles to resist longitudinal load, which is no longer done for seismic reasons. There appears to be no damage or repair attributable to any previous seismic events.

3. The end span to midspan ratio is about 0.52, creating potential uplift load at the end piers under some live load conditions. This uplift is now resisted by uplift capacity at the end pier pile foundations, but this is not compatible with current design practice in conjunction with seismic design.
4. Scour of the pile caps at pier 2 has been a concern in the past, but the recent underwater inspections show the stream thalweg has shifted and become shallower. That changes over time and could be a concern again in the future.
5. The existing bridge barriers are substandard based on current crash test standards, and also the transverse roadway deck reinforcement is inadequate to anchor any retrofitted bridge rails intended to meet current traffic rail design standard.

REPAIR AND UPGRADE CONSIDERATIONS FOR THE EXISTING BRIDGE

The existing bridge as described is not a prime candidate for widening and upgrading as would be required to meet the proposed lane configuration for this project. Still it should not yet be concluded that the only option is to remove and replace it, that being the most expensive option. Following are some considerations to try to utilize the existing structure.

1. Widening or otherwise keeping this bridge as part of the Talley Way improvement project suggests that repair or mitigation should be done to bring up the rating factor, especially since this route will service commercial/industrial business with moderately high Average Daily Truck Traffic on the bridge. The substandard load rating for shear can be largely mitigated by improving and maintaining the condition of the pavement approaching the bridge ends to reduce the impact on the end spans from trucks. A more stringent but expensive method would be to repair the low shear capacity zones. The low shear capacity zones are very localized so the repair would be on short lengths of the girder webs. In this type of bridge it is not easy to get access to the interior webs to do repair, but it is possible to open access through the roadway deck into the box cells in four locations and to do repairs and apply the remainder of the repairs to the outside of the outer webs. In this the superstructure could be brought into compliance with load rating requirements for its intended traffic. The cost of the repair has not yet been analyzed.
2. The existing bridge cannot practically be widened in kind with more Cast-In-Place (CIP) box girder superstructure. Since it is a cast-in-place structure over a river, it requires pile supported falsework to be placed in the stream to support the cast-in-place construction. This may be a permitting issue as well as being more expensive to construct. One suggestion would be to use prestressed girders alongside the CIP box. Some preliminary analysis would be needed to determine stiffness match-up to the existing, especially considering the short existing end spans.
3. The existing bridge was designed without seismic analysis/design/detailing. Is seismic retrofit warranted, and to what degree? It is doubtful that the widened bridge could be retrofitted to meet current seismic requirements. Widening by joining two different types of superstructures has been done, but such action would further complicate seismic analysis/design; and the existing end piers use battered piles to resist longitudinal load, which is no longer done for seismic reasons. The end span to midspan ratio is about 0.52, creating potential uplift load at the end piers under some live load conditions. This is now resisted by the pile foundations, but this is not compatible with current design practice in conjunction with seismic design. Current design practice would shift the longitudinal pier stiffness to the intermediate piers, a conflict with the existing. Some considerable preliminary analysis should be allowed to determine what if any seismic resistance

can be achieved and whether applicable seismic design code could be met. Is the remaining level of risk to the bridge acceptable?

4. Scour of the pile caps at pier 2 should be investigated as part of the design process to keep and widen the existing bridge. Some mitigation may be possible to preclude future scour problems if required in lieu of merely monitoring the scour situation.
5. The bridge barrier on the non-widened side would, of course, need replacement. Can a new barrier be attached to meet applicable code? The acceptable criteria for this and whether the structure can provide or be upgraded to provide the required capacity need to be determined..

Before ruling out or pressing ahead with widening the existing Talley Way Bridge over the Coweeman River, a preliminary bridge design study should be completed.

OTHER OPTIONS

If a preliminary bridge design study determines the existing bridge is not a suitable candidate for widening within acceptable criteria for serviceability and extreme event response (seismic), other options remain. These are presented in concept only, not having been studied or cost estimated:

1. Replace the bridge in stages using the existing bridge to maintain traffic during construction of half of the new, then remove existing and build second half of the new. This would most closely maintain the existing alignment of the roadway over the bridge.
2. Replace the bridge in one stage if a suitable detour can be planned to allow full removal and reconstruction of the bridge with traffic interfering with the contractor's workspace.
3. Replace the bridge in one stage if the alignment can be moved over enough to accommodate the new bridge alongside the existing bridge, maintaining traffic on the existing during construction.
4. If only limited funding is available in the near future, keep the existing bridge, as is, for one direction of traffic and build a new bridge alongside for the other direction. Replace the existing at a later date when funding is available. This assumes that if the existing is left alone, the new codes would not be enforced upon it. This is the least expensive of these options.
5. In all these options removal of the existing will be problematic in that it will need to be propped for stability by temporary piles in the stream because the superstructure is hinged to the pier caps at all piers. It's just another item of permitting and expense.

In Option 4, the existing bridge is utilized with least cost to upgrade, repairing the shear deficiency only and minimizing other modifications. The existing bridge would remain subject to risk from earthquake at the foundations. Depending on the desired roadway alignment, sidewalks and railings on the existing bridge may be modified or removed IF the required new barrier or railing can be attached to meet applicable code. The existing bridge could continue to serve two lanes of one direction of traffic. For the needed new lanes, the opposing direction of traffic could be channeled to a new bridge alongside, designed appropriate to site conditions and meeting all current design codes. Should earthquake ever damage the existing bridge substantially, the new bridge could serve traffic while the existing is repaired or replaced. At that time consideration could be given to joining a replacement bridge to the current new bridge, if desired, to facilitate the optimal traffic channelization demands at that time.

In all cases bridge replacement is the most expensive option and consideration should be given to working the alignment around that fact to the extent possible.

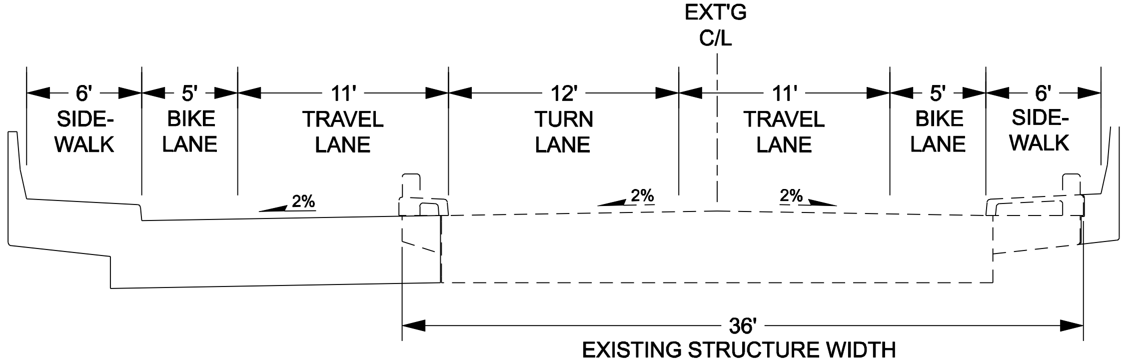
COSTS

Conceptual estimates of costs are as follows:

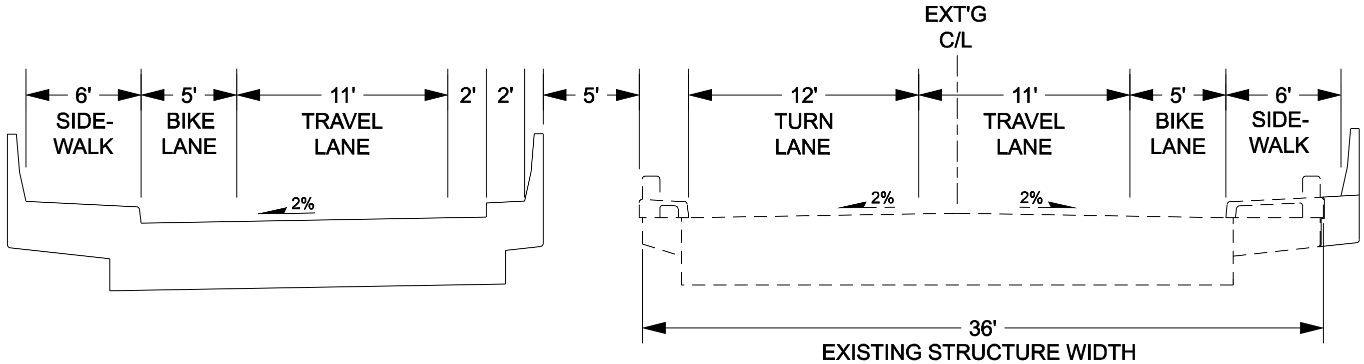
		Widen Existing Structure	Adjacent Structure	Replacement Structure
Square Foot (sf) of Bridge	sf	6466	7076	14396
Base Cost	($/sf)	250	200	190
Demo extg struct (10%)	($/sf))			19
Staging (10%)	($/sf)	25		19
Contingency (25%)	($/sf)	62.5	50	47.5
Engineering (10%)	($/sf)	25	20	19
Total	($/sf)	362.5	270	294.5
Total Cost		$ 2,300,000	$1,900,000	$4,200,000

CONCLUSIONS

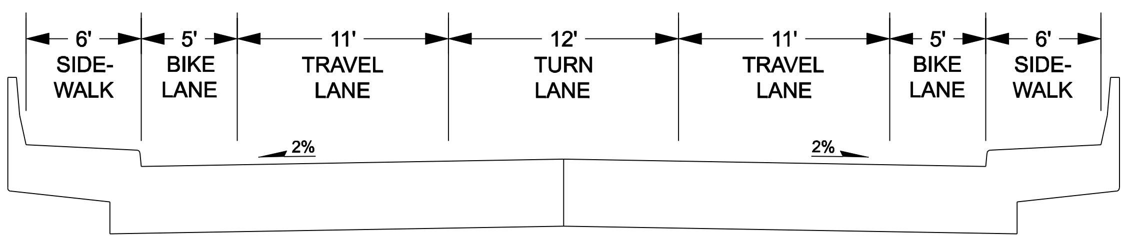
For the Talley Way Bridge across the Coweeman River, several options exist. The feasibility of each and the best choice can only be evaluated after a bridge preliminary plan study is performed on widening of the existing bridge and preferred options. The evaluation of the bridge choice would occur during the preliminary design phase of the project or during a Type Size and Location Study (TS&L) which at a minimum should address the following items: application of design codes, construction problems and feasibility, maintenance of traffic, comparative benefits, and resulting comparative cost estimates. In general the TS&L or preliminary engineering of the bridge will be covered under the overall cost of preliminary engineering. The cost to develop a preliminary design or TS&L study for this particular project would depend on the level of detail needed or requested at the early stage, but would probably be on the order of $80,000 to $90,000.



WIDEN EXISTING STRUCTURE



ADJACENT STRUCTURE



REPLACEMENT STRUCTURE

(NTS)

TALLEY WAY CORRIDOR
TRANSPORTATION STUDY
BRIDGE ASSESSMENT

APPENDIX E

STORMWATER MANAGEMENT

TECHNICAL MEMORANDUM

Stormwater Management Plan
Talley Way Corridor Transportation Study Implementation Plan

Prepared by David Evans and Associates, Inc.

June 24, 2009

The purpose of this memorandum is to provide a general overview of the existing stormwater drainage system and describe the steps necessary to prepare a Stormwater Management Plan (SMP) for the Talley Way corridor.

NEED FOR DEVELOPING A STORMWATER MANAGEMENT PLAN

The City of Kelso is currently considering upgrades to the Talley Way corridor that include multi-modal transportation improvements in the reconstruction of Talley Way to minor arterial standards that include two through travel lanes, a two-way center turn lane, and sidewalks. The SMP will enable the City of Kelso, the Diking District and business owners to better manage the entire drainage area by preventing future drainage problems, addressing existing drainage problems, preserving the natural and beneficial functions of the drainage system and preserving and enhancing stormwater quality.

BACKGROUND

The Talley Way corridor runs through an industrial area located south of the city center and accesses I-5 via the SR432 Talley Way interchange (see attached site map). The corridor is currently a two lane section with typically no curb and some ditch sections along the roadway. The majority of the area is developed with industrial facilities and businesses. The other primary land use within the area is the SW Washington Regional Airport, which is located to the west of the Talley Way corridor. At the south end of the corridor, there is open space that could be developed in the future. North of the corridor area, there is a mix of industrial and residential land uses.

The corridor basin area is bordered by the Coweeman River to the south and east and the Cowlitz River to the west. The corridor basin area is diked along both rivers by the BNSF Railroad embankment and the Coweeman River dike. As a result of the dike system, the area is not within the 100 year flood plain. Although the area is very flat, the ground slopes very gently to the north. Stormwater runoff in the Talley Way basin is generated from a mix of public and private areas. Although all of the runoff ultimately drains into ditches and closed conveyance pipes, there is not currently a clear understanding or record of all of the drainage connections and drainage easements in the area.

In general, much of the drainage along Talley Way runs into open ditches. As previously mentioned, the roadway section is typically not curbed. The ditches drain to the north, into a slough area near Baker Way that becomes a ditch running along the toe of the I-5 slope. To the north, another slough comes from the west under 13th Street and connects into the ditch along the toe of I-5. Two pump stations pump the water in the slough/ditch system directly into the Coweeman River. The first pump station is located near Baker Way and can pump 120 cubic feet per second. The second pump station is located approximately one half mile to the north of the Baker Way Pump station, near Grade Street, and can pump 80 cubic feet per second.

Stormwater from the Kelso Longview Regional Airport ultimately drains to the ditches along Talley Way. The majority of the drainage from the runway enters into a closed drainage system that flows into a large wetland basin and slough remnant just north of the Clary hangar. From there, runway drainage enters a closed pipe system that discharges to the open system along Talley Way. Drainage from the D E F G airport hangars and taxi lane flows to a detention pond which discharges into an open ditch along Parrott Way. Stormwater drainage from the wash rack area goes into another detention/sediment basin that also discharges into the Parrott Way ditch.

ELEMENTS OF A STORMWATER MANAGEMENT PLAN

A SMP should be completed for the Talley Way Corridor that considers the Kelso Longview Regional Airport Master Plan, the development south of the Coweeman River, and any known additional development in the area. While the SMP will evaluate several options for drainage in the area, the emphasis will be on regional stormwater management planning and should include the following main components:

Project Overview

- A general description of the area, location and the proposed elements under consideration for upgrades or development.
- A description of the relevant rules and requirements of the City of Kelso and the Washington State Department of Ecology as they pertain to stormwater-related water quality and water quantity control design and performance standards. In particular, the SMP should reference the rules and requirements of the Stormwater Management Manual for Western Washington. In addition to this, the SMP should include a statement of drainage area-specific water quality and water quantity control objectives for the Talley Way Corridor.

Existing Conditions and Issues

- A characterization and assessment of the drainage area, including descriptions of the drainage area boundaries, existing and projected land uses, soils, topography, water bodies and their status, flood hazard areas, environmentally sensitive areas, and existing impairments such as degraded or eroded streambeds or embankments.
- An investigation to determine the location and size of all of the existing drainage systems, connections, and easements within the study area. This task is a fundamental component of the SMP in that it will provide the foundation upon which all of the decisions regarding future drainage design will be based. The task will include both surveying work and a review of available existing drainage information from the City of Kelso, the Diking District and the existing property owners or business owners in the area.

Proposed Stormwater Management Approach

- A hydrologic and hydraulic model or analysis of the drainage area which addresses existing land uses and projected land uses assuming full development under existing and expected zoning. The model should be calibrated with actual rainfall and runoff data to ensure reasonably accurate predictions of runoff events.
- An evaluation of whether an open, closed, or mixed stormwater conveyance system is most appropriate for the corridor. The chosen conveyance system in the area will have to be designed to have capacity to convey stormwater from the roadway, the existing properties along Talley Way, and other existing and future upstream developments. Additionally, the conveyance system

will need to convey runoff from the Kelso Longview Regional Airport. It will be important to coordinate with the airport during this analysis to determine what their conveyance and water quality needs will be and how they can be accommodated in the Talley Way conveyance system.

- An evaluation of potential stormwater quality management measures. Likely options to be evaluated include, but are not limited to the following:
  - A regional treatment system near the downstream end of the drainage area. This option would entail some type of wetland or pond treatment system and would require the acquisition of a large parcel of land near the Baker Way pump station.
  - An open conveyance system along Talley Way that includes a water quality component such as a swale, media filter drain, compost amended vegetated filter strip, etc. to treat roadway runoff.
  - An open conveyance system along Talley Way such as a swale or filter strip that is intended to serve as a regional treatment system to treat both roadway and other developed area runoff.
- Suggested stormwater management measures for existing land uses, including retrofit of existing facilities to tie into the proposed stormwater system or to provide onsite treatment; elimination of illicit or illegal discharges; and suggested measures to minimize the exposure of pollutants to stormwater.
- Stormwater management guidelines for future or redevelopment in the area, including treatment requirements, nonstructural stormwater management practices, and source control requirements.

Recommendations and Strategies

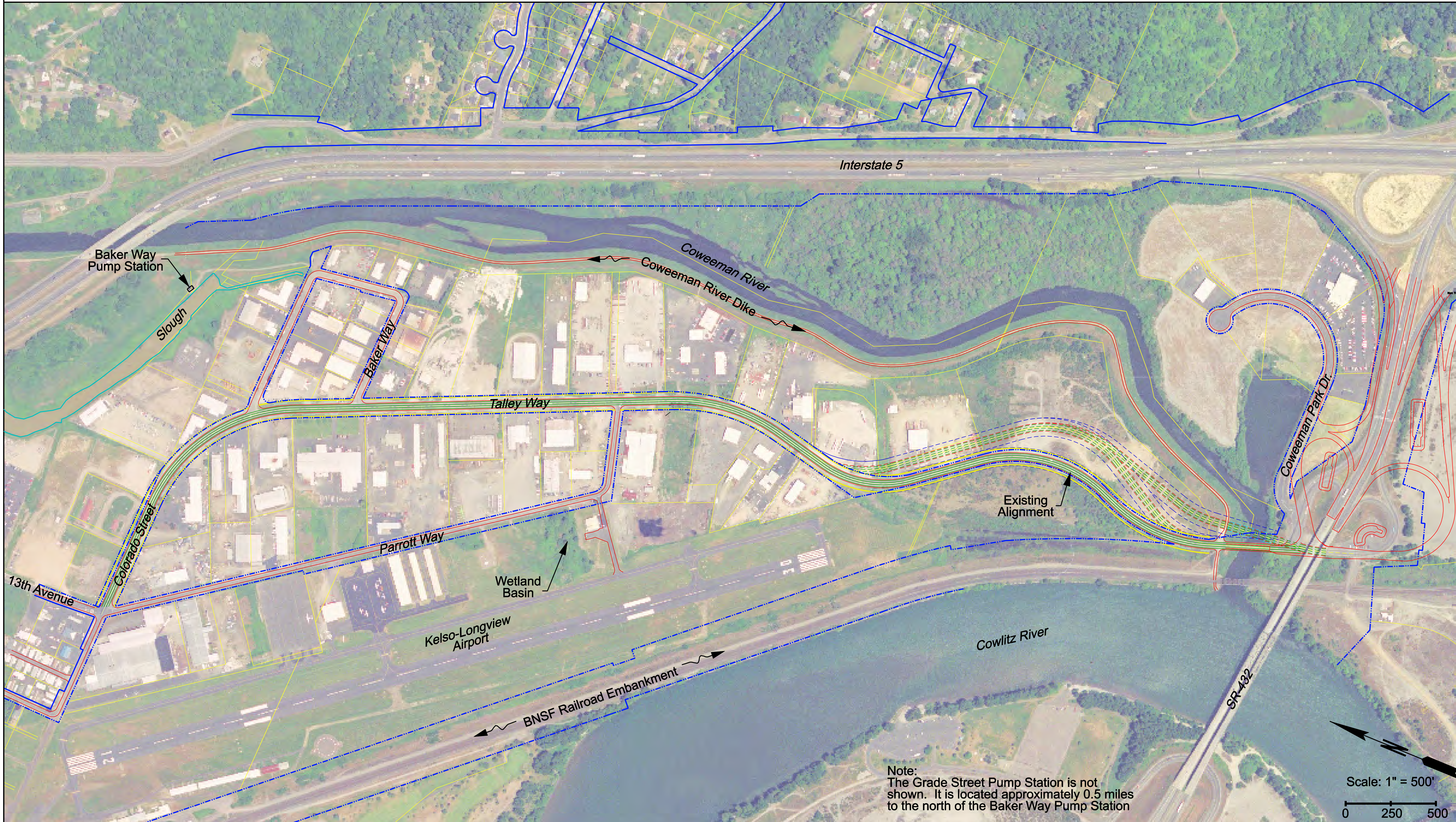
- Recommendations on the most appropriate approach for stormwater management for the Talley Way corridor area that are based both on the analysis described above and the potential costs involved.
- A description of any further work that may be needed to implement the recommendations made within the SMP. For example, as per the requirements of the DOE Stormwater Management Manual for Western Washington, more detailed stormwater site plans may be required once specific projects are selected to move forward.
- A description of the strategy for implementing the selected stormwater management measures for the drainage area and for evaluating the effectiveness of the regional stormwater management plan.
- A discussion of the importance of regular maintenance on stormwater management facilities, including a description of required maintenance activities for each type of facility discussed within the SMP.
- An estimate of costs that would be incurred to implement the recommended measures within the SMP over the short and the long term and identification of potential funding sources to cover the costs.

CONCLUSIONS

- A stormwater management plan will enable the City of Kelso and business owners to better manage the entire drainage area by preventing future drainage problems, addressing existing drainage problems, preserving the natural and beneficial functions of the drainage system and preserving and enhancing stormwater quality.

- Further evaluation will be needed to determine if an open ditch system, closed pipe system, or a combination of the above is the most appropriate conveyance system for the corridor.
- Further study is needed to review an open conveyance system along Talley Way, which may include a water quality component such as a swale, media filter drain, compost amended vegetated filter strip, etc., to treat roadway runoff.
- Initial stormwater quality options for the corridor are listed below:
    - Additional review of a "regional" facility option is needed to determine the placement and area to be treated by such options as a created wetland, pond treatment, etc., potentially near the Baker lift station.
    - Another option for review is an open conveyance system along Talley Way such as a swale or filter strip that is intended to serve as a "regional" treatment system to treat both roadway and other areas.

TALLEY WAY CORRIDOR STUDY AREA - DRAINAGE FEATURES



APPENDIX F

DESIGN AND CONSTRUCTION SCHEDULE AND BUDGETS

TECHNICAL MEMORANDUM

Design and Construction Schedule
Talley Way Corridor Transportation Study Implementation Plan

Prepared by David Evans and Associates, Inc.

June 23, 2009

This memorandum reviews the overall construction cost and schedule of the Talley Way corridor project.

PROJECT SCHEDULE

Since this project is in the planning phase, a detailed project schedule is not feasible at this time; however general guidance can be given. Anticipating federal funding for this project, a very effective guide for the overall process or flow of a project is shown in WSDOT's Local Agency Guidelines (LAG) manual Chapter 14 – Developing Projects Using the Local Agency Guidelines. A copy of the flow chart from appendix 14.51 is shown at the end of this memorandum.

The overall process can be broken down into the four main categories below:

- Planning phase
- Preliminary Engineering
- Right of way phase
- Construction phase

For planning purposes and in order to meet the documentation needs for federal funding, a few items should be addressed; and these include:

- Completion of a project prospectus
- Inclusion in Washington's Statewide Transportation Improvements Program (STIP)
- Documented project estimate
- Local agency agreements

The completion of the following items will help to solidify the direction and overall costs for the Talley Way corridor project:

- Completion of a stormwater master plan for the corridor and basin.
- Completion of an access management plan for the corridor.
- Determination of the impacts to the corridor by the airport expansion.
- Completion of the final design of the SR 432 interchanges by WSDOT to determine if there are impacts to the alignment and other elements of this project.

In terms of general timeframes and overall schedule, the following generic times apply; however the actual schedule will depend on many factors (available funding, timing of other elements, etc.):

- 1 year for the planning phase including the completion of the studies mentioned above.
- 1-2 years for preliminary engineering and environmental documentation
- 1-2 years for Right of Way Funding and Acquisition
- 1-2 years for construction of project.

PROJECT COSTS

The project costs shown in the table below are based on general concepts and are not to be considered a detailed estimate. Essentially the estimate is based on widening both sides of the road with either curb and gutter or general excavation for a ditch section. Some of the estimate is based on WSDOT bid prices with contingency factors in order to account for miscellaneous items. A more detailed breakdown of the estimate is attached at the end of this memorandum. As this project progresses it is important to review this estimate and update it as needed. Bid item costs have historically increased overtime, however, some costs may level out or even become lower in the future

Four alternatives were developed to bracket the overall cost of the project range from the least expensive option of using the existing alignment with a ditch section to the most expensive option of a new alignment with a full bridge replacement. When the project has progressed to the point of knowing the ultimate direction, these costs should be revisited in order to narrow the range down to the appropriate alternative. Consideration should be given to breaking the project up into various phases or sections. In other words, the project could be phased or certain features of the project could be constructed as the corridor develops. The impact from the development south of the corridor and the impact caused by the airport expansion may drive the timing for these improvements.

Other costs not included in the table below would be the development of the stormwater master plan and the development of an access management plan for the corridor. Obviously the cost for these studies will depend on when they are implemented and the overall scope of services. A planning level range for the development of an access management plan would be in the $20,000 to $40,000 range which would include multiple open house meetings and discussion with individual property owners. The access management plan could be developed in the 3 to 6 months timeframe. A planning level estimate for developing the stormwater master plan would be in the $150,000-$160,000 range and would include detailed survey of the existing system and overall basin analysis. A general schedule for developing and completing the stormwater master plan would be a in the 6 to 9 month timeframe.

The costs shown below include preliminary design to develop plans, specification and estimate (PSE) construction bid set and the construction of the project. The preliminary engineering cost is based on common guidelines to design a roadway project and in general this would include the environmental documentation, bridge plans and other design features for the project. The estimate assumes the construction of this project would fall under a categorical exclusion with the appropriate minimal documentation and permitting requirements for that classification. The cost does not include the purchase of any ROW or ROW negotiations. The cost below does include commonly used percentages for construction engineering and contingencies, but it would not include any cost incurred by the City of Kelso for managing the project.

PLANNING LEVEL COST ESTIMATE

	Alignment Option 1	Alignment Option 1	Alignment Option 2	Alignment Option 3
Option	Existing Alignment with ditches and widen extg bridge	Existing Alignment with Curb and widen extg bridge	Shifted Alignment, with ditches and widen extg bridge	Shifted Alignment with ditches and a replacement bridge
Estimated Construction Cost	$ 5,651,000	$ 6,081,000	$ 6,165,000	$ 9,003,000
Construction Eng. & Contingencies (14%)	$ 814,000	$ 876,000	$ 888,000	$ 1,296,000
Preliminary Engineering (15%)	$ 970,000	$ 1,043,000	$ 1,058,000	$ 1,545,000
Project Total	**$ 7,435,000**	**$ 8,000,000**	**$ 8,111,000**	**$ 11,844,000**

Note: Right of Way Costs are not included in the above estimates.

Planning Phase

- City of Kelso will need to budget for developing the prospectus, updating the estimate, inclusion into the STIP and the local agency agreement.
- $150,000 -160,000 for the completion of a storm water master plan for the corridor and basin.
- $20,000 - $40,000 for the completion of an access management plan for the corridor.

Preliminary Engineering

- $970,000 to $ 1,545,000 for the completion of a preliminary design.

Right of Way Phase

- City of Kelso will need to budget for the relocation and ROW costs.

Construction Phase

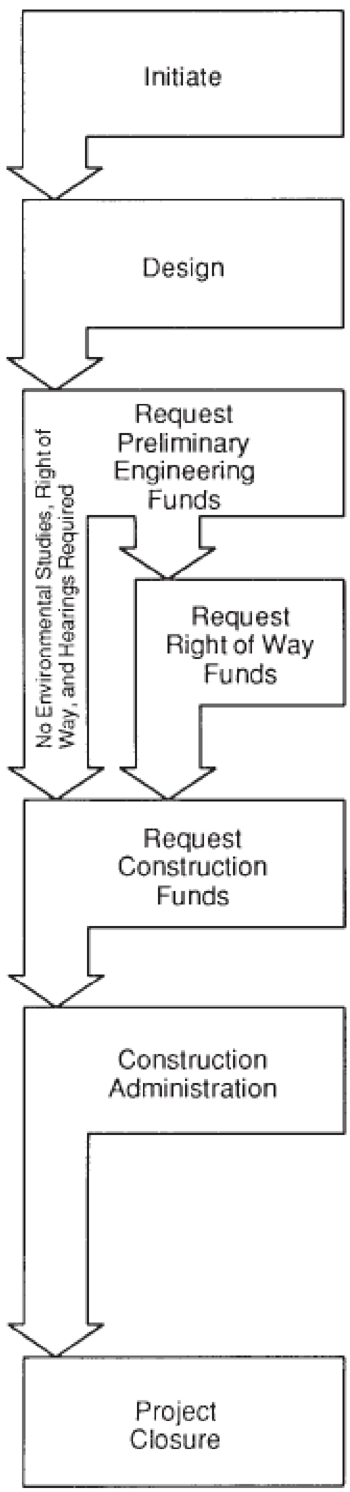
- $ 6,465,000 to $10,299,000 for construction, construction engineering and contingencies

Funding Flow Chart: Shows approximate budget needs for the project.

CONCLUSIONS

- The schedule and costs are conceptual in nature and will need to be updated as the project progresses or as elements in the corridor change.
- The current project costs range from $7.4 to $11.8 million based on the alignment and bridge replacement options.
- The project may be able to meet the overall goal of the corridor by constructing improvements in phases as external factors impact the corridor.
- The completion of the following items will help to solidify the direction and overall costs for the Talley Way corridor project:
    - Completion of a stormwater master plan for the corridor and basin.
    - Completion of an access management plan for the corridor.
    - Determination of the impacts to the corridor by the airport expansion.
    - Completion of the final design of the SR 432 interchanges by WSDOT to determine if there are impacts to the alignment and other elements of this project.

Phase



	Process Activities	Chapter Reference
00	Project Development Checklist	12 & 14
00	Included in STIP	or
00	Project Development Checklist	
00	Prepare Project Prospectus-Design Report	21 & 43
00	If Applicable, Engage Consultant	31
00	Make Environmental Determination	24
00	If Applicable, Request Design Deviation	41
00	Project Development Checklist	
00	Project Prospectus	21
00	Local Agency Agreement	22
00	If Applicable, Request Design Deviation	41
00	Project Development Checklist	
00	Location/Design, Public Hearing, and Approval	43
00	Complete Environmental Action	24
00	Develop Right-of-Way Plans and Estimate	25
00	Complete Relocation Plan	25
00	Supplement to Local Agency Agreement	22
00	Project Development Checklist	
00	Relocation and Right-of-Way Certification and Project Analysis	25
00	DBE Goals Set	26
00	PS&E Approval	44
00	Supplement to Local Agency Agreement	22
00	For State Ad and Award, Financial Responsibility Letter	44
00	Project Development Checklist	
00	Contract Number From Regional Highways and Local Programs Engineer	46
00	Notice to Minority Contractors Association (see Regional Highways and Local Programs for Distribution Centers)	26
00	Advertise for Bids	46
00	For Certified Agency (CA), Approve Award and Notify Regional Highways and Local Programs Engineer	46
00	For WSDOT Administered Contracts, Award by WSDOT	45
00	Award Data to Regional Highways and Local Programs Engineer	46
00	Preconstruction Conference	52
00	Construction Administration (WSDOT Construction Manual)	52
00	Project Development Checklist	
00	Construction Completion Notice to Regional Highways and Local Programs Engineer	53
00	Final Acceptance by FHWA	53
00	Final Billing and Cost Report to Regional Highways and Local Programs Engineer	23 & 53
00	Complete DBE Form	26
00	Final Records	53
00	Audit	53

- OPINION OF COST ESTIMATE -	DAVID EVANS AND ASSOCIATES INC	April-09	*Unit costs obtained from WSDOT records for ALL REGIONS WEST - Contracts awarded from 2/26/2008 thru 2/26/2009*

Std. Item No.	Item	Unit	Unit Cost		Alignment Option 1 — Existing Alignment with Roadside Ditches - Widen Ext'g Structure: Quantity	Cost	Alignment Option 1 — Existing Alignment with Curb & Gutter - Widen Ext'g Structure: Quantity	Cost	Alignment Option 2 — Alignment Shifted East with Ditches - Widen Ext'g Structure: Quantity	Cost	Alignment Option 3 — Alignment Shifted East with Ditches - Replace Ext'g Structure: Quantity	Cost
	Talley Way - 3 lane improvement costs	**KESO-0001**										
Section1	**Earthwork**			**Subtotal**		**$ 317,557**		**$ 317,557**		**$ 398,920**		**$ 387,930**
25	Clearing and Grubbing	ACRE	$ 4,850		3.2	$ 15,421	3.2	$ 15,421	4.5	$ 22,059	4.4	$ 21,373
90	Removing Cement Concrete Driveway	S.Y.	$ 12.00		0	$ -	0	$ -	0	$ -	0	$ -
120	Removing Asphalt Roadway	S.Y.	$ 6.00		3,120	$ 18,720	3,120	$ 18,720	3,120	$ 18,720	3,120	$ 18,720
310	Roadway Excavation Including Haul	C.Y.	$ 11.00		23,141	$ 254,547	23,141	$ 254,547	29,261	$ 321,875	28,416	$ 312,571
409	Select Borrow	C.Y.	$ 25.00			$ -		$ -		$ -		$ -
421	Gravel Borrow Including Haul	C.Y.	$ 10.00			$ -		$ -		$ -		$ -
470	Embankment Compaction	C.Y.	$ -			$ -		$ -		$ -		$ -
	Miscellaneous (10% of Section 1 items)	L.S.	Est			$ 28,869		$ 28,869		$ 36,265		$ 35,266
Section 2	**Pavement**			**Subtotal**		**$ 1,230,179**		**$ 1,230,179**		**$ 1,443,252**		**$ 1,410,963**
5767	Asphalt Concrete	TON	$ 70		8,237	$ 576,613	8,237	$ 576,613	9,578	$ 670,446	9,344	$ 654,077
5625	Cement Concrete Pavement	C.Y.	$ 200		1,040	$ 208,000	1,040	$ 208,000	1,040	$ 208,000	1,040	$ 208,000
5100	Crushed Surfacing	TON	$ 22		14,903	$ 327,874	14,903	$ 327,874	19,684	$ 433,039	19,072	$ 419,575
	Miscellaneous (15% of Section 2)	L.S.				$ 117,692		$ 117,692		$ 131,767		$ 129,311
Section 3	**Drainage**			**Subtotal**		**$ 584,815**		**$ 637,075**		**$ 619,611**		**$ 607,404**
	Conveyance (5% of Section 1,2,4,5)	L.S.				$ -		$ -		$ -		$ -
1030	Ditch Excavation incl. haul	C.Y.	$ 15		14,830	$ 222,444	0	$ -	15,378	$ 230,667	14,963	$ 224,444
1063	Combination inlets	EACH	$ 1,700		0	0	17	$ 28,900	0	$ -	0	$ -
1180	12" Concrete Pipe	L.F.	$ 35		3,840	$ 134,400	425	$ 14,875	3,840	$ 134,400	3,840	$ 134,400
7360	Storm Sewer Manholes	EACH	$ 2,600		0	$ -	9	$ 22,100	0	$ -	0	$ -
1184	24" Concrete Pipe	L.F.	$ 55		0	$ -	6,925	$ 380,875	0	$ -	0	$ -
1069	Filter Blanket	C.Y.	$ 25		2,224	$ 55,611	0	$ -	2,307	$ 57,667	2,244	$ 56,111
	Detention and Treatment (10% of Sections 1,2,4,5)	L.S.				$ 17,830		$ 17,830		$ 23,088		$ 22,415
	TESC (5% of sections 1-5)	L.S.				$ 78,249		$ 89,399		$ 92,971		$ 90,807
	Miscellaneous (15% of Section 3)	L.S.				$ 76,280		$ 83,097		$ 80,819		$ 79,227
Section 4	**Specialty Items**			**Subtotal**		**$ -**		**$ -**		**$ -**		**$ -**
	Retaining Walls, MSE	S.F.	$ 60			$ -		$ -		$ -		$ -
	Retaining Walls, Concrete	S.F.	$ 75			$ -		$ -		$ -		$ -
	Structure Supporting Retaining Walls	S.F.				$ -		$ -		$ -		$ -
	Noise Barrier Walls	S.F.	$ 35			$ -		$ -		$ -		$ -
	Miscellaneous (15% of Section 4)	L.S.	Est			$ -		$ -		$ -		$ -
Section 5	**Traffic**			**Subtotal**		**$ 17,250**		**$ 240,235**		**$ 17,250**		**$ 17,250**
	Concrete Barrier	L.F.	$ 50			$ -		$ -		$ -		$ -
	Signal Systems	L.F.				$ -		$ -		$ -		$ -
	Illumination	L.S.	Est			$ 10,000		$ 10,000		$ 10,000		$ 10,000
	Signing	L.S.	Est			$ 5,000		$ 5,000		$ 5,000		$ 5,000
	Traffic Signal	EACH	$ 200,000			$ -		$ -		$ -		$ -
6700	Cement Conc. Traffic Curb	L.F.	$ 14		0	$ -	13,850	$ 193,900	0	$ -	0	$ -
	Miscellaneous 15% of Section 5	L.S.	Est			$ 2,250		$ 31,335		$ 2,250		$ 2,250
Section 6	**Structures**			**Subtotal**		**$ 1,452,000**		**$ 1,452,000**		**$ 1,452,000**		**$ 3,325,960**
n/a	Widen Portion of Existing Bridge (includes Staging)	S.F.	$ 250		5,280	$ 1,320,000	5,280	$ 1,320,000	5,280	$ 1,320,000		$ -
0071	Removing Existing Structure	S.F.	$ 25			**$ -**		**$ -**		**$ -**	**8,160**	**$ 204,000**
n/a	New Replacement Structure (includes Staging)	S.F.	$ 190			$ -		$ -		$ -	14,840	$ 2,819,600
	Miscellaneous (10% of Section 6)	L.S.	Est			$ 132,000		$ 132,000		$ 132,000		$ 302,360
Section 7	**Other Items**			**Subtotal**		**$ 200,090**		**$ 213,852**		**$ 216,552**		**$ 307,475**
	Surveying	L.S.	$ 20,000		1	$ 20,000	1	$ 20,000	1	$ 20,000	1	$ 20,000
	Traffic Control (5% of Earthwork, Paving, Structures,	L.S.	Est			$ 180,090		$ 193,852		$ 196,552		$ 287,475
	Major Item Subtotal					**$ 3,801,900**		**$ 4,090,900**		**$ 4,147,600**		**$ 6,057,000**
	Minor Items and Contingencies 25% of Major Item Subtotal		25%		$950,475	**$ 4,752,375**	$1,022,725	**$ 5,113,625**	$1,036,900	**$ 5,184,500**	$1,514,250	**$ 7,571,250**
	Mobilization 10% of (Inflated Construction Subtotal)		10%		$475,238	**$ 5,227,613**	$511,363	**$ 5,624,988**	$518,450	**$ 5,702,950**	$757,125	**$ 8,328,375**
	Sales Tax 8.1% of (Inflated Const. Subtotal + Mobilization)		8.1%		$423,437	**$5,651,049**	$455,624	**$6,080,611**	$461,939	**$6,164,889**	$674,598	**$9,002,973**
	Construction Contract Est. Bid Amount					**$ 5,651,000**		**$ 6,081,000**		**$ 6,165,000**		**$ 9,003,000**
	Construction Engineering 10% of (Inflated Con. + Mob. + Tax + Agreements)				$565,105	**$ 6,216,154**	$608,061	**$ 6,688,673**	$616,489	**$ 6,781,378**	$900,297	**$ 9,903,271**
	Construction Contingencies 4% of (Inflated Con. + Mob. + Tax + Agreements)				$248,646	**$ 6,464,800**	$267,547	**$ 6,956,220**	$271,255	**$ 7,052,633**	$396,131	**$ 10,299,402**
	Construction Total					**$ 6,465,000**		**$ 6,956,000**		**$ 7,053,000**		**$ 10,299,000**
	Preliminary Engineering 15% of (Construction Total)	15%				$ 969,750		$ 1,043,400		$ 1,057,950		$ 1,544,850
	Project Total					**$7,434,750**		**$7,999,400**		**$8,110,950**		**$11,843,850**

Job Description:	Improvement Alternatives	
Calculation for:	Project Totals	Notes:
Job Number:	KESO0001	
BY:	AJJA	
Date:	2/27/2009	
Updated:	3/24/2009	
Sheet:	1 of 1	

4/13/2009

PROJECT TOTALS - TYPICAL CALCULATIONS - **OVERALL LENGTHS AND EXCAVATIONS**

Alignment	Beginning Sta	End Sta	Length (ft)	Length x 2 sides of road (Curb Length)	Total Culvert Lengths (ft) from cad	Total Ditch Installation (ft)	Filter Blanket Vol. (cu. yds)	Ditch X-sec Area (sq.ft.)	Ditch Excavation (cu. yds)
WSDOT ITEM #				**6700**	**1216**		**1069**		**1030**
Alternative 1	10+80.00	80+05.00	6,925	0	3,840	10,010	2,224	40	14,830
Alternative 2	10+80.00	80+05.00	6,925	13,850	3,840	10,010	0	0	0
Alternative 3	10+80.00	58+60.00	4,780	9,560	3,840	5,720	1,271	40	8,474
	58+60.00	81+90.00	2,330	4,660	0	4,660	1,036	40	6,904
		subtotals -->	(7,110)	(14,220)	(3,840)	(10,380)	(2,307)		(15,378)
Alternative 4	10+80.00	58+60.00	4,780	9,560	3,840	5,720	1,271	40	8,474
	58+60.00	80+50.00	2,190	4,380	0	4,380	973	40	6,489
		subtotals -->	(6,970)	(13,940)	(3,840)	(10,100)	(2,244)		(14,963)

PROJECT TOTALS - TYPICAL CALCULATIONS (continued) - **PAVEMENT WIDTHS AND LENGTHS & BASE ROCK VOLUMES**

Alignment	Pavement Widening or New Road Widths (ft)	Length (ft)	Roadway Base Rock Thickness (ft)	Sidewalk Base Rock Thickness (ft)	Sidewalk Width (ft)	Sidewalk Length (equals ditch length) (ft)	Sidewalk Base Rock Volume (cu. yds.)	Total Roadway Base Rock Volume (cu. yds)	Base Rock (Tons) **1.85 T/c.y. Fig 520-1
WSDOT ITEM #									**5100, *0310***
Alternative 1	10	widen 2 sides 13,850	1.45	0.33	5	10,010	618	8,056	14,903
Alternative 2	10	widen 2 sides 13,850	1.45	0.33	5	10,010	618	8,056	14,903
Alternative 3	10	9,560	1.45	0.33	5	10,380	641	5,134	9,498
	44	2,330	1.45					5,506	10,186
		subtotals -->						(10,640)	(19,684)
Alternative 4	10	9,560	1.45	0.33	5	10,100	623	5,134	9,498
	44	2,190	1.45					5,175	9,574
		subtotals -->						(10,309)	(19,072)

PROJECT TOTALS - TYPICAL CALCULATIONS (continued) - **SIDEWALKS & ASPHALT VOLUMES**

Alignment	Sidewalk Asphalt Thickness (2") (ft)	Sidewalk Width (ft)	Sidewalk Length (equals ditch length) (ft)	Sidewalk Asphalt Volume (cu.ft.)	Pavement Widening or New Road Thickness (ft)	New or Widened Asphalt Volume (cu. yds)	2-inch thick Overlay Volume (cu.yds.)	Total Asphalt Volume (cu.yds.)	Asphalt (Tons) **2.05 T/c.y. Fig 520-2a
WSDOT ITEM #									**5767, *0310***
Alternative 1	0.17	5	10,010	309	0.50	2,565	*(235,450 s.f.)* 1,453	4,327	8,237
Alternative 2	0.17	5	10,010	309	0.50	2,565	*(235,450 s.f.)* 1,453	4,327	8,237
Alternative 3	0.17	5	10,380	320	0.50	1,770	*(162,520 s.f.)* 1,003	4,672	9,578
					0.50	1,899			
						(3,669)			
Alternative 4	0.17	5	10,100	312	0.50	1,770	*(162,520 s.f.)* 1,003	4,558	9,344
					0.50	1,784			
						(3,555)			

PROJECT TOTALS - TYPICAL CALCULATIONS (continued) - **DRIVEWAYS, STORM SEWER, and STRUCTURES**

Alignment	Concrete Driveway Area (52 drwys @ 15 x 36 wide) (sf)	New Concrete Driveway Area & A.C. Removal (s.y.)	Number of Inlets @ 300' spacing	Inlet Lead pipe length - 12" concrete (l.f.)	Number of Manholes @ 300' spacing	Length of Storm Drain Main - 24" Conc. (l.f.)	Remove Structure 240 x 34 (s.f.)	Widen or New Structure Area(s.f.)
WSDOT ITEM #		**0120, 5625**	**1063**	**1180**	**7360**	**1184, 1294**	**0071**	n/a
Alternative 1	28,080	3,120 1,040 250	n/a	n/a	n/a	1.00	0	$180/s.f. 5,280
Alternative 2	28,080	3,120 1,040 190	17	425	9	6,925	0	5,280
Alternative 3	28,080	3,120 1,040 (CY)	n/a	n/a	n/a	0.00	0	5,280 240' x 22'
Alternative 4	28,080	3,120 1,040 (CY)	n/a	n/a	n/a	0.00	8,160	265' x 56' 14,840

** WSDOT Design Manual M22-01.02 November 2007

APPENDIX G

FUNDING STRATEGIES

TECHNICAL MEMORANDUM

Funding Strategies
Talley Way Corridor Transportation Study Implementation Plan

Prepared by David Evans and Associates, Inc.

May 12, 2009

The purpose of this memorandum is to review potential funding sources, strategize potential solutions and summarize general recommendations for potential revenue sources.

FUNDING STRATEGY

With gas and sales tax revenues in decline, this is a very difficult time to seek funding for the Talley Way project. Thus, in the near-term, the strategy should be to focus on preparing the needed information and network of support so that the project will be well positioned to take advantage of future funding opportunities. The timing for such an opportunity is dependent upon external events such as an economic recovery, decision to expand the airport, and the development of property south of Highway 432.

The City's strategy should include developing the following:

- Compelling reason(s) to attract funding
- Local support for the project, including an individual to act as a Champion, if possible
- A reliable cost estimate in year of expenditure dollars – thus including adequate contingency and inflation. A phasing plan may also be considered to lower the cost.
- Plans for a Local Improvement District
- A capital reserve to use as local match when state and federal funds become available

POTENTIAL FUNDING SOURCES

- **LOCAL**
    - City Budget – including allocations from the state from gas tax and vehicle registration.
    - Public Works Trust Fund - www.pwb.wa.gov.
    - Local Improvement Districts
    - Stormwater
    - Road Improvement

Working with property owners an LID could be created to help fund improvements to stormwater systems and the road. For example, an order-of-magnitude analysis reveals that an assessment of $250/acre on the approximately 340 acres in the area could generate enough revenue to support a $1 million bond.

- **TRAFFIC IMPACT FEES**
    - A fee could be assessed on new development south of highway 432, based on additional traffic at the intersection and on Talley Way.

- **SYSTEM DEVELOPMENT CHARGES**
  - Transportation
  - Storm water

- **STATE**
  - Freight Mobility – An application process for these funds is described on their web page. While this may be worth a cursory exploration, since this project will not dramatically improve freight mobility, and projects must wait in the cue for several years, this funding source is not attractive.
    - The web page is www.frnsib.wa.gov
  - Transportation Improvement Board –. The Washington State Legislature created the Transportation Improvement Board (TIB) to foster state investment in quality local transportation projects. The TIB distributes grant funding, which comes from the revenue generated by three cents of the statewide gas tax, to cities and counties for funding transportation projects.
    - The web page is www.pwb.wa.gov/partners.asp
  - Tax Increment Financing - SB 5045 is under consideration by the 2009 legislature. While something to monitor, this source might not be appropriate for this project. The generation of TIF is dependent upon substantial increases in property values which does not seem likely in this case.
  - Washington Department of Ecology - **www.ecy.wa.gov**

- **FEDERAL**
  - Discretionary – Funds allocated to projects on a case-by-case basis through Congressional "earmarks" or U.S. DOT agency discretionary allocations. Collectively these sources are referred to as discretionary funds. A project's ability to obtain federal discretionary funds in the upcoming reauthorization bill or through administrative approvals depends on many factors, including the importance of the project, amount of funding in the bill, competition for funds, administrative criteria and practices, and Congressional procedures and politics. The City would need to invest substantial time and resources (lobbyist) to pursue an earmark.
  - Federal formula funds – National Highway System (NHS) funds - NHS funds are apportioned to states by formula for such improvements as construction, reconstruction, resurfacing, restoration, and rehabilitation of segments of the national highway system; operational improvements; capital and operating costs for traffic monitoring and control facilities; corridor parking facilities; carpool and vanpool projects; and bicycle and pedestrian facilities.
  - Surface Transportation Program (STP) funds - STP funds are apportioned to states by formula, a portion of which must be used for safety (10 percent), enhancement (10 percent), and allocated by formula to urbanized and rural areas in the state. STP funds may be used for planning, construction, reconstruction, rehabilitation, and operational highway improvements.

- Environmental Protection Agency – Watershed funding
  The web page is **www.epa.gov/owow/funding/tools**.

- Environmental Protection Agency – Low Impact development
  The web page is **www.epa.gov/nps/lid/**.

RECOMMENDATIONS

To increase the chance of leveraging various funding sources in the future, develop a persuasive discussion that highlights and connects numerous issues including the following:

- Transportation
- Storm water
- The airport
- New development to the south

Discuss the funding strategy with local, state and federal officials to assess their willingness to help, hear their suggestions, make revisions and prepare for next steps. This is an excellent area in which the City council can help.

Nurture a Talley Way coalition of public and private interests to support the project and gauge their interests. The coalition might include the following groups:

- The City
- Airport interests
- Property owners adjacent to Talley Way
- Development interests south of Highway 432
- Community groups such as the Kelso-Longview Chamber of Commerce
- Any organized supporters of trails, bike paths, and natural stormwater treatment.

Initially, this group might meet infrequently; however as events unfold that indicate possible funding opportunities, the group can gather more often.

The City must develop solid technical information to assess choices. In preparing to request funding, knowing how much to request, and avoiding amending (increasing) the request in the future, is very important. In the event opportunities arise in which segments of the project might proceed, basic project phasing estimates should be developed (i.e. the airport expands and a portion of Talley Way is rebuilt).

Once solid cost estimates are prepared, the City needs to prepare an amendment to the Statewide Transportation Improvement Program (STIP).
www.wsdot.wa.gov/LocalPrograms/ProgramMgmt/STIP.htm.

Projects must be in the STIP to be eligible for state and federal funding. The schedule for adding a project to the STIP is shown on the web page.

KEY ASSUMPTIONS

1. The project will cost between $7 and $12 million dollars in year-of-expenditure to plan, design, and construct.
2. The City will be hard-pressed to provide even a small level of matching funds, 5 – 15%. Therefore, most of the funding for the project will come from other sources.
3. If the project is built, the City expects to have adequate funds for operating and maintenance, thus additional O & M funding is not an issue.
4. Even before the economic recession, traditional state and federal funding sources were over-subscribed and competition for them was keen. The recession has exasperated the budgetary challenges.
5. This project is not ready to enter construction in a timeline that would meet the eligibility requirements for federal economic stimulus funding.
6. Since the commercial property adjacent to Talley Way is nearly all developed, this project will not generate a significant amount of development and new jobs.
7. The schedule for the project is dependent upon identifying funding. While the project offers many desirable benefits, the need for the project is not seen as urgent.
8. New commercial development to the south of the project is expected to increase travel demand on Talley way.
9. The airport is a regionally significant asset considering expansion. If a runway is lengthened, the Talley Way alignment may move east at the southern limits of the project to allow for airport expansion.
10. The primary benefits of this project are as follows:
    a. Improved safety and traffic flow
        i. There will be an access management plan to reduce conflicts.
        ii. The project includes a center turn lane.
    b. Improved bike and pedestrian connectivity
        i. There will be sidewalks and bike lanes connecting to planned and existing trails.
    c. Improved handling of storm water
        i. There will be bio-swales and possible wetland regeneration
    d. Increased road capacity and encouragement of commerce
        i. Talley Way improvements will compliment the planned reconstruction of the interstate 5 interchange expected to begin in 2010.

RESOURCES

- MRSC Website - **www.mrsc.org**. The Municipal Research and Services Center (MRSC) is a non-profit, independent organization created in 1969 to continue programs established in 1934 under the Bureau of Governmental Research at the University of Washington. A principal service of the Municipal Research and Services Center is to respond to inquiries and provide advice and information on all aspects of local government. Staff experience includes budget and finance, municipal law, public management, growth management, public works, utilities, and local government policies. MRSC's comprehensive website contains weekly news, sample documents, responses to common questions received by MRSC, state statutes and administrative rules, and court decisions.

- WSDOT Local Agency Guidelines (LAG) Manual - www.wsdot.wa.gov/localprograms/LAG. The LAG manual is intended to help Washington's public agencies plan, design, construct, and maintain transportation facilities. To assist agencies in accomplishing these goals, the manual describes the processes, documents, and approvals necessary to obtain Federal Highway Administration (FHWA) funds to develop local transportation projects and defray their costs.

- WS DOT website – www.wsdot.wa.gov.

- WA DOE website - www.ecy.wa.gov.