TRAFFIC IMPACT ANALYSIS

FOR THE

IDAHO-MARYLAND MINE PROJECT

Nevada County, CA

Prepared For:

Rise Grass Valley Inc.
P.O. Box 271
Grass Valley, CA 95945

Prepared By:

KDAnderson & Associates, Inc.
3853 Taylor Road, Suite G
Loomis, California 95650
(916) 660-1555

March 24, 2020

5875-02

0 Rise Grass Valley TIA.rpt

TRAFFIC IMPACT ANALYSIS FOR THE
IDAHO-MARYLAND MINE PROJECT
Nevada County, CA

TABLE OF CONTENTS

KDA

TABLE OF CONTENTS (continued)

TRAFFIC IMPACT ANALYSIS FOR THE
IDAHO-MARYLAND MINE PROJECT
Nevada County, CA

I. INTRODUCTION

I.1. Study Purpose and Objectives

This technical study has been prepared for Rise Grass Valley Inc. ("Rise Grass Valley" or "Rise") to evaluate the potential traffic impacts associated with the proposed Idaho-Maryland Mine Project located in Nevada County, CA.

This report was prepared:

- to provide information for the CEQA analysis;
- to comply with the Nevada County Code & General Plan;
- in accordance with the County of Nevada Traffic Impact Study Guidelines, last updated November 2013 (Pack, 2013); and
- following City of Grass Valley Traffic Study Guidelines for applicable roadways and intersections.

The 2018 CEQA Guidelines Update includes new and revised provisions for analyzing the significance of transportation impacts. Specifically, CEQA Guidelines section 15064.3 was adopted, effective December 28, 2018, and states that Vehicle Miles Travelled (VMT) for land use projects "exceeding an applicable threshold of significance may indicate a significant impact." (14 CCR § 15064.3, subd. (b)(1).). **This new metric takes effect state-wide July 1, 2020.** As a result of this new section, the significance threshold for transportation impacts in both CEQA Guidelines section 15064 and Appendix G (Environmental Checklist Form) are described in terms of VMT rather than LOS.

- A project must still be evaluated individually and cumulatively to determine whether the project is consistent with the local agency's General Plan. The project was evaluated under an Existing plus Approved Projects condition, i.e., existing plus near term condition which included local projects previously approved by Nevada County and Grass Valley. Cumulatively, it was analyzed under future conditions which may include either a list of past, present and probably future projects producing related or cumulative impacts or a summary of projections contained in an adopted local, regional or statewide plan or related planning document. For this project the Nevada County Transportation Commission travel demand model was used as the basis to establish Cumulative No Project conditions.

The Level of Service (LOS) analysis was evaluated for General Plan consistency and to identify feasible improvements to meet the General Plan Vehicle LOS Standard. Vehicle LOS is used to identify potential improvement projects that may be included in conditions of approval for the project entitlements.

The scope of this traffic impact analysis has been identified through consultation with Nevada County and the City of Grass Valley. In addition to VMT analysis, this study addresses the following scenarios for LOS analysis:

1. Existing Setting
2. Existing Plus Approved Projects [EPAP] (5-year)
    A. Existing Plus Approved Projects [EPAP] Conditions
    B. EPAP plus Project Conditions to Centennial site
    C. EPAP plus Project Conditions to SR 49
3. Cumulative Impacts (2035)
    A. 2035 Traffic Conditions
    B. 2035 Plus Project Conditions to Centennial site
    C. 2035 Plus Project Conditions to SR 49

The objective of the Vehicle LOS study is to identify those street intersections and roadways that may be impacted by development of this project based on Nevada County and City of Grass Valley significance criteria and to suggest strategies for locations that are adversely affected by this project.

The VMT analysis incorporates Transportation Alternatives pursuant to Nevada County Land Use and Development Code Sec. L-II 4.1.9. The Vehicle LOS study also includes an evaluation of truck turning movements, sight distance at key locations, acceleration on grade, and the Traffic Index (TI) to assess pavement conditions.

I.2. Project Description

Rise Grass Valley proposes to reinitiate underground mining and gold mineralization processing of the Idaho-Maryland Mine (the "project") in unincorporated Nevada County (County). The proposed facilities and operations will be located on two properties owned by Rise referred to as the Brunswick Industrial Site and the Centennial Industrial Site. The project sites are shown on the vicinity map in Figure 1. The project comprises five primary elements:

1. dewatering the existing underground mine workings,
2. mining existing and new underground mine workings,
3. processing gold mineralization and rock,
4. placing engineered fill at the Brunswick and Centennial Industrial Sites, and
5. export of engineered fill from the Brunswick Industrial Site to support local construction projects.

Rise is seeking approval of a new use permit and reclamation plan to build and operate the facilities for these project elements. This use permit and reclamation plan proposes to allow:

- operation of pumps and a water treatment facility to dewater the underground workings;
- construction of a water pipeline to transport treated water to an outfall located in South Fork Wolf Creek;
- construction of the necessary aboveground facilities at the Brunswick Industrial Site (e.g., headframes and hoists, surface structures, a mineral processing plant) to support underground mining and mineral processing;
- construction of a new service shaft and ventilation shaft from the underground mine to surface at the Brunswick Industrial Site;
- underground mining, including drilling, blasting, and gold mineralization removal;
- gold mineralization and rock processing at the Brunswick Industrial Site and off-site transport of gold concentrate;
- transport of engineered fill from the Brunswick Industrial Site and placement at the Centennial Industrial Site;
- transport of engineered fill from the Brunswick Industrial Site to off-site construction projects;
- placement of engineered fill at the Brunswick Industrial Site; and
- construction of a potable water pipeline to supply residences along a portion of East Bennett Road.

The majority of aboveground facilities, the access to the underground mining, the treated-water outfall structure, and a portion of the engineered fill will be located on Rise's 119-acre Brunswick Industrial Site. Engineered fill will also be placed on Rise's 56-acre Centennial Industrial Site. In addition, Rise owns approximately 2,585 acres of subsurface rights that encompass the historic Idaho-Maryland Mine workings and Idaho-Maryland Mine Project. Once the aboveground facilities are constructed, Rise will begin dewatering the mine, performing advanced exploration, and mining the underground workings.

The project is projected to include year-round underground mining with a production target of 1,000 tons per day of gold ore extraction. Approximately 500 tons per day of sand tailings and 500 tons per day of barren rock from tunneling would be used as engineered fill material. Gold concentrate will be shipped off-site for refining.

Active mining operations will result in the highest off-site traffic volume due to full employment in this phase, material and supplies delivery for both Brunswick and Centennial sites and shipping of gold concentrate to an off-site refiner.

I.2.a. Brunswick Industrial Site

The proposed project will reactivate the Idaho-Maryland Mine at the Brunswick Industrial Site located at 12625 Brunswick Road, along the west side of Brunswick Road and south of E. Bennett Road. This site is mainly surrounded by rural-residential properties and to a lesser

degree by light industrial zoned property. The vicinity map is presented in Figure 1 and the project sites are shown in Figure 2.

Primary access to the Brunswick site will be via the existing access location approximately ½ mile south of the Brunswick Road / E. Bennett Road – Greenhorn Road intersection. This driveway will provide full access for all vehicles other than semi-trailer and dump trucks used for transporting engineered fill. The Brunswick Road driveway will provide inbound access for these vehicles while the secondary access, located at Millsite Road / E. Bennett Road intersection, will provide for right-turn only outbound truck movements from the site.

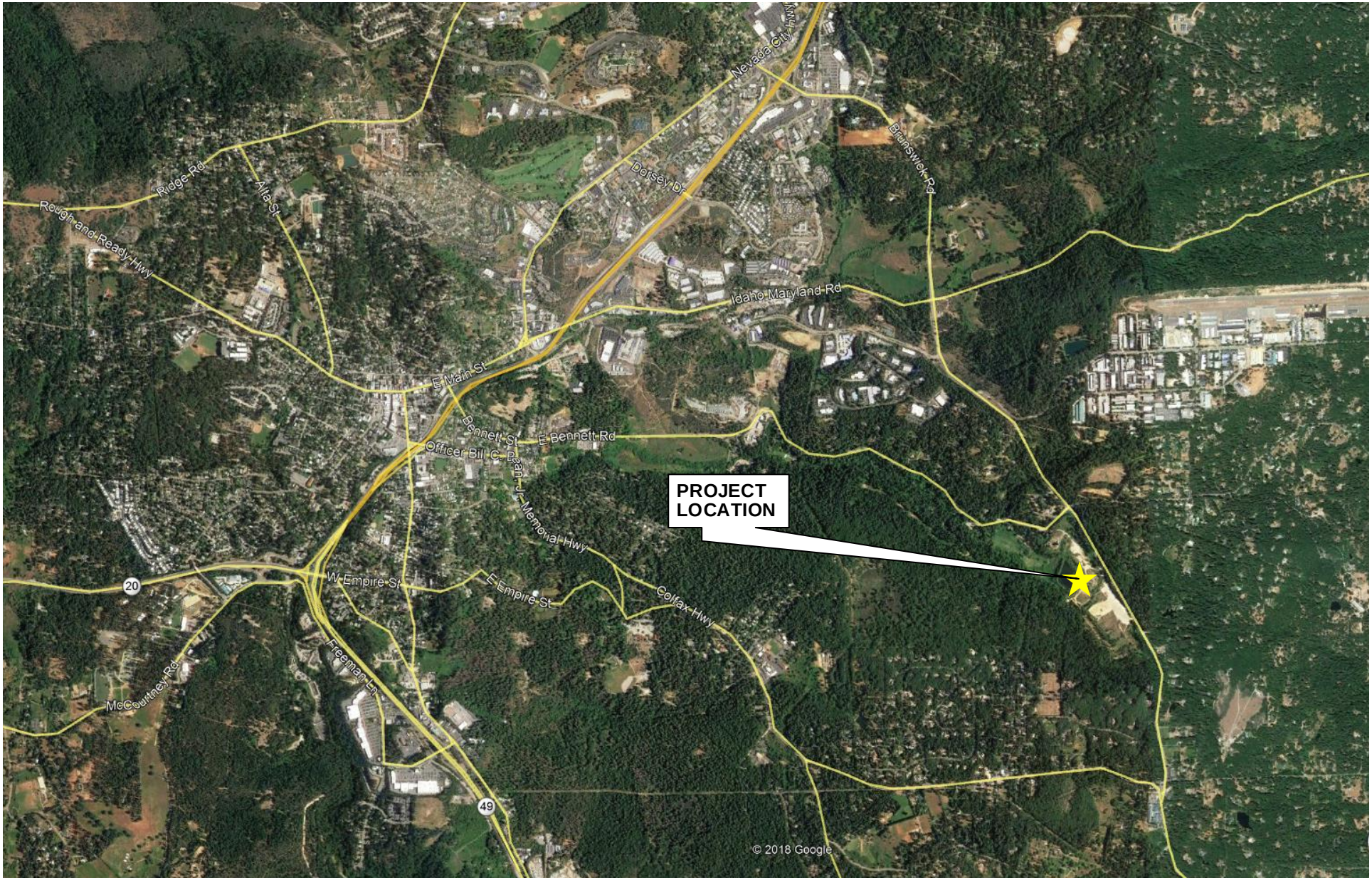
I.2.b. Centennial Industrial Site

Engineered fill will be transported by truck from the Brunswick Industrial Site and placed on the Centennial Industrial Site ("Centennial site"). It is projected that this will occur over a five-year time period within the 20-year analysis.

The Centennial site is located at 10350 Centennial Drive. The site is within Nevada County; however, the site will be accessed from a new driveway along Whispering Pines Lane in the City of Grass Valley. This site is surrounded by various properties consisting of a mixture of commercial / industrial and business park within the City of Grass Valley and light industrial uses within Nevada County. The vicinity map is presented in Figure 1 and the project sites are shown in Figure 2.

The engineered fill will be hauled to the Centennial Industrial site with proposed access along the west end of Whispering Pines Lane. A new driveway is proposed along Whispering Pines Lane approximately 180 feet east of the Centennial Drive intersection.

Figure 2 provides an aerial view of both Brunswick and Centennial sites relative to the surrounding area.

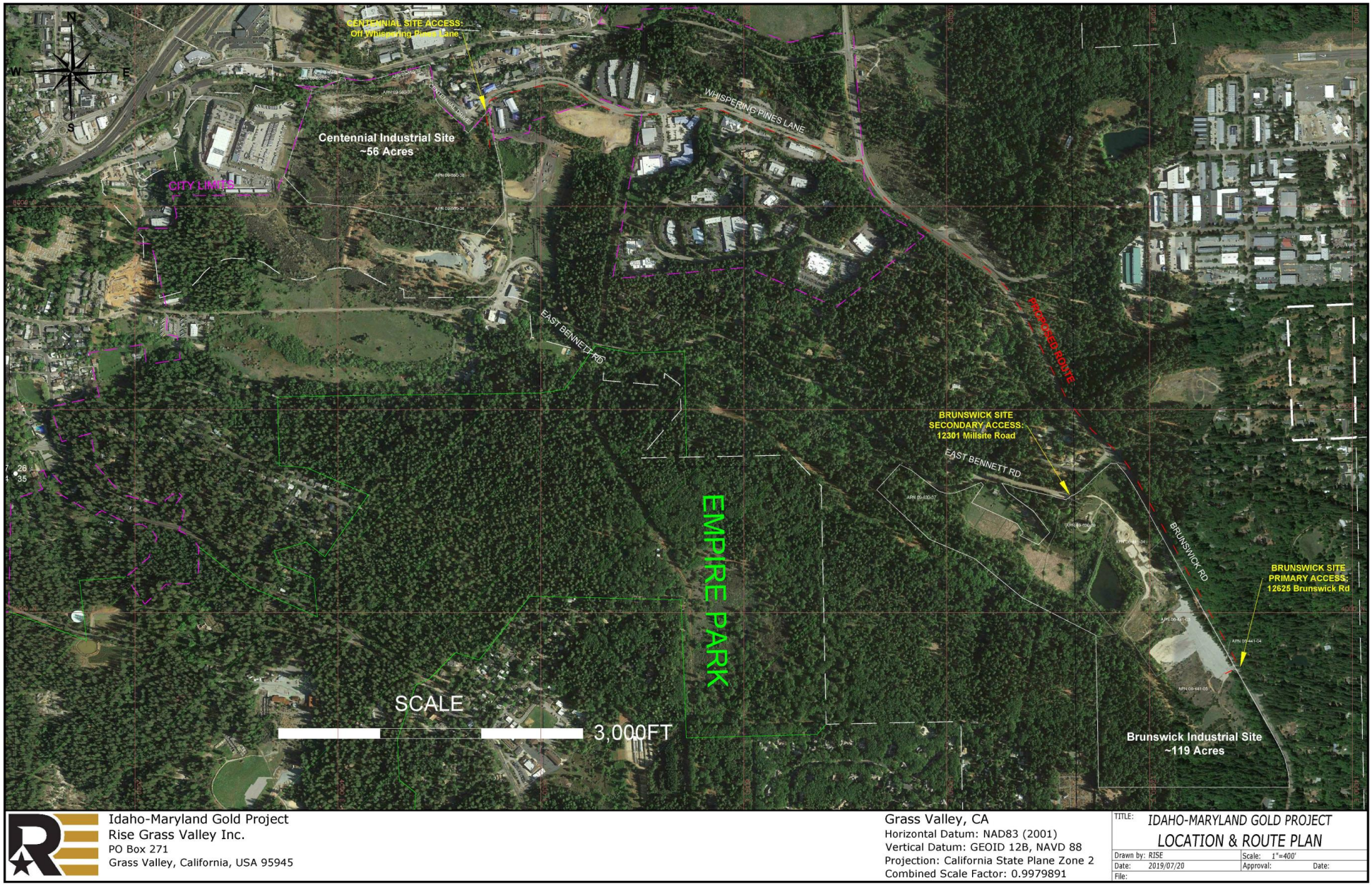


VICINITY MAP

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

figure 1



KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

SITE PLAN

figure 2

II. VEHICLE MILES TRAVELED (VMT) ANALSYIS

II.1. VMT Description

As previously noted, the 2018 CEQA Guidelines Update includes new and revised provisions for analyzing the significance of transportation impacts using VMT in determining the significance of a project relative to the transportation system. The criterion considers the effect a project has on the vehicle miles traveled.

VMT is a metric that accounts for the number of vehicle trips generated and the length or distance of those trips (Fehr & Peers, 2019). The available measures of VMT for Nevada County include (Fehr & Peers, 2019):

- Total VMT – the sum of VMT for all vehicle trips and trip purposes.
- Residential VMT per capita – sum of VMT for trips originating from home, divided by the number of residents.
- VMT per worker – sum of VMT for trips from home to work, divided by the number of workers.

II.2. VMT Methodology and Analysis Criteria

In September 2019 Fehr & Peers prepared *Senate Bill 743, Vehicle Miles Traveled Implementation [DRAFT]* for the Nevada County Transportation Commission (NCTC). NCTC, in turn distributed the document to the various agencies within the County so that each agency can develop their own significant threshold guidelines. Fehr & Peers recommends that VMT should be expressed as a generation rate and not a ratio (Fehr & Peers, 2019). Since this project is an industrial land use project, it was determined that the preferred significance threshold metric was VMT per Worker (ie. employee).

Methodologies and Threshold Recommendations were made by Fehr & Peers (2019) and are described below:

Thresholds of Significance Recommendation - A project's or plan's VMT impact may be considered less than significant if:

- The project or plan total weekday VMT per service population is less than or equal to the subarea mean under baseline conditions; and
- The project or plan is consistent with the jurisdiction's general plan and the Nevada County Regional Transportation Plan.

The subareas, based on similar travel characteristics and proximity, are recommended to be: City of Grass Valley, City of Nevada City, Town of Truckee, Alta Sierra, Lake of the Pines, Lake Wildwood and Penn Valley, the Remainder of Western Nevada County, and the Remainder of Eastern Nevada County. The subarea threshold acknowledges the differences in VMT generation in different parts of Nevada County (Fehr & Peers, 2019).

VMT Methodology for Land Use Projects and Land Use Plans

Table A-3, Home-Based VMT per Worker by Data Source, of the Fehr & Peers (2019) draft report presents results of the VMT measurement analysis from several data sources including the NCTC Travel Demand Model (TDM), the California State Travel Demand Model and MXD+, a trip generation tool developed by Fehr & Peers.

The NCTC TDM data, shown in Table 1, was used to determine the significance threshold for the Idaho-Maryland Mine Project. The Grass Valley subarea was used as the basis due to the project's proximity to the City. A project is considered significant if the VMT generation rate is greater than the thresholds provided below. Accordingly, the recommended VMT threshold for the Idaho-Maryland Mine Project is 18.6 per worker (Fehr & Peers, 2019)

TABLE 1
HOME-BASED VMT PER WORKER

Location (SubArea)	NCTC TDM
Grass Valley	18.6
Nevada City	26.6
Truckee	N/A
Alta Sierra	27.8
Lake Wildwood	34.3
Penn Valley	18.6
Lake of the Pines	25.0
Unincorporated Nevada County	N/A

Source: Fehr & Peers, 2019 (Table A-3)

II.3. Project Vehicle Miles Traveled (VMT)

The Nevada County Transportation Commission travel demand model (TDM) for 2035 conditions was used to estimate the proposed project's daily VMT per service population for comparison to the NCTC baseline VMT per service population. Fehr & Peers was retained to conduct model runs to develop VMT projections for the Idaho-Maryland Mine Project (Fehr & Peers, 2020). Trip generation for the VMT analysis was based on the project building square footage and the trip generation rates contained in the TDM. An initial model run was performed to compare model trip generation to the project employee generation expected to occur. Fehr and Peers iteratively adjusted the input land use element of the model as it initially estimated higher volumes than the project is expected to generate. Project trips were then tracked throughout the model network using a select-zone analysis. Project VMT was calculated on each link by multiplying the link distance by the number of vehicles using a particular link. The methodology and results are described in the Fehr & Peers Memo in Appendix 1.

II.4. Findings / Results

On a per worker basis, which is the recommended threshold of significance (Fehr & Peers, 2019), the Idaho-Maryland Mine Project is modelled to generate a daily rate per employee of 13.9 VMT under 2035 plus Project conditions. This is below the home-based VMT per worker for the Grass Valley area of 18.6 VMT per worker. Therefore, the project's impact on Vehicle Miles Travelled is less than significant.

II.5. Transportation Demand Management (TDM) Strategies

The Nevada County Land Use and Development Code, Section L-II 4.1.9, *Transportation Alternatives*, identifies that methods should be undertaken to reduce automobile dependence travel throughout the County. Land use applications requiring a development permit or a use permit shall address alternative transportation opportunities for employees, residents and/or customers served by the project. For projects that employ 50 or more persons, the applicant shall submit a detailed analysis of transportation alternatives, documenting feasible measures for reducing auto dependence.

The project is anticipated to employ approximately 312 direct employees during full operations. Project trip generation is described in Section V.1. of this report.

The project is not currently served by transit and the Nevada County Transit Services Division has no plans to bring service to this area . Currently, the nearest bus route to the Brunswick site is Route #3, the Grass Valley Loma Rica Loop route which operates between the Tinloy Street / Bank Street Transit Center and the Nevada County Airport.
An area for bicycle racks is incorporated into the site design at the Brunswick Industrial Site and will have a minimum of 11 racks (44 bicycle spaces).

Transportation reduction alternatives were identified based on the TDM strategies categorized in Appendix D, TDM Strategy Evaluation, of the *SB 743 Vehicle Miles Traveled Implementation [Draft]* report (Fehr & Peers, 2019).

Commute Trip Reduction, #3.4.11, TRT-11: Provide Employer-Sponsored Vanpool / Shuttle

This strategy would make available a company sponsored vanpool / shuttle to allow employees to commute in a single vehicle. Since employees are likely to be coming from throughout the area the use of specific locations for pick up, such as existing 'Park and Ride' lots in the County, would facilitate the reduction of commute vehicles. CAPCOA projects a 0.3% - 13.4% VMT commute reduction with this strategy.

The project could also institute a shuttle service between the project site(s) and the Tinloy Street / Bank Street Transit Center to provide a convenient location for employees to transfer from public transit or to be dropped off (i.e. kiss and ride). A shuttle could operate several times each day, during the 7:00 a.m. and 7:00 p.m. shift changes and at the end of the administrative workday, after 3:30 p.m.

Commute Trip Reduction, #3.4.3, TRT-3: Provide Ride-Sharing Programs

This strategy involves the employer providing ride share coordination and parking facilities to provide information for employees to ride share to and from work. The strategy is intended to match employees by location resulting in a reduction of commute vehicles. CAPCOA projects a 1% - 15% VMT commute reduction with this strategy.

Rideshare activities would provide incentives for employees commuting to and from the site. Ridesharing could be coordinated between employees along a similar route from their residence to the work site. The use of existing Park and Ride lots may provide a location for employees to meet and commute together, reducing the number of vehicles in the roadway network. There are three Caltrans Park and Ride locations in Nevada County, two in Penn Valley and one in Grass Valley; all are located along SR 20. There is also a Park and Ride location in Auburn for employees commuting along SR 49 from Placer County. Incentives may include the use of high occupancy vehicle (HOV) lanes, less maintenance on a single vehicle due to reduced use, and cost sharing between employees / employer.

III. VEHICLE LEVEL OF SERVICE (LOS) STUDY

III.1. Study Area

This study also addresses traffic conditions at 23 existing intersections and 11 roadway segments shown in Figure 3. The limits of the study area were reviewed and approved by Nevada County and City of Grass Valley staff. In addition to level of service analyses, a traffic index assessment was completed considering the haul routes of engineered fill along County and City roads and an AutoTURN assessment was completed considering the turning movements of haul trucks along the proposed routes. Specifically, truck movements were evaluated at the Brunswick and Centennial access locations, East Bennett Road at Brunswick Road and Brunswick Road at Whispering Pines Lane.

The text that follows describes the roadway facilities included in this analysis; intersections associated with SR 49 / SR 20 are referred to throughout this analysis as SR 49. The entirety of SR 49 proceeds in a northbound / southbound direction and is identified as such.

The quality of traffic flow is typically governed by the operation of major intersections and the daily volume of traffic along the roadways. The physical characteristics of the study intersections are described in the text which follows.

III.2. Study Area Intersections

1. The **Tinloy Street / Neal Street** intersection is a signal-controlled intersection providing access to downtown Grass Valley and SR 49. Southwest-bound Tinloy Street is a two-lane one-way street with left-through and through-right lanes. Neal Street is a two-way street with one eastbound and westbound lane along Neal Street. Crosswalks are present across both legs of Tinloy Street. Bike lanes are not present in the intersection.

2. The **Tinloy Street / S. Auburn Street** intersection is a signal-controlled intersection providing access to downtown Grass Valley and SR 49. Southwest-bound Tinloy Street is a two-lane one-way street with left-through and through-right lanes. S. Auburn Street is a two-way street with one southbound lane and two northbound lanes, one left-through and one through lane. Crosswalks are present across both legs of S. Auburn Street. Bike lanes are not present in the intersection.

3. The **Tinloy Street / E. Bennett Road – Southbound SR 49 off-ramp** intersection is a four-way stop-controlled intersection. The southbound SR 49 ramp is stop controlled and includes through-left and through-right lanes. Southbound E. Bennett Road includes a single uncontrolled lane while northbound E. Bennett Road includes a left lane and a through lane which are stop controlled. Crosswalks are present across the SR 49 ramp and E. Bennett Road approaches. Bike lanes are not present along any of these roads.

4. The **Hansen Way / E. Bennett Road** intersection is a four-way all-way stop controlled intersection. Hansen Way is a one-way northbound roadway consisting of through-left and through-right lanes on the approach leg. The eastbound E. Bennett Road approach includes a left turn lane and a through lane while westbound E. Bennett Road includes a through-right

lane. Crosswalks are present along across both sides of Hansen Way while bike lanes are not present along any of the roadways.

5. The **E. Main Street / Idaho Maryland Road / SB SR 49 ramps** intersection is a modified one-lane roundabout. The Main Street approaches are along the southbound and eastbound approaches. The westbound Idaho Maryland Road approach includes two entry lanes, one for u- and left turning vehicles and one for through and right turning vehicles. The southbound E. Main approach includes a free right turn movement onto westbound E. Main Street and a single lane for through, left and u-turns. The eastbound Main Street and southbound SR 49 ramps approaches include a single lane for right, through, left and u-turns. Crosswalks are present along all the north, east and west approaches. Bike lanes are not present along any of the approaches.

6. The **Idaho Maryland Road / NB SR 49/20 ramps** intersection is an all-way stop tee intersection. The center of the intersection is about 175' west of the center of the Idaho Maryland / Railroad Avenue intersection, also all-way stop controlled. The eastbound Idaho Maryland Road approach includes a single through-right lane while the westbound approach includes a through-left lane and a through lane. The NB SR 49/20 off-ramp includes left and right lane turn lanes. Crosswalks are present across the west and south legs.

7. The **Idaho Maryland Road / Railroad Avenue** intersection is an all-way stop tee intersection just east of the NB SR 49/20 ramps as described above. The eastbound Idaho Maryland Road approach includes a through lane and a through-right lane while the westbound approach includes a through-left lane and a through lane. NB Railroad Avenue includes a single approach lane. A crosswalk is present across the Railroad Avenue leg.

8. The **Main Street / Brunswick Road** intersection is a split phase signal-controlled four leg intersection. The northbound Main Street approach includes left, through and right lanes while the southbound approach includes dual left turn lanes and a through-right lane. The westbound approach includes a left turn lane, a through-left lane and a right turn lane. The westbound right turn includes an overlap with the southbound left turn phase. The eastbound approach, Olympia Drive, is a single lane approach. Crosswalks are present across the southbound and westbound approaches. Bicycle lanes or marked sharrows, shared lanes for automobiles and bicycles, are present along the Main Street and Brunswick Road approaches.

9. The **Brunswick Road / Maltman Drive – SB SR 49 Off-ramp** intersection is a signal-controlled four leg intersection. The intersection is split phased along the Maltman Drive and SB SR 49 off-ramp approaches. The eastbound Brunswick Road approach includes a through lane and a through-right lane while the westbound Brunswick Road approach includes a left turn lane and two through lanes. The SB SR 49 off-ramp includes dual left turn lanes, a through lane and a right turn lane while Maltman Drive includes a left turn lane and a right turn lane; the right turn lane is overlapped with the westbound left turn movement. A crosswalk is present across the Maltman Drive approach and bike lanes or sharrows are present along Brunswick Road.

10. The **Brunswick Road / NB SR 49 ramp** intersection is a signal-controlled intersection. Both approaches along Brunswick Road include a free right turn onto NB SR 49 and two through lanes. The off-ramp approach includes left and right turn lanes. A crosswalk exists

across the ramp approach and marked bike lanes are present along the west side of the intersection.

11. The **Brunswick Road / Sutton Way** intersection is a four-way signal-controlled intersection. The eastbound Brunswick Road approach includes dual left turn lanes, two through lanes and a right turn lane. The westbound approach includes a left turn lane, a through lane and a through-right lane. Northbound Sutton Way includes dual left turn lanes and a through-right lane while the southbound approach includes a left turn lane, a through lane and a right turn lane. The southbound right turn lane has separate signal control than the rest of this approach and provides right green arrows with southbound Sutton Way, when eastbound through or left turn Brunswick Road movements are green and when northbound Sutton Way is green. Crosswalks exist across the north, south and east approaches while marked bike lanes are present along Brunswick Road east of the intersection. A bike lane is also present along the departure leg on the south side of Sutton Way while a northbound bike terminates prior to the Brunswick Road intersection.

12. The **Brunswick Road / Idaho Maryland Road** intersection is stop controlled along the Idaho Maryland Road approaches of the intersection. Northbound Brunswick Road includes a left lane and a through-right turn lane while the southbound approach includes left, through and right turn lanes. The eastbound Idaho Maryland Road approach includes a right turn only lane while the westbound approach includes a left lane and a right lane. Vehicles were observed along the Idaho Maryland Road approaches making illegal left and through movements. Those volumes were moved into legal movements for this analysis. Crosswalks and bike facilities are not present at this intersection.

13. The **Brunswick Road / Whispering Pines Lane** intersection is a signal-controlled tee intersection. The northbound approach along Brunswick Road includes a left turn lane and a through lane while the southbound approach includes a through lane and a through-right lane; the outside lane merges into the through lane about 350 feet south of the intersection. The eastbound Whispering Pines Lane approach includes right and left turn lanes. Crosswalks and bike facilities are not present in the intersection.

14. The **Brunswick Road / E. Bennett Road – Greenhorn Road** intersection is an all-way stop controlled intersection. The Brunswick Road approaches include left turn lanes and through-right lanes while the E. Bennett Road and Greenhorn Road approaches include a single lane for all movements. Crosswalks and bike facilities are not present at this intersection.

15. The **Brunswick Road / SR 174** intersection is a tee intersection with stop control along Brunswick Road. The northbound SR 174 approach includes a single through-right lane with a slip ramp leading to northbound Brunswick Road. The southbound SR 174 approach includes a left turn lane and a through lane. The Brunswick Road approach is stop controlled and includes left and right turn lanes. Crosswalks and bike facilities are not present at this intersection.

16. The **Brunswick Road / Project Access** intersection is an existing tee intersection with stop control at the project driveway. Brunswick Road includes single lanes in each direction with a two-way left turn lane at the driveway. Bike facilities are not present.

17. The **E. Bennett Road / Millsite Road** intersection is an existing tee intersection providing a secondary access to the Brunswick site. The existing roadway along Millsite Road is unimproved. This driveway will provide right turn only access to Brunswick Road for larger haul trucks. E. Bennett Road includes single lanes in each direction. Bike facilities are not present.

18. The **Whispering Pines Lane / Centennial Industrial site** intersection is a future driveway that will provide access to the Centennial site. The driveway will be located about 180 feet east of Centennial Drive and will be used for employee and haul route truck traffic. Whispering Pines Lane is a two-lane divided roadway from Brunswick Road to just east of the proposed project driveway where the median ends. Although not marked as a bike lane the roadway includes a shoulder stripe to allow a bike lane.

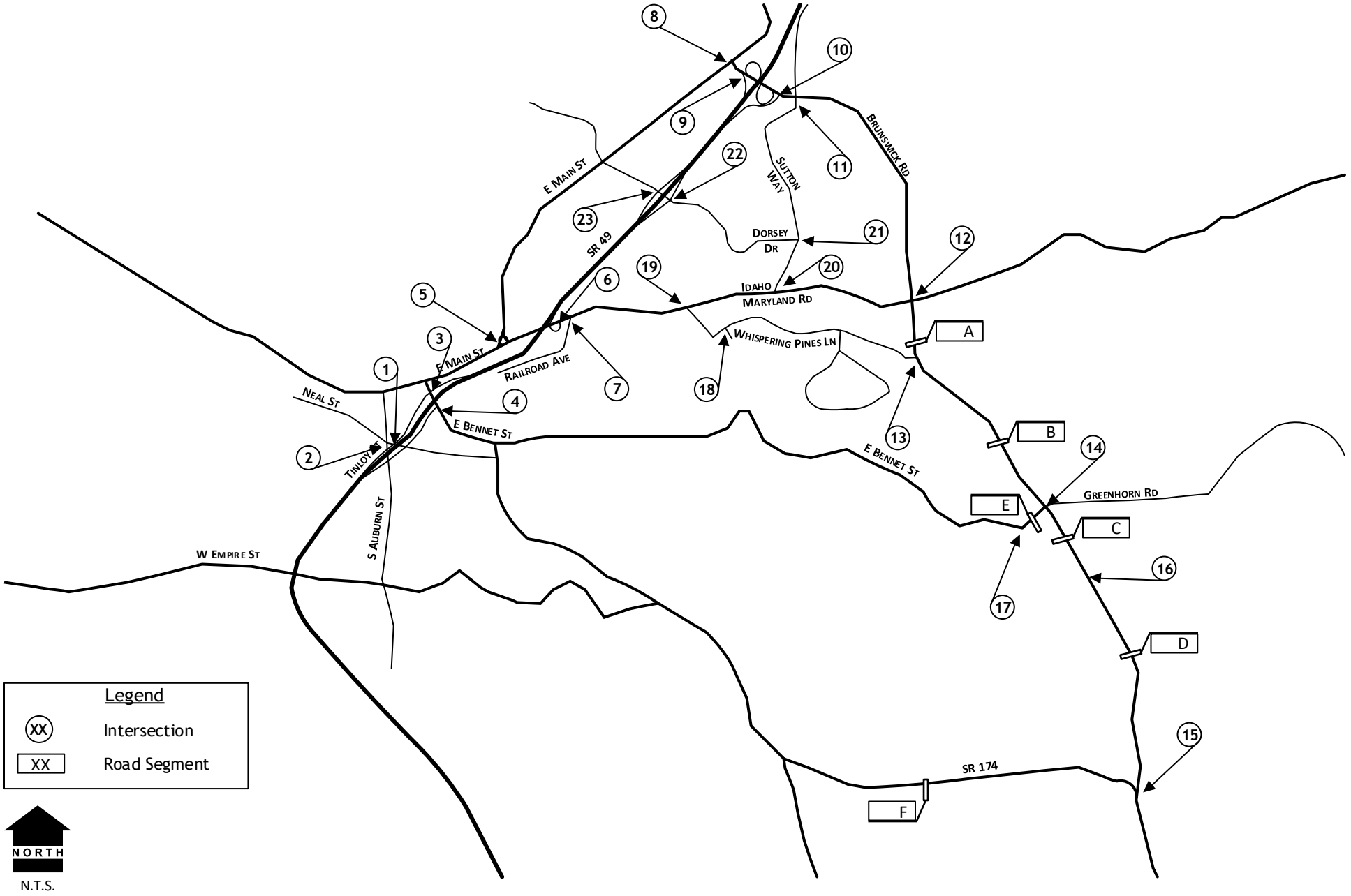
19. The **Idaho Maryland Road / Centennial Road** intersection is a tee intersection with stop control along Centennial Road. Idaho Maryland Road includes a through lane and right turn lane along the eastbound approach and a left turn lane and through lane along the westbound approach. Centennial Drive is a single lane approach. Crosswalks and bike facilities are not present at this intersection.

20. The **Idaho Maryland Road / Sutton Way** intersection is an all-way stop controlled tee intersection. Idaho Maryland Road includes single lanes in each direction while Sutton Way includes right and left turn lanes. Crosswalks and bike facilities are not present at this intersection.

21. The **Sutton Way / Dorsey Drive** intersection is an all-way stop controlled tee intersection. Northbound Sutton Way includes a single lane for left and through movements while the southbound approach includes a through lane and right turn lane. The eastbound Dorsey Drive approach is a single lane; however, is wide enough to allow right turns past left turning vehicles. A crosswalk is present across the Dorsey Drive approach while bike facilities are not present.

22. The **SR 49 NB Ramps / Dorsey Drive** intersection is one-half of a diamond interchange. The intersection is signal-controlled. The eastbound Dorsey Drive approach includes a left turn lane and a through lane while the westbound approach includes two through lanes and a through-right lane; the inside through lane is a trap left turn lane for access onto southbound SR 49. The northbound SR 49 off-ramp includes a left turn lane, a through-left lane and a right turn lane. Crosswalks are present along the northbound SR 49 ramps and the westbound Dorsey Drive approach. Bike lanes are present along Dorsey Drive.

23. The **SR 49 SB Ramps / Dorsey Drive** intersection is one-half of a diamond interchange. The intersection is signal-controlled. The eastbound Dorsey Drive approach includes two through lanes and a right turn lane; the inside through lane is a trap left turn lane for access onto northbound SR 49. The westbound approach includes a left turn lane and two through lanes. Crosswalks are present along the southbound SR 49 ramps and the eastbound Dorsey Drive approach. Bike lanes are present along Dorsey Drive.



STUDY INTERSECTIONS AND ROADWAY SEGMENTS

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

figure 3

III.3. Analysis Criteria

Intersection Level of Service Methodology. *Level of Service Analysis* has been employed to provide a basis for describing existing traffic conditions and for evaluating the significance of project traffic impacts. Level of Service measures the *quality* of traffic flow and is represented by letter designations from "A" to "F", with a grade of "A" referring to the best conditions, and "F" representing the worst conditions.

The analysis techniques presented in the *Highway Capacity Manual 6th Edition* were used to provide a basis for describing existing traffic conditions and evaluating the significance of project traffic impacts.

Various software programs have been developed to assist in calculating intersection Level of Service, and the level of sophistication of each program responds to factors that affect the overall flow of traffic. Three programs, (1) Synchro, (2) Synchro/Simtraffic, a simulation program, and (3) SIDRA, a roundabout intersection analysis program, were utilized for the analysis depending on the intersection characteristics.

Synchro software was used at the following intersections:

4. Hansen Way / E. Bennett Road
6. Idaho Maryland Road / NB SR 49/20 Ramps
7. Idaho Maryland Road / Railroad Avenue
12. Brunswick Road / Idaho Maryland Road
13. Brunswick Road / Whispering Pines Lane
14. Brunswick Road / E. Bennett Road – Greenhorn Road
15. Brunswick Road / SR 174
16. Brunswick Road / Project Access
17. E. Bennett Road / Millsite Road
18. Whispering Pines Lane / Centennial Industrial site driveway
19. Idaho Maryland Road / Centennial Road
20. Idaho Maryland Road / Sutton Way
21. Sutton Way / Dorsey Drive

The City of Grass Valley has previously identified the Brunswick Road / SR 49/20 interchange to be analyzed using Synchro/Simtraffic simulation software. Additional intersections were also simulated based on non-standard traffic control conditions that Synchro cannot analyze. The following intersections utilized Synchro/Simtraffic simulation software:

1. Tinloy Street / Neal Street
2. Tinloy Street / S. Auburn Street
3. Tinloy Street / E. Bennett Road – SB SR 49 Off-Ramp
8. Main Street / Brunswick Road
9. Brunswick Road / Maltman Drive – SB SR 49 Off-Ramp
10. Brunswick Road / NB SR 49 Ramps

11. Brunswick Road / Sutton Way
22. NB SR 49 Ramps / Dorsey Drive
23. SB SR 49 Ramps /Dorsey Drive

SIDRA software was used at the following intersection:

5. E. Main Street / Idaho Maryland Road / SB SR 49 Ramps

Each of the intersections analyzed by Synchro/Simtraffic software is within the City of Grass Valley. As noted above, the City requires simulation of the Brunswick Road corridor. The remaining intersections were also simulated based on non-standard traffic control. The Synchro/Simtraffic software is a stochastic model, i.e. randomness is present when running the simulations. The results will vary within each scenario and between scenarios. This may result in some intersections having lower delays in the 'Plus Project' scenarios than in the 'No Project' scenarios. This is a normal occurrence for stochastic models, and it is not unexpected that delays or queues could improve at one intersection while increasing at other intersections. The changes typically should be reasonable; a substantial reduction in delay should not be anticipated. The simulation results contained herein reflect the average of the mean 10 one-hour simulation runs selected from a 20-run sample.

Roundabout analyses were conducted using *SIDRA* Version 8 software.

Applicable Level of Service thresholds based on average delay are shown in Table 2.

TABLE 2
LEVEL OF SERVICE DEFINITIONS

Level of Service	Signalized Intersection	Unsignalized Intersection	Roadway (Daily)
"A"	Uncongested operations, all queues clear in a single-signal cycle. Delay ≤ 10.0 sec	Little or no delay. Delay ≤ 10 sec/veh	Completely free flow.
"B"	Uncongested operations, all queues clear in a single cycle. Delay > 10.0 sec and ≤ 20.0 sec	Short traffic delays. Delay > 10 sec/veh and ≤ 15 sec/veh	Free flow, presence of other vehicles noticeable.
"C"	Light congestion, occasional backups on critical approaches. Delay > 20.0 sec and ≤ 35.0 sec	Average traffic delays. Delay > 15 sec/veh and ≤ 25 sec/veh	Ability to maneuver and select operating speed affected.
"D"	Significant congestion of critical approaches but intersection functional. Cars required to wait through more than one cycle during short peaks. No long queues formed. Delay > 35.0 sec and ≤ 55.0 sec	Long traffic delays. Delay > 25 sec/veh and ≤ 35 sec/veh	Unstable flow, speeds and ability to maneuver restricted.
"E"	Severe congestion with some long standing queues on critical approaches. Blockage of intersection may occur if traffic signal does not provide for protected turning movements. Traffic queue may block nearby intersection(s) upstream of critical approach(es). Delay > 55.0 sec and ≤ 80.0 sec	Very long traffic delays, failure, extreme congestion. Delay > 35 sec/veh and ≤ 50 sec/veh	At or near capacity, flow quite unstable.
"F"	Total breakdown, stop-and-go operation. Delay > 80.0 sec	Intersection blocked by external causes. Delay > 50 sec/veh	Forced flow, breakdown.

Sources: Highway Capacity Manual, 6th Edition Transportation Research Board, 2016.
Sec/veh – seconds per vehicle

III.4. Roadway Segment Level of Service Methodology

Two-Lane Highway Roadway Segments. Roadway segments were analyzed using methods presented in the *Highway Capacity Manual 2010 (HCM);* the methods used in 2010 and HCM 6th Edition are similar. A two-lane highway is an undivided roadway with one lane in each direction. Passing a slower vehicle requires use of the opposing lane as sight distance and gaps in the opposing traffic stream permit. As volumes and geometric restrictions increase, the ability to pass decreases and platoons form. Motorists in platoons are subject to delay because they are unable to pass. The HCM divides these roadways into three types: Class I, Class II and Class III. They are defined as follows:

- *Class I two-lane highways* are highways where motorists expect to travel at relatively high speeds. Two-lane highways that are major intercity routes, primary connectors of major traffic generators, daily commuter routes, or major links in state or national

highway networks are generally assigned to Class I. These facilities serve mostly long-distance trips or provide the connections between facilities that serve long-distance trips.

- *Class II two-lane highways* are highways where motorists do not necessarily expect to travel at high speeds. Two-lane highways functioning as access routes to Class I facilities, serving as scenic or recreational routes (and not as primary arterials), or passing through rugged terrain (where high-speed operation would be impossible) are assigned to Class II. Class II facilities most often serve relatively short trips, the beginning or ending portions of longer trips, or trips for which sightseeing plays a significant role.

- *Class III two-lane highways* are highways serving moderately developed areas. They may be portions of a Class I or Class II highway that pass through small towns or developed recreational areas. On such segments, local traffic often mixes with through traffic, and the density of unsignalized roadside access points is noticeably higher than in a purely rural area. Class III highways may also be longer segments passing through more spread-out recreational areas, also with increased roadside densities. Such segments are often accompanied by reduced speed limits that reflect the higher activity level.

Levels of Service. Three measures of effectiveness are incorporated into the methodology to determine automobile LOS:

1. Average Travel Speed (ATS) reflects mobility on a two-lane highway. It is defined as the highway segment length divided by the average travel time taken by vehicles to traverse it during a designated time interval.

2. Percent Time Spent Following (PTSF) represents the freedom to maneuver and the comfort and convenience of travel. It is the average percentage of time that vehicles must travel in platoons behind slower vehicles due to the inability to pass. Because this characteristic is difficult to measure in the field, a surrogate measure is the percentage of vehicles traveling at headways of less than 3.0 at a representative location within the highway segment. PTSF also represents the approximate percentage of vehicles traveling in platoons.

3. Percent of free-flow speed (PFFS) represents the ability of vehicles to travel at or near the posted speed limit.

Speed and delay due to passing restrictions are both important to motorists on Class I two-lane highways; therefore, LOS is defined in terms of both ATS and PTSF. Travel speed is not a significant issue on Class II highways; therefore, LOS is defined in only terms of PTSF. High speeds are not expected on Class III highways and since the length of the Class III segments may be generally limited, passing restrictions are also not a major concern. In Class III segments drivers are expected to want to travel at or near the speed limit. Therefore, PFFS is used to define LOS. The LOS criteria for two-lane highways are shown in Table 3.

TABLE 3
AUTOMOBILE LOS FOR TWO-LANE HIGHWAYS†

LOS	Class I Highways		Class II Highways	Class III Highways
	ATS (mi / hr)	PTSF (%)	PTSF (%)	PFFS (%)
A	>55	≤35	≤40	>91.7
B	>50-55	>35-50	>40-55	>83.3 – 91.7
C	>45-50	>50-65	>55-70	>75.0 – 83.3
D	>40-45	>65-80	>70-85	>66.7 – 75.0
E	≤40	>80	>85	≤66.7

† HCM 2010, Chapter 15, December 2010

The following Nevada County roadway segments were analyzed:

A. Brunswick Road, from Whispering Pines Lane to SR 49 (Class III)
B. Brunswick Road, between E. Bennett Road and Whispering Pines Lane (Class III)
C. Brunswick Road, between E. Bennett Road and the project driveway (Class III)
D. Brunswick Road, between the project driveway and SR 174(Class III)
E. SR 174, between Brunswick Road and Empire Street (Class I)
F. E. Bennett Road, between Millsite Road and Brunswick Road (Class III)

III.5. Level of Service Thresholds of Significance

Nevada County

Nevada County identifies LOS D or better as the acceptable Level of Service at intersections and roadways in community regions and LOS C in rural regions. All intersections and roadways, except the SR 174 / Brunswick Road intersection and SR 174 east of Empire Street are within the Grass Valley Community Region as identified in the County's General Plan. The SR 174 / Brunswick Road intersection and SR 174 roadway segment, east of Empire Street, are a part of the State highway system.

Under project conditions, a traffic impact is considered to adversely affect an intersection or roadway segment if the conditions change from acceptable to unacceptable Levels of Service or a project adds traffic to an intersection or roadway segment already operating at unacceptable LOS.

The Nevada County General Plan Policy LU-4.1.6 states "Relative to the State highway system, Nevada County recognizes the major funding limitations that exist within the State system and finds that as a matter of policy, additional growth and development may be allowed within the County, notwithstanding the adverse impacts which may result in the short term by this growth and development."

Grass Valley

The City of Grass Valley identifies LOS D or better as the acceptable Level of Service at intersections and roadways. Under project conditions a traffic impact is considered to adversely affect an intersection if the conditions change from acceptable to unacceptable Levels of Service or a project adds traffic to an intersection already operating at unacceptable LOS. The City allows LOS E conditions at the SR 49 SB Ramp / Bennett Road intersection.

Caltrans

The Caltrans *Guide for the Preparation of Traffic Impact Studies* (December 2002) states the following: "Caltrans endeavors to maintain a target LOS at the transition between LOS "C" and LOS "D" on State highway facilities. Caltrans acknowledges that this may not be always feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS. Based on the recently approved Dorsey Marketplace traffic study in Grass Valley the LOS D threshold was used as the acceptable LOS and will be used for Caltrans facilities.

Intersection Queuing Analysis. The quality of traffic flow can also be affected by queuing at signalized intersections. For this study, the lengths of peak period queues have been identified and compared to available storage in order to determine whether spillover from turn lanes can affect adjoining travel or extend through adjacent intersections. 95th percentile queue lengths are reported as part of the Synchro, Synchro/Simtraffic and SIDRA analyses. Those locations where the 95th percentile queue exceeds the available storage have also been noted.

Traffic Signal Warrants. The extent to which existing or projected traffic volumes may justify signalization at unsignalized intersections has been determined based on consideration of traffic signal warrant presented in the *Manual of Uniform Traffic Control Devices, 2014.* For this analysis, the volume thresholds associated with Warrant 3 (Peak Hour Volume) have been assessed. Since this analysis considered the peak hours of adjacent a.m. and p.m. street traffic as well as the peak hours of project traffic, the peak hour warrant was analyzed for each of the five hours. The meeting of a traffic signal warrant does not, in itself, require installation of a traffic signal but serves as a method to identify a location where further analysis is required.

III.6. Non-Automobile Transportation

Public Transit. The Transit Services Division of the Nevada County Public Works Department provides bus service throughout Nevada County. The nearest bus route to either the Brunswick site or Centennial site is Route #3 which passes directly by the Centennial site.

The #3 Grass Valley Loma Rica Loop route operates between the Tinloy Street / Bank Street Transit Center and the Nevada County Airport. The route operates Monday through Friday only, with departures from the Transit Center at 8:30 a.m., 10:30 a.m., 12:30 p.m., 1:30 p.m., 3:30 p.m. and 5:30 p.m. The loop takes approximately 30 minutes.

Bicycle and Pedestrian Facilities. Designated bicycle facilities exist on various parts of County roadways and City of Grass Valley streets. There are no marked bicycle facilities near the Brunswick site. Whispering Pines Lane, which will provide access to the Centennial site, is a

two-lane divided roadway with a wide shoulder which is not marked as a bike lane. Sidewalk is more prevalent within the City of Grass Valley than along Nevada County roadways; however, no sidewalk exists near the Brunswick site or Centennial site.

III.7. Existing Traffic Operating Conditions

Traffic Volume Counts. New traffic counts were conducted by National Data and Surveying Services (NDS). Intersection turning movements were conducted the weeks of August 26, 2019 and October 21, 2019 on Tuesdays, Wednesdays or Thursdays while schools were in session. Roadway segment counts were conducted over a three-day midweek period from August 27 to August 29, 2019 while vehicle classification counts were conducted over a seven-day period from September 4 to September 10.

All counts were conducted based on accepted engineering practice. Five (5) time periods were studied based on direction from Nevada County. These included the "standard" a.m. and p.m. peak hours, when adjacent street traffic is at its highest, and at the three time periods when project employee trips are expected to occur. The standard time periods are generally in the two-hour windows from 7:00 a.m. to 9:00 a.m. and from 4:00 p.m. to 6:00 p.m. The remaining three analysis periods include 6:30 a.m. to 7:30 a.m., 3:30 p.m. to 4:30 p.m., and 6:30 p.m. to 7:30 p.m. The 6:30 a.m. / p.m. to 7:30 a.m. / p.m. period coincides with mining operation shift changes at 7:00 a.m. / p.m. while the 3:30 p.m. to 4:30 p.m. period coincides with administrative personnel shift end at 3:30 p.m.; administrative personnel commence their workday at 7:00 a.m. This is referred to as 'project traffic hours' throughout the report. Intersection turning movements are presented in Figures 4A through 4D.

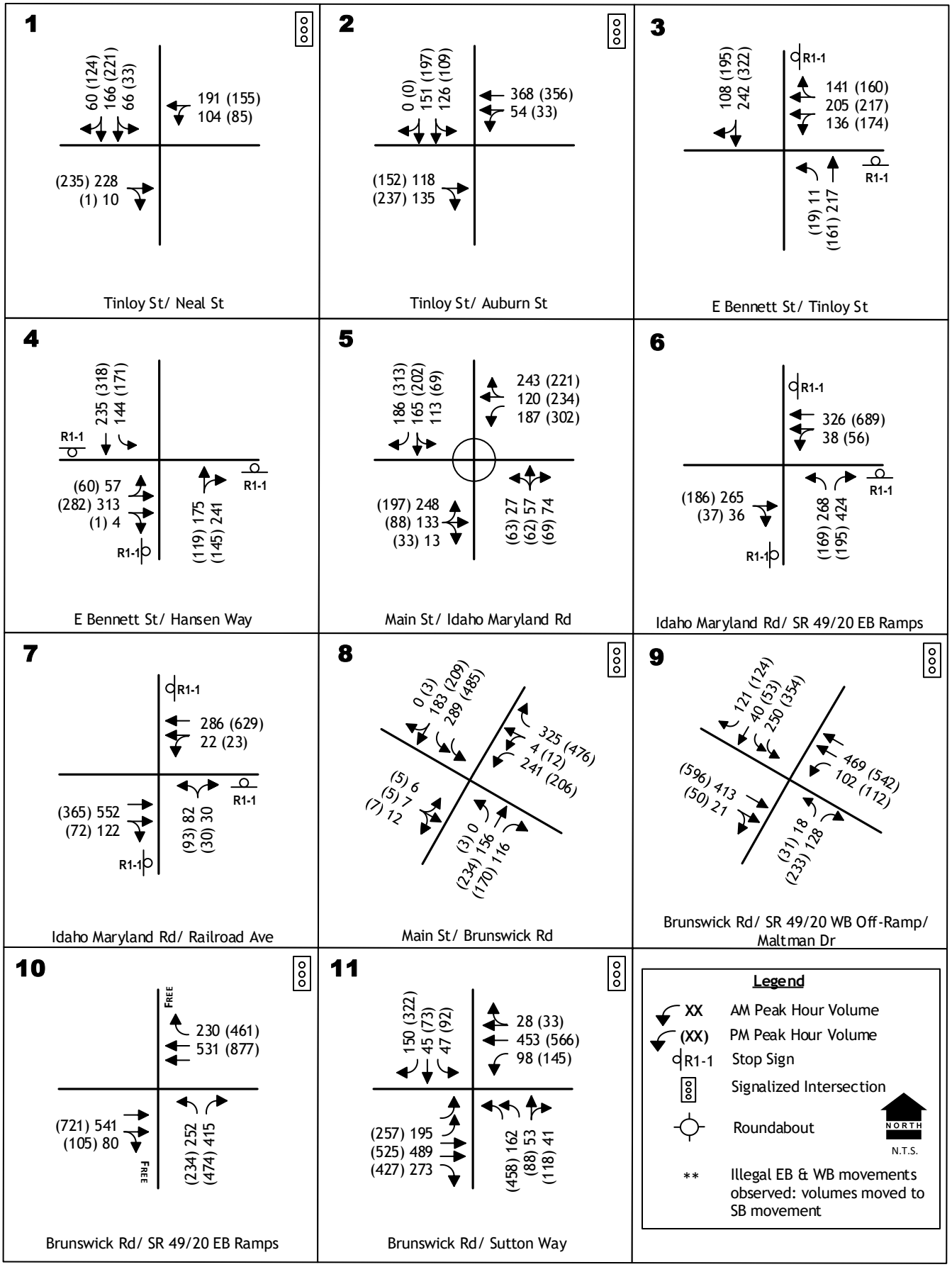
Intersection Levels of Service. Tables 4A and 4B summarize current operating Levels of Service at the study area intersections for each of the five time periods described. Three intersections currently operate at unacceptable Levels of Service, at LOS E or F. These intersections include:

12. Brunswick Road at Idaho Maryland Road where the westbound approach operates at LOS F,
15. Brunswick Road at SR 174 where the southbound approach operates at LOS F, and
19. Idaho Maryland Road at Centennial Drive where the northbound approach operates at LOS F.

Six intersections currently meet the peak hour signal warrant. These intersections include:

3. Bennett Road at Tinloy Street,
6. Idaho Maryland Road at SR 49/20 EB Ramps,
12. Brunswick Road at Idaho Maryland Road,
13. Brunswick Road at Whispering Pines Lane,
14. Brunswick Road at E. Bennett Road, and
15. Brunswick Road at SR 174.

As identified above, the Brunswick Road / Idaho Maryland Road intersection and Brunswick Road / SR 174 intersection also operate below the accepted LOS D threshold.

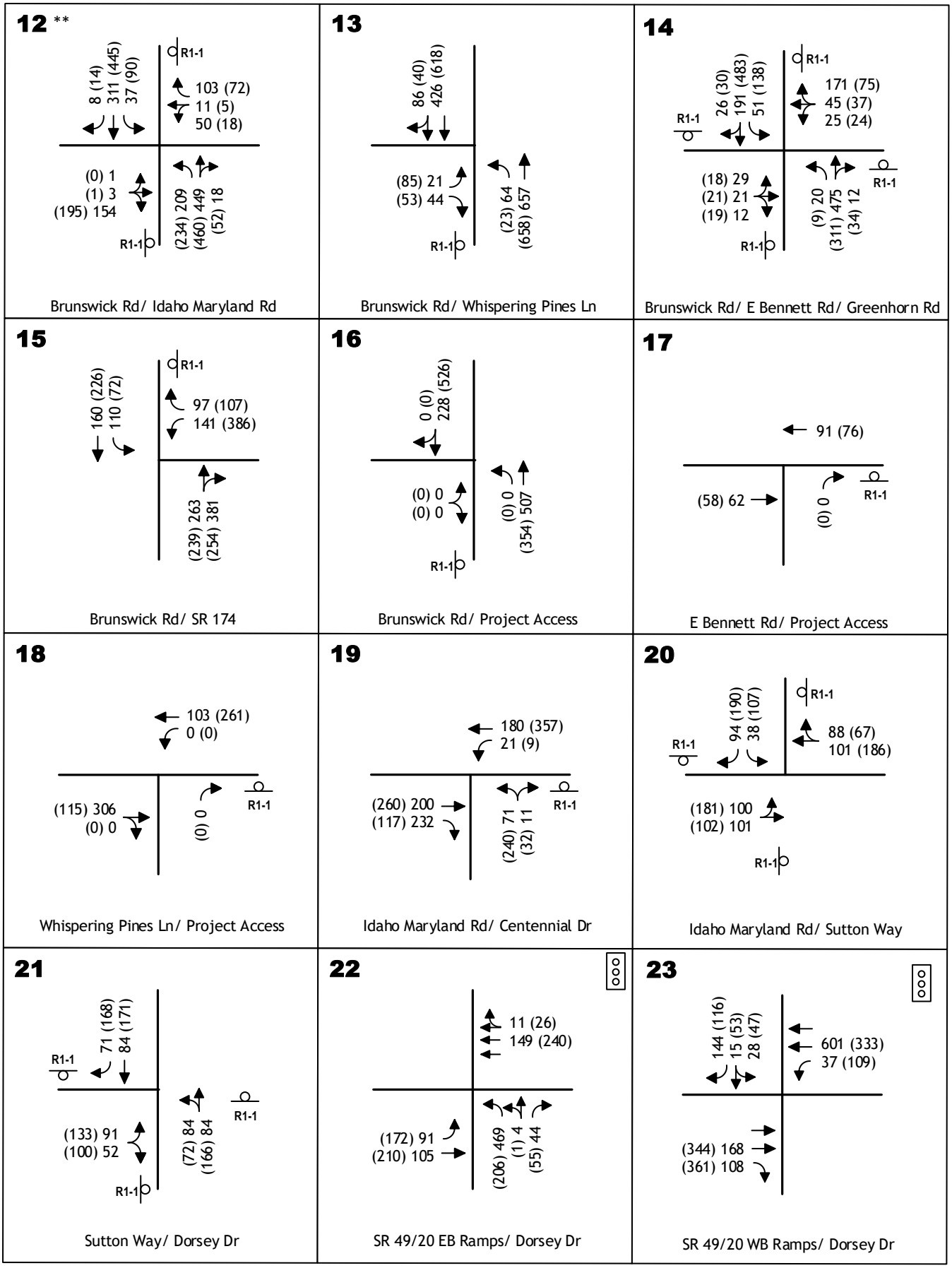


AM/PM PEAK HOURS EXISTING
TRAFFIC VOLUMES AND LANE CONFIGURATIONS

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

figure 4a

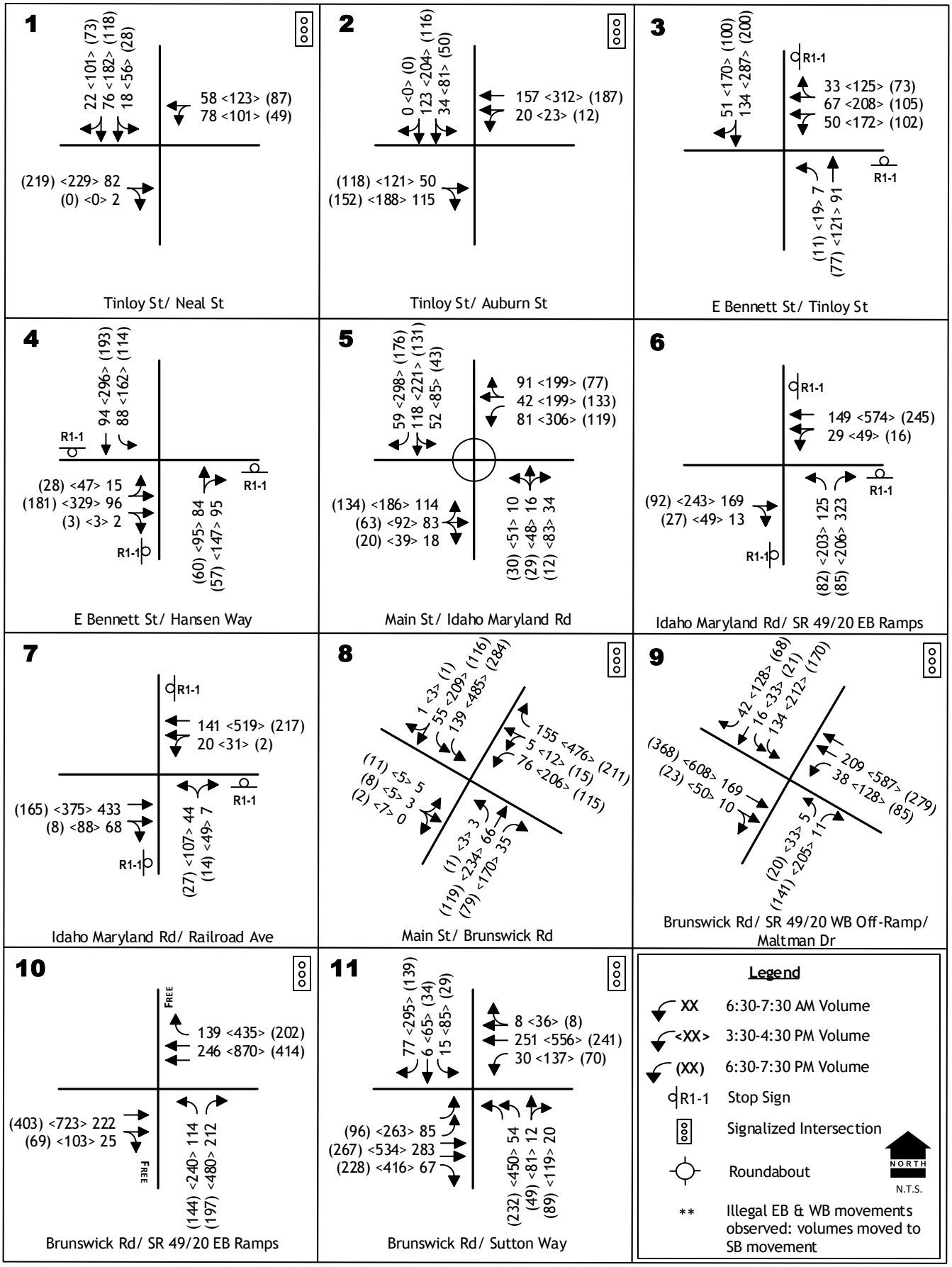


AM/PM PEAK HOURS EXISTING
TRAFFIC VOLUMES AND LANE CONFIGURATIONS

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

figure 4b

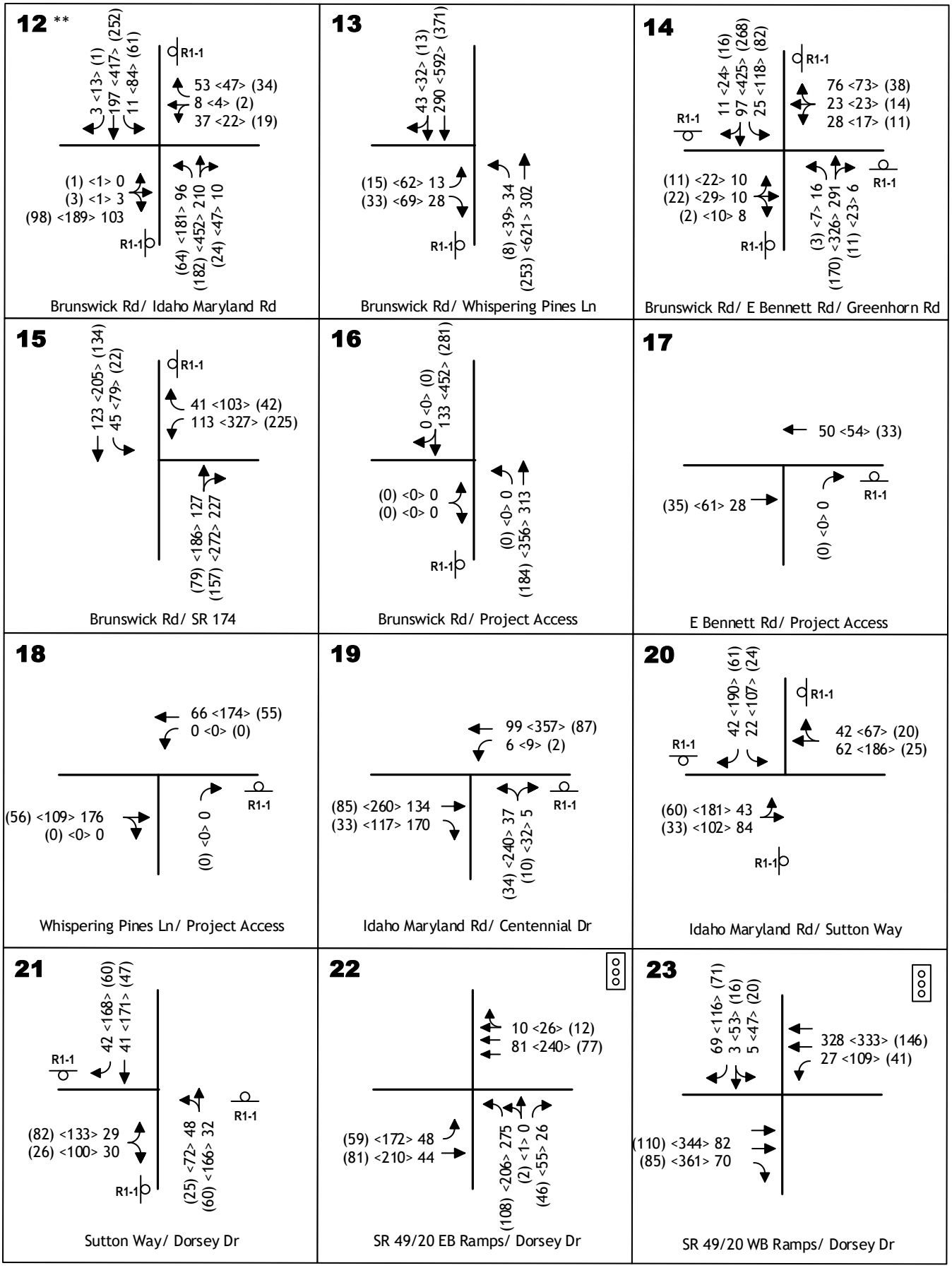


PROJECT TRAFFIC HOURS EXISTING
TRAFFIC VOLUMES AND LANE CONFIGURATIONS

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

figure 4c



PROJECT TRAFFIC HOURS EXISTING
TRAFFIC VOLUMES AND LANE CONFIGURATIONS

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

figure 4d

TABLE 4A
EXISTING LEVELS OF SERVICE AT INTERSECTIONS
(PEAK HOURS)

Location	Control	AM Peak Hour		PM Peak Hour		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	
1. Neal St / Tinloy St	Signal	B	14.5	B	10.9	N/A
2. S. Auburn St / Tinloy St	Signal	B	10.4	B	10.3	N/A
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp	SB / WB Stop	A	6.2	A	7.0	Yes
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp	AWS	C	19.0	C	15.4	No
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps	Roundabout	A	7.2	A	6.9	N/A
6. Idaho Maryland Rd / SR 49 EB Ramps	AWS	C	20.1	C	23.8	Yes
7. Idaho Maryland Rd / Railroad Ave	AWS	B	12.2	C	16.3	No
8. Main St / Brunswick Rd – W. Olympia Dr	Signal	B	10.4	B	13.8	N/A
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr	Signal	B	17.5	C	20.7	N/A
10. Brunswick Rd / SR 49 EB Ramps	Signal	B	12.0	B	12.4	N/A
11. Brunswick Rd / Sutton Way	Signal	B	11.8	C	22.4	N/A
12. Brunswick Rd / Idaho Maryland Rd						
NB Left	EB/WB Stop	A	8.6	A	9.2	Yes
SB Left		A	8.5	A	8.8	
EB		B	11.6	B	14.0	
WB		**F**	**73.7**	**F**	**61.8**	
13. Brunswick Rd / Whispering Pines Ln						
NB Left	EB Stop	A	8.9	A	9.1	Yes
EB		B	12.5	C	16.3	
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd	AWS	C	23.7	C	19.5	Yes
15. Brunswick Rd / SR 174						
SB	SB Stop	C	16.6	**F**	**72.9**	Yes
EB Left		A	8.1	A	7.9	
16. Brunswick Rd / Project Driveway	EB Stop	Not Studied				

AWS – all way stop
Bold indicates intersection operates below threshold

TABLE 4A (continued)
EXISTING LEVELS OF SERVICE AT INTERSECTIONS
(PEAK HOURS)

Location	Control	AM Peak Hour		PM Peak Hour		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	
17. E. Bennett Rd / Millsite Rd	NB Stop	Not Studied				
18. Whispering Pines Ln / Centennial Site Driveway	NB Stop	Not Studied				
19. Idaho Maryland Rd / Centennial Dr NB WB Left	NB Stop	 B A	 12.1 8.3	 **F** A	 **59.1** 8.3	 No
20. Idaho Maryland Rd /Sutton Way	AWS	A	9.2	B	12.4	No
21. Sutton Way / Dorsey Dr	AWS	A	8.8	B	11.7	No
22. Dorsey Dr / SR 49 EB Ramps	Signal	B	12.6	B	13.7	N/A
23. Dorsey Dr / SR 49 WB Ramps	Signal	A	6.5	A	8.8	N/A

AWS – all way stop
Bold indicates intersection operates below threshold

TABLE 4B
EXISTING LEVELS OF SERVICE AT INTERSECTIONS
(PROJECT TRAFFIC HOURS)

Location	Control	6:30 – 7:30 AM		3:30 – 4:30 PM		6:30 – 7:30 PM		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	
1. Neal St / Tinloy St	Signal	A	4.8	A	8.3	A	6.6	N/A
2. S. Auburn St / Tinloy St	Signal	A	6.1	A	8.7	A	7.0	N/A
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp	SB / WB Stop	A	3.9	A	6.1	A	4.1	Yes*
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp	AWS	A	9.2	B	14.8	B	10.1	No
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps	Roundabout	A	4.5	A	6.6	A	4.3	N/A
6. Idaho Maryland Rd / SR 49 EB Ramps	AWS	B	13.5	C	18.2	A	9.5	No
7. Idaho Maryland Rd / Railroad Ave	AWS	B	10.7	C	15.9	A	8.5	No
8. Main St / Brunswick Rd – W. Olympia Dr	Signal	A	5.8	B	13.3	A	8.7	N/A
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr	Signal	B	16.6	B	19.8	B	16.7	N/A
10. Brunswick Rd / SR 49 EB Ramps	Signal	A	8.6	B	13.2	A	9.2	N/A
11. Brunswick Rd / Sutton Way	Signal	A	4.8	C	21.3	A	9.1	N/A
12. Brunswick Rd / Idaho Maryland Rd								
NB Left	EB/WB Stop	A	8.0	A	9.0	A	8.0	Yes*
SB Left		A	7.8	A	8.8	A	7.8	
EB		B	10.3	B	13.7	B	10.6	
WB		C	17.1	**F**	**70.7**	B	14.6	
13. Brunswick Rd / Whispering Pines Ln								
NB Left	EB Stop	A	8.4	A	9.0	A	8.3	Yes*
EB		B	10.8	B	14.1	B	10.5	
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd	AWS	B	10.6	C	17.4	B	10.5	Yes*
15. Brunswick Rd / SR 174								
SB	SB Stop	B	12.5	**E**	**35.1**	B	12.5	Yes*
EB Left		A	7.6	A	7.8	A	7.4	
16. Brunswick Rd / Project Driveway	EB Stop	Not Studied						

AWS – all way stop
Bold indicates intersection operates below threshold
* meets warrant in 3:30 p.m. hour

TABLE 4B (continued)
EXISTING LEVELS OF SERVICE AT INTERSECTIONS
(PROJECT TRAFFIC HOURS)

Location	Control	6:30 – 7:30 AM		3:30 – 4:30 PM		6:30 – 7:30 PM		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	
17. E. Bennett Rd / Millsite Rd	NB Stop	Not Studied						
18. Whispering Pines Ln / Centennial Site Driveway	NB Stop	Not Studied						
19. Idaho Maryland Rd / Centennial Dr NB WB Left	NB Stop	B A	11.3 8.2	**F** A	**59.1** 8.3	B A	10.1 7.6	No
20. Idaho Maryland Rd /Sutton Way	AWS	A	8.1	B	12.4	A	8.0	No
21. Sutton Way / Dorsey Dr	AWS	A	8.0	B	11.8	A	8.2	No
22. Dorsey Dr / SR 49 EB Ramps	Signal	A	7.9	B	13.6	A	7.8	N/A
23. Dorsey Dr / SR 49 WB Ramps	Signal	A	3.7	A	9.1	A	5.3	N/A

AWS – all way stop
Bold indicates intersection operates below threshold

Intersection Queues. The quality of traffic flow can also be affected by queuing. For this study, the lengths of turning lane queues and stop controlled approach lanes at unsignalized intersections were identified and compared to available storage in order to determine whether spillover from turn lanes can affect adjoining travel or extend through adjacent intersections. The available storage is presented along with the 95th percentile queue lengths. On multiple lane approaches the longest queue is identified unless noted.

Tables 5A and 5B present information regarding current queuing each study intersection where turn lanes exist, or spillback may cause a queue to extend beyond an adjacent intersection. Those 95th percentile queues with length exceeding the available storage have been highlighted. The 95th percentile queue exceeds available storage in 13 locations at eight intersections. The intersections of Neal Street at Tinloy Street and Tinloy Street at S. Auburn Street have queues that exceed the available storage and back up through the adjacent intersection. Similar conditions also exist at the westbound approach of the Idaho Maryland Rd / SR 49 EB Ramps intersection and the eastbound approach of Brunswick Road at SR 49 Westbound Off-Ramp - Maltman Drive intersection. It is assumed that one additional vehicle (25') can store in the available left or right turn taper and this occurs at three locations.

TABLE 5A
EXISTING QUEUES
(PEAK HOURS)

Location	Length*	AM Peak Hour Queue (feet)	PM Peak Hour Queue (feet)
1. Neal St / Tinloy St			
EB	70	115	118
WB	150	265	168
2. S. Auburn St / Tinloy St			
NB through	80	153	135
NB through-left	80	93	76
SB	75	99	138
WB	95	115	120
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp			
NB left turn	60	35	41
NB through	150	65	63
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp			
SB left turn	60	33	40
SB through	150	63	103
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps			
NB	---	26	26
SB	---	34	41
EB	---	84	54
WB	---	53	72

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 5A (continued)
EXISTING QUEUES
(PEAK HOURS)

Location	Length*	AM Peak Hour Queue (feet)	PM Peak Hour Queue (feet)
6. Idaho Maryland Rd / SR 49 EB Ramps			
NB right	---	170	45
NB left	355	90	48
WB	90	60	260
7. Idaho Maryland Rd / Railroad Ave			
EB	90	88	60
8. Main St / Brunswick Rd – W. Olympia Dr			
NB left	110	---	<25
NB right	125	76	117
SB left (2 lanes)	355	111	172
WB left (2 lanes)	150	91	94
WB right	150	95	150
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr			
NB left	100	50	83
NB right	100	74	152
SB left (2 lanes)	260	167	208
SB right	260	76	75
EB	160	145	201
WB left	145	99	106
10. Brunswick Rd / SR 49 EB Ramps			
NB left	200	221	213
NB right	---	209	231
11. Brunswick Rd / Sutton Way			
NB left (2 lanes)	280	94	250
SB left	190	65	104
SB right	180	---	---
EB left (2 lanes)	185	90	122
EB right	250	96	160
WB left	125	87	145
12. Brunswick Rd / Idaho Maryland Rd			
NB left	540	<25	<25
SB left	120	<25	<25
EB right	---	<25	38
WB left	60	113	58
13. Brunswick Rd / Whispering Pines Ln			
NB left	210	<25	<25
EB left	110	<25	28

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 5A (continued)
EXISTING QUEUES
(PEAK HOURS)

Location	Length*	AM Peak Hour Queue (feet)	PM Peak Hour Queue (feet)
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd			
NB left	225	<25	<25
SB left	260	<25	<25
EB	---	<25	<25
WB	---	55	<25
15. Brunswick Rd / SR 174			
SB left	90	48	345
EB left	130	<25	<25
19. Idaho Maryland Rd / Centennial Dr			
NB	---	<25	233
WB left	130	<25	<25
20. Idaho Maryland Rd /Sutton Way			
SB right	90	<25	38
SB left	---	<25	<25
ÈB	---	33	70
WB	---	28	55
21. Sutton Way / Dorsey Dr			
SB right	120	<25	30
SB thru	---	<25	35
NB	---	25	55
EB	---	<25	53
22. Dorsey Dr / SR 49 EB Ramps			
NB Left (2 lanes)	215	204	108
NB right	215	55	43
EB left	180	99	151
23. Dorsey Dr / SR 49 EB Ramps			
SB right	400	70	59
SB left-thru	400	62	84
EB right	155	51	120
WB left	180	58	96

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 5B
EXISTING QUEUES
(PROJECT TRAFFIC HOURS)

Location	Length*	6:30 – 7:30 AM Queue (feet)	3:30 – 4:30 PM Queue (feet)	6:30 – 7:30 PM Queue (feet)
1. Neal St / Tinloy St				
EB	70	59	104	97
WB	150	81	125	87
2. S. Auburn St / Tinloy St				
NB through	80	63	117	74
NB through-left	80	55	74	55
SB	75	69	109	99
WB	95	84	97	74
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp				
NB left turn	60	27	39	32
NB through	150	44	58	48
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp				
SB left turn	60	<25	38	<25
SB through	150	<25	90	<25
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps				
NB	---	<25	<25	<25
SB	---	<25	47	<25
EB	---	29	55	27
WB	---	<25	52	26
6. Idaho Maryland Rd / SR 49 EB Ramps				
NB right	---	105	45	<25
NB left	355	30	58	<25
WB	90	<25	153	30
7. Idaho Maryland Rd / Railroad Ave				
EB	90	73	75	<25
8. Main St / Brunswick Rd – W. Olympia Dr				
NB left	110	<25	<25	<25
NB right	125	40	117	56
SB left (2 lanes)	355	57	183	98
WB left (2 lanes)	150	42	90	60
WB right	150	60	145	66
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr				
NB left	100	<25	80	51
NB right	100	30	128	83
SB left (2 lanes)	260	130	191	136
SB right	260	52	86	53
EB	160	49	202	122
WB left	145	60	107	51

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 5B (continued)
EXISTING QUEUES
(PROJECT TRAFFIC HOURS)

Location	Length*	6:30 – 7:30 AM Queue (feet)	3:30 – 4:30 PM Queue (feet)	6:30 – 7:30 PM Queue (feet)
10. Brunswick Rd / SR 49 EB Ramps				
NB left	200	147	218	178
NB right	---	93	236	87
11. Brunswick Rd / Sutton Way				
NB left (2 lanes)	280	47	245	109
SB left	190	39	100	56
SB right	180	---	---	---
EB left (2 lanes)	185	56	117	65
EB right	250	44	160	82
WB left	125	43	145	68
12. Brunswick Rd / Idaho Maryland Rd				
NB left	540	<25	<25	<25
SB left	120	<25	<25	<25
EB right	---	<25	35	<25
WB left	60	<25	60	<25
13. Brunswick Rd / Whispering Pines Ln				
NB left	210	<25	<25	<25
EB left	110	<25	<25	<25
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd				
NB left	225	<25	<25	<25
SB left	260	<25	<25	<25
EB	---	<25	<25	<25
WB	---	<25	<25	<25
15. Brunswick Rd / SR 174				
SB left	90	25	198	43
EB left	130	<25	<25	<25
16. Brunswick Rd / Project Driveway				
NB left	TWLTL	---	---	---
19. Idaho Maryland Rd / Centennial Dr				
NB	---	<25	233	<25
WB left	130	<25	<25	<25
20. Idaho Maryland Rd /Sutton Way				
SB right	90	<25	38	<25
SB left	---	<25	<25	<25
ÈB	---	<25	70	<25
WB	---	<25	55	<25

Highlighted values indicate queue length in excess of available storage

* - longest lane for multiple turn lane approaches

Queuing distances based on stochastic modeling

TABLE 5B (continued)
EXISTING QUEUES
(PROJECT TRAFFIC HOURS)

Location	Length*	6:30 – 7:30 AM Queue (feet)	3:30 – 4:30 PM Queue (feet)	6:30 – 7:30 PM Queue (feet)
21. Sutton Way / Dorsey Dr				
SB right	120	<25	38	<25
SB thru	---	<25	35	<25
NB	---	<25	55	<25
EB	---	<25	55	<25
22. Dorsey Dr / SR 49 EB Ramps				
NB Left (2 lanes)	215	100	104	58
NB right	215	30	40	38
EB left	180	58	141	61
23. Dorsey Dr / SR 49 EB Ramps				
SB right	400	46	61	44
SB left-thru	400	26	91	48
EB right	155	37	123	42
WB left	180	46	101	53

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

Existing Roadway Segment Levels of Service. Table 6 summarizes the Levels of Service based on the current traffic volumes on study area roads with the existing roadway configuration. Applicable Level of Service thresholds and roadway classifications are presented.

The Levels of Service along Brunswick Road, E. Bennett Road and SR 174 were computed using the HCS two-lane roadway methodology. All segments along Brunswick Road and E. Bennett Road operate at LOS D or better while the SR 174 segment operates at LOS E. The SR 174 segment exceeds the LOS C threshold in both directions.

TABLE 6
EXISTING ROADWAY SEGMENT LEVELS OF SERVICE

Roadway	Location	Facility Classification	ATS/PTSF/LOS Existing PM Peak Hour
Brunswick Rd	SR 49 to Whispering Pines Ln	Class I Highway	
	NB		31.8 / 75.6 / D
	SB		31.7 / 76.3 / D
	Whispering Pines Ln to E. Bennett Rd	Class I Highway	
	NB		37.4 / 67.0 / C
	SB		36.6 / 82.6 / D
	E. Bennett Rd to Project Driveway	Class I Highway	
	NB		35.7 / 60.4 / C
	SB		35.7 / 76.9 / C
	Project Driveway to SR 174	Class I Highway	
	NB		34.1 / 66.4 / C
	SB		33.4 / 80.2 / D
E. Bennett Rd	Project Driveway to Brunswick Rd	Class III Highway	
	EB		35.4 / 35.4 / B
	WB		36.3 / 50.3 / B
SR 174	Brunswick Rd to Empire St	Class I Highway	
	EB		**30.3 / 59.6 / E**
	WB		**29.3 / 77.2 / E**

ATS – average travel speed
PTSF – percent time spent following
LOS – level of service
Bold indicates LOS threshold exceeded

IV. EXISTING PLUS APPROVED PROJECTS [EPAP]

The analysis of the near-term cumulative condition is intended to consider the impact of projects that are approved or are reasonably foreseeable in the next five years. This is referred to as the "Existing Plus Approved Projects" (EPAP) scenarios. Nevada County and City of Grass Valley staff were contacted to identify any approved or pending projects in the project vicinity.

Where available, trip generation developed for a project was assigned to the study intersections. When unavailable, KD Anderson & Associates used the best available information for those projects, generated trips for each and distributed and assigned trips to the study intersections. The Approved Projects traffic was then added to the existing volumes to develop the EPAP scenario. EPAP volumes are presented in Figure 5A through 5D. The following 11 projects were identified based on an approved project list provided by Nevada County and a project status log provided by Grass Valley.

1) **Guilded Springs** - The project is located on Main Street west of Bennett Road. The project consists of division of a 6.96-acre parcel into 27 single family residential lots;
2) **O-Reilly Auto Parts** - The project is located on Nevada City Highway north of Brunswick Road. It includes 8,694 square feet of retail use;
3) **740 Maltman Drive** - The project is located south of Brunswick Road and includes replacement of an existing 2,000 square foot building with a new 3,700 square foot professional office building;
4) **500 Idaho Maryland Road** - The project includes construction of two manufacturing buildings, one of which has already been completed, consisting of 22,500 square feet. The site is located east of Railroad Avenue;
5) **River Valley Bank** - The project includes construction of two buildings, a 3,500 square foot bank which has already been completed and a new 1,450 square foot professional office building;
6) **634 Town Talk Road** includes division of a 1.36-acre parcel into 11 lots in an R-3 zone. The project is located just east of Brunswick Road in the vicinity of the SR 49 interchange;
7) **130 Crown Point Circle** - This project is located in the Whispering Pines Specific Plan zone and includes construction of a 6,889 square foot dental office (medical office building);
8) **Loma Rica Ranch** - This includes the first phase of the Loma Rica Ranch Specific Plan (LRRSP). The LRRSP area includes lands between Sutton Way to east of Brunswick Road north of Idaho Maryland Road. This first phase includes 175 single family residential units and 60 duplex/ townhome lots;
9) **Dorsey Marketplace** - This project considered two alternative site plans. Alternative A included commercial development of 181,900 square feet, construction of 90 multiple-family residential units and a 3,200 square foot clubhouse. Alternative B provided up to

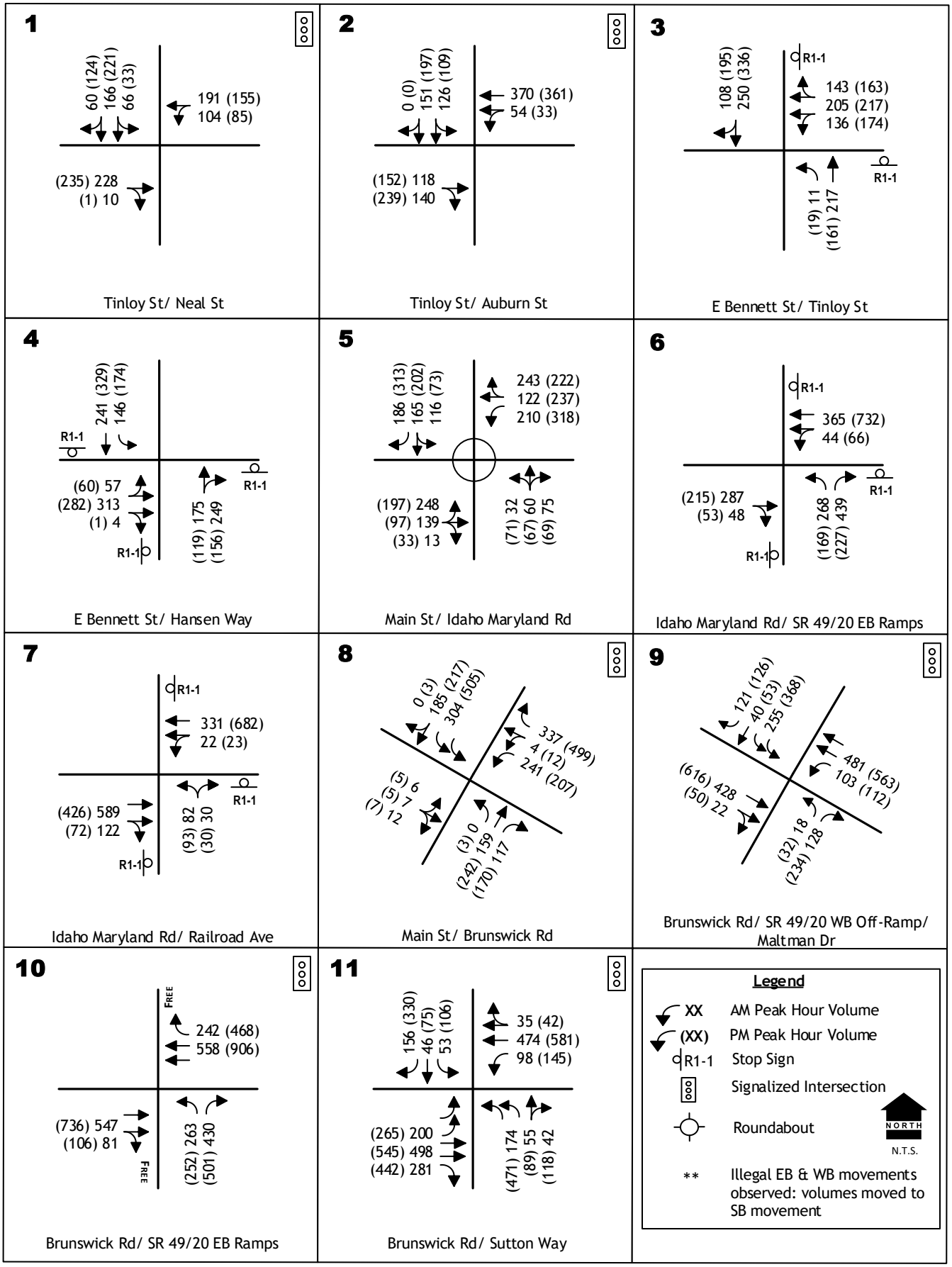
172 apartments, a 3,200-square foot clubhouse, approximately 104,350 square feet of commercial space and approximately 8,500 square feet of office space. The worst-case trip generation for this site, Alternative A, was used;

10) **South Woodlands** - This project is located on Greenhorn Road east of Brunswick Road. The project consists of development of 30 single family residential lots;

11) **Tranquility Lane Estates** - This project is located on Idaho Maryland Road east of Brunswick Road. The project consists of development of 9 single family residential lots.

Intersection Levels of Service. The identified EPAP volumes were used to recalculate operating Levels of Service at the study intersections. No improvements to the study area intersections were identified. Tables 7A and 7B summarize operating Levels of Service at the study area intersections for each of the five time periods described. Three intersections will continue to operate at unacceptable Levels of Service, at LOS E or F. These include Brunswick Road at Idaho Maryland Road where the westbound approach operates at LOS F, Brunswick Road at SR 174 where the southbound approach operates at LOS F and Idaho Maryland Road at Centennial Drive where the northbound approach operates at LOS F.

Seven intersections will meet the peak hour signal warrant. These include E. Bennett Road at Tinloy Street, Idaho Maryland Road at SR 49/20 EB Ramps, Brunswick Road at Idaho Maryland Road, Brunswick Road at Whispering Pines Lane, Brunswick Road at E. Bennett Road, Brunswick Road at SR 174 and Idaho Maryland Road at Centennial Drive. As identified above, the Brunswick Road / Idaho Maryland Road intersection, Brunswick Road / SR 174 intersection and Idaho Maryland Road at Centennial Drive intersection also operate below the accepted LOS D threshold.

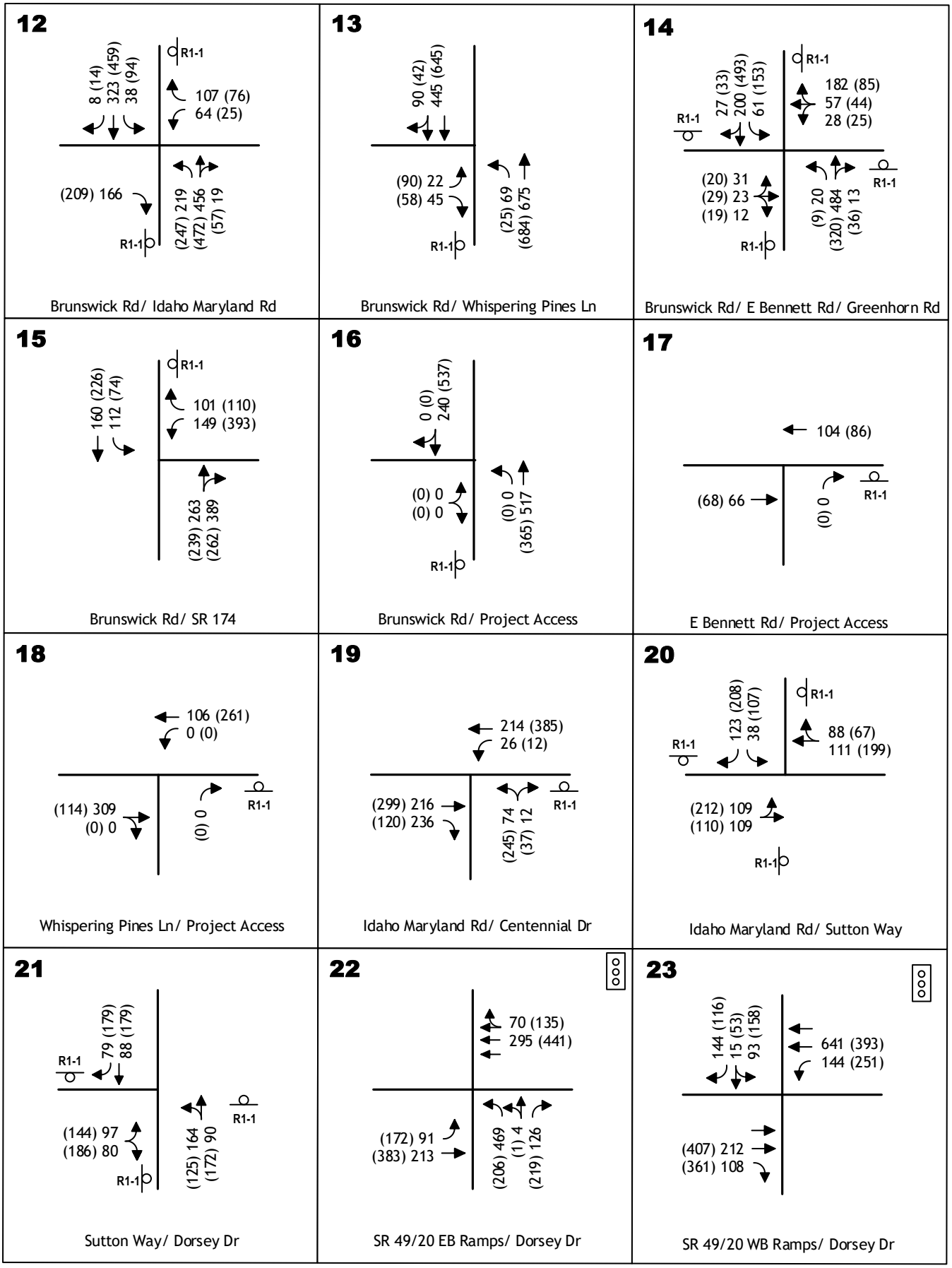


AM/PM PEAK HOURS EXISTING PLUS APPROVED PROJECT TRAFFIC VOLUMES AND LANE CONFIGURATIONS

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

figure 5a

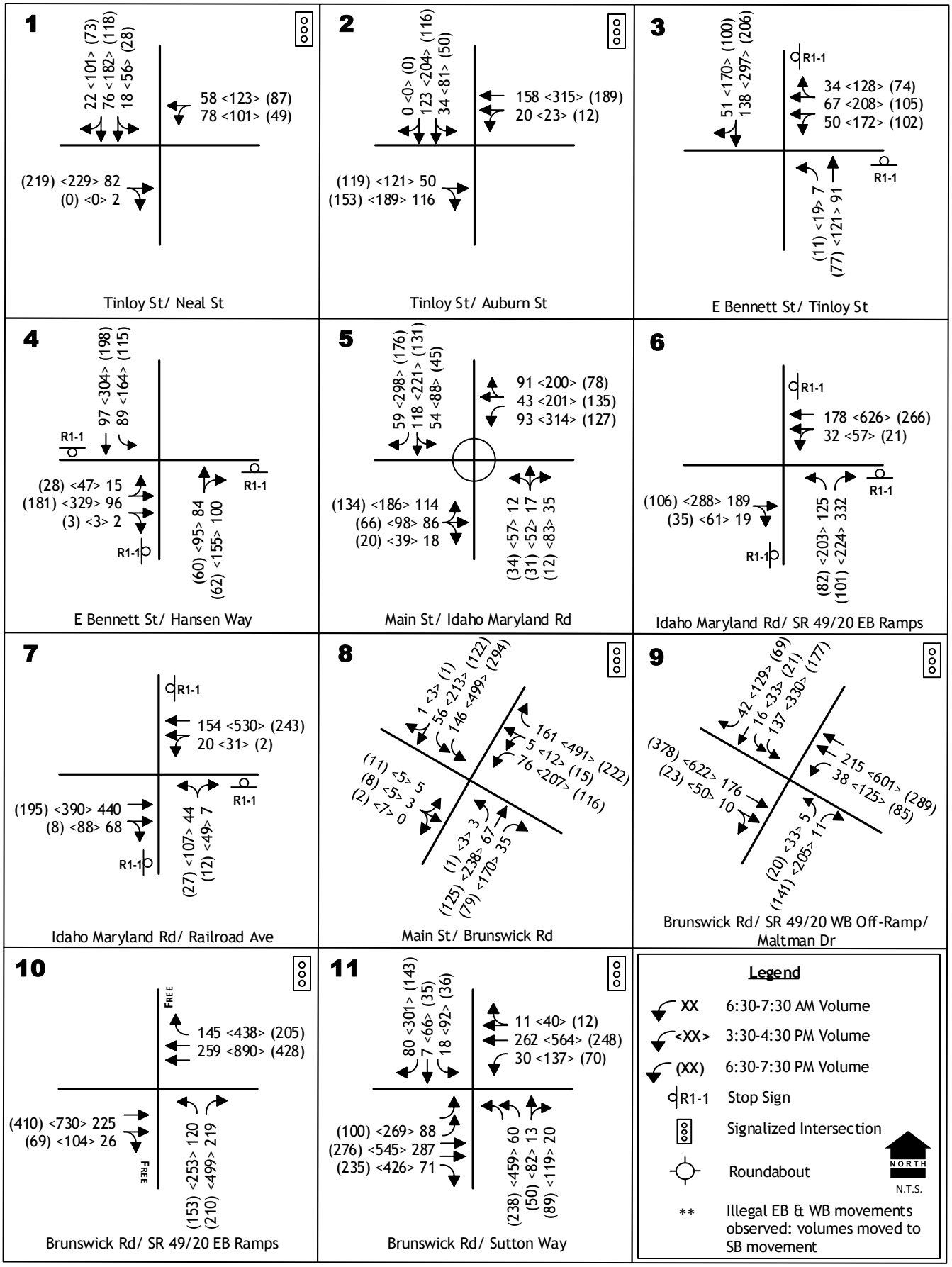


AM/PM PEAK HOURS EXISTING PLUS APPROVED PROJECT
TRAFFIC VOLUMES AND LANE CONFIGURATIONS

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

figure 5b

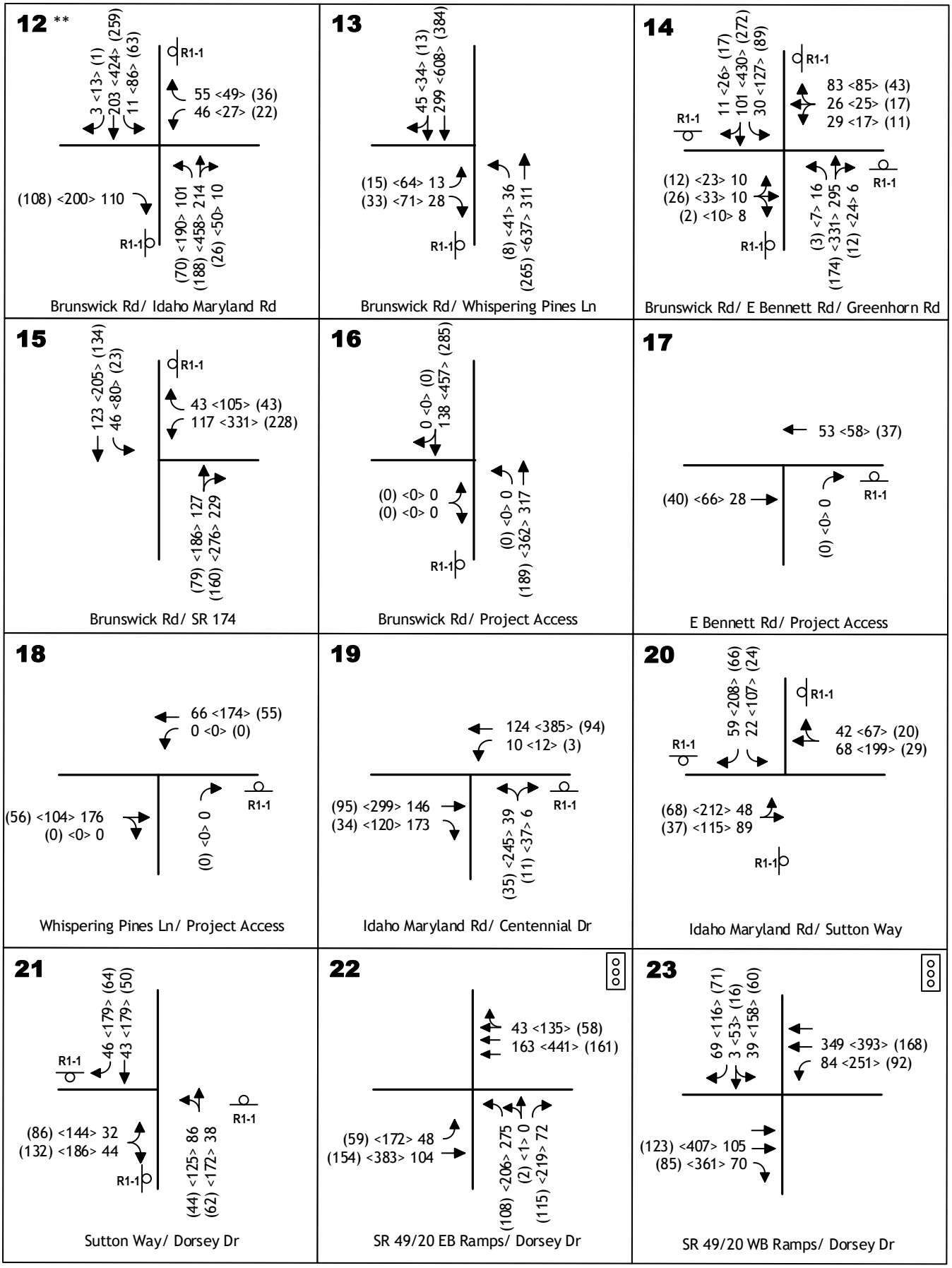


PROJECT TRAFFIC HOURS EXISTING PLUS APPROVED PROJECT TRAFFIC VOLUMES AND LANE CONFIGURATIONS

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

figure 5c



PROJECT TRAFFIC HOURS EXISTING PLUS APPROVED PROJECT TRAFFIC VOLUMES AND LANE CONFIGURATIONS

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

figure 5d

TABLE 7A
EPAP LEVELS OF SERVICE AT INTERSECTIONS
(PEAK HOURS)

Location	Control	EPAP AM Peak Hour		EPAP PM Peak Hour		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	
1. Neal St / Tinloy St	Signal	B	12.6	B	11.5	N/A
2. S. Auburn St / Tinloy St	Signal	A	9.8	B	10.5	N/A
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp	SB / WB Stop	A	6.1	A	7.4	Yes
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp	AWS	C	19.7	C	15.9	No
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps	Roundabout	A	7.6	A	7.3	N/A
6. Idaho Maryland Rd / SR 49 EB Ramps	AWS	C	23.4	D	31.2	Yes
7. Idaho Maryland Rd / Railroad Ave	AWS	B	13.0	C	19.6	No
8. Main St / Brunswick Rd – W. Olympia Dr	Signal	B	10.4	B	14.7	N/A
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr	Signal	B	17.4	C	21.4	N/A
10. Brunswick Rd / SR 49 EB Ramps	Signal	B	12.7	B	13.5	N/A
11. Brunswick Rd / Sutton Way	Signal	B	12.8	C	23.1	N/A
12. Brunswick Rd / Idaho Maryland Rd NB Left SB Left EB WB	EB/WB Stop	 A A B **F**	 8.7 8.5 11.9 **97.9**	 A A B **F**	 9.4 8.9 14.5 **90.7**	Yes
13. Brunswick Rd / Whispering Pines Ln NB Left EB	EB Stop	 A B	 9.0 12.8	 A C	 9.2 17.1	Yes
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd	AWS	D	29.1	C	22.0	Yes
15. Brunswick Rd / SR 174 SB EB Left	SB Stop	 C A	 17.1 8.1	 **F** A	 **78.6** 7.9	Yes

AWS – all way stop
Bold indicates intersection operates below threshold

TABLE 7A (continued)
EPAP LEVELS OF SERVICE AT INTERSECTIONS
(PEAK HOURS)

Location	Control	EPAP AM Peak Hour		EPAP PM Peak Hour		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	
16. Brunswick Rd / Project Driveway	EB Stop	Not Studied				
17. E. Bennett Rd / Millsite Rd	NB Stop	Not Studied				
18. Whispering Pines Ln / Centennial Site Driveway	NB Stop	Not Studied				
19. Idaho Maryland Rd / Centennial Dr NB WB Left	NB Stop	 B A	 12.9 8.4	 **F** A	 **99.8** 8.5	Yes
20. Idaho Maryland Rd /Sutton Way	AWS	A	9.6	B	13.8	No
21. Sutton Way / Dorsey Dr	AWS	A	8.9	C	15.6	No
22. Dorsey Dr / SR 49 EB Ramps	Signal	B	15.0	B	13.6	N/A
23. Dorsey Dr / SR 49 WB Ramps	Signal	B	10.0	B	15.5	N/A

AWS – all way stop
Bold indicates intersection operates below threshold

TABLE 7B
EPAP LEVELS OF SERVICE AT INTERSECTIONS
(PROJECT TRAFFIC HOURS)

Location	Control	EPAP 6:30 – 7:30 AM		EPAP 3:30 – 4:30 PM		EPAP 6:30 – 7:30 PM		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	
1. Neal St / Tinloy St	Signal	A	4.8	A	8.4	A	7.0	N/A
2. S. Auburn St / Tinloy St	Signal	A	6.3	A	8.7	A	6.9	N/A
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp	SB / WB Stop	A	3.8	A	6.4	A	4.2	Yes*
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp	AWS	A	9.3	B	15.2	B	10.2	No
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps	Roundabout	A	4.7	A	6.8	A	4.4	N/A
6. Idaho Maryland Rd / SR 49 EB Ramps	AWS	B	14.9	C	22.6	A	9.9	Yes*
7. Idaho Maryland Rd / Railroad Ave	AWS	B	11.0	C	16.5	A	8.7	No
8. Main St / Brunswick Rd – W. Olympia Dr	Signal	A	6.1	B	13.7	A	9.0	N/A
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr	Signal	B	15.9	B	19.8	B	16.5	N/A
10. Brunswick Rd / SR 49 EB Ramps	Signal	A	9.1	B	13.5	A	9.0	N/A
11. Brunswick Rd / Sutton Way	Signal	A	5.2	C	21.5	A	9.5	N/A
12. Brunswick Rd / Idaho Maryland Rd								
NB Left	EB/WB Stop	A	8.0	A	9.0	A	8.0	Yes*
SB Left		A	7.8	A	8.8	A	7.9	
EB		B	10.4	B	14.1	B	10.7	
WB		C	17.9	**F**	**83.7**	C	15.3	
13. Brunswick Rd / Whispering Pines Ln								
NB Left	EB Stop	A	8.4	A	9.1	A	8.3	Yes*
EB		B	10.9	B	14.5	B	10.6	
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd	AWS	B	10.7	C	18.5	B	10.8	Yes*
15. Brunswick Rd / SR 174								
SB	SB Stop	B	12.5	**E**	**36.3**	B	12.6	Yes*
EB Left		A	7.6	A	7.8	A	7.4	

AWS – all way stop **Bold** indicates intersection operates below threshold * meets warrant in 3:30 p.m. hour

TABLE 7B (continued)
EPAP LEVELS OF SERVICE AT INTERSECTIONS
(PROJECT TRAFFIC HOURS)

Location	Control	EPAP 6:30 – 7:30 AM		EPAP 3:30 – 4:30 PM		EPAP 6:30 – 7:30 PM		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	
16. Brunswick Rd / Project Driveway	EB Stop	Not Studied						
17. E. Bennett Rd / Millsite Rd	NB Stop	Not Studied						
18. Whispering Pines Ln / Centennial Site Driveway	NB Stop	Not Studied						
19. Idaho Maryland Rd / Centennial Dr NB WB Left	NB Stop	B A	11.3 8.2	**F** A	**99.8** 8.5	B A	10.2 7.6	No
20. Idaho Maryland Rd /Sutton Way	AWS	A	8.1	B	13.9	A	8.1	No
21. Sutton Way / Dorsey Dr	AWS	A	8.1	C	15.6	A	9.2	No
22. Dorsey Dr / SR 49 EB Ramps	Signal	A	9.3	B	13.7	A	8.2	N/A
23. Dorsey Dr / SR 49 WB Ramps	Signal	A	6.2	B	14.9	A	7.4	N/A

AWS – all way stop
Bold indicates intersection operates below threshold

Intersection Queues. Tables 8A and 8B present information regarding queuing at each study intersection under EPAP conditions. 95th percentile queues with lengths exceeding the available storage are highlighted. The 95th percentile queue exceeds available storage in 18 locations at 12 intersections. The intersections of Neal Street at Tinloy Street and Tinloy Street at S. Auburn Street have queues that exceed the available storage and back up through the adjacent intersection. Similar conditions also exist at the westbound approach of the Idaho Maryland Road / SR 49 EB Ramps intersection and the eastbound approach of Brunswick Road at SR 49 Westbound Off-Ramp - Maltman Drive intersection. It is assumed that one additional vehicle (25') can store in the available left or right turn taper and this occurs at three locations.

TABLE 8A
EPAP QUEUES
(PEAK HOURS)

Location	Length*	AM Peak Hour Queue (feet)	PM Peak Hour Queue (feet)
1. Neal St / Tinloy St			
EB	70	113	119
WB	150	226	185
2. S. Auburn St / Tinloy St			
NB through	80	144	154
NB through-left	80	91	77
SB	75	104	140
WB	95	110	120
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp			
NB left turn	60	32	43
NB through	150	66	65
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp			
SB left turn	60	33	40
SB through	150	65	110
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps			
NB	---	28	28
SB	---	36	44
EB	---	91	59
WB	---	54	79
6. Idaho Maryland Rd / SR 49 EB Ramps			
NB right	---	205	63
NB left	355	95	50
WB	90	78	338
7. Idaho Maryland Rd / Railroad Ave			
EB	90	103	83

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 8A (continued)
EPAP QUEUES
(PEAK HOURS)

Location	Length*	AM Peak Hour Queue (feet)	PM Peak Hour Queue (feet)
8. Main St / Brunswick Rd – W. Olympia Dr			
NB left	110	---	<25
NB right	125	70	130
SB left (2 lanes)	355	108	187
WB left (2 lanes)	150	90	93
WB right	150	101	152
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr			
NB left	100	52	79
NB right	100	80	161
SB left (2 lanes)	260	170	200
SB right	260	79	81
EB	160	147	211
WB left	145	105	101
10. Brunswick Rd / SR 49 EB Ramps			
NB left	200	230	220
NB right	---	212	249
11. Brunswick Rd / Sutton Way			
NB left (2 lanes)	280	109	263
SB left	190	66	118
SB right	180	---	---
EB left (2 lanes)	185	92	126
EB right	250	97	159
WB left	125	90	157
12. Brunswick Rd / Idaho Maryland Rd			
NB left	540	<25	<25
SB left	120	<25	<25
EB right	---	25	43
WB left	60	133	73
13. Brunswick Rd / Whispering Pines Ln			
NB left	210	<25	<25
EB left	110	<25	30
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd			
NB left	225	<25	<25
SB left	260	<25	28
EB	---	<25	<25
WB	---	55	28

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 8A (continued)
EPAP QUEUES
(PEAK HOURS)

Location	Length*	AM Peak Hour Queue (feet)	PM Peak Hour Queue (feet)
15. Brunswick Rd / SR 174			
SB left	90	53	363
EB left	130	<25	<25
19. Idaho Maryland Rd / Centennial Dr			
NB	---	<25	315
WB left	130	<25	<25
20. Idaho Maryland Rd /Sutton Way			
SB right	90	<25	45
SB left	---	<25	<25
ÈB	---	38	95
WB	---	30	63
21. Sutton Way / Dorsey Dr			
SB right	120	<25	38
SB thru	---	<25	43
NB	---	25	98
EB	---	<25	110
22. Dorsey Dr / SR 49 EB Ramps			
NB Left (2 lanes)	215	207	109
NB right	215	93	95
EB left	180	98	153
22. Dorsey Dr / SR 49 EB Ramps			
SB right	400	72	64
SB left-thru	400	108	161
EB right	155	80	202
WB left	180	126	186

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 8B
EPAP QUEUES
(PROJECT TRAFFIC HOURS)

Location	Length*	EPAP 6:30 – 7:30 AM Queue (feet)	EPAP 3:30 – 4:30 PM Queue (feet)	EPAP 6:30 – 7:30 PM Queue (feet)
1. Neal St / Tinloy St				
EB	70	67	105	99
WB	150	86	139	95
2. S. Auburn St / Tinloy St				
NB through	80	78	115	78
NB through-left	80	55	76	53
SB	75	78	109	101
WB	95	84	99	79
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp				
NB left turn	60	27	41	31
NB through	150	46	54	47
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp				
SB left turn	60	<25	38	<25
SB through	150	<25	95	35
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps				
NB	---	<25	26	<25
SB	---	<25	49	<25
EB	---	30	58	28
WB	---	<25	53	26
6. Idaho Maryland Rd / SR 49 EB Ramps				
NB right	---	120	55	<25
NB left	355	33	63	<25
WB	90	30	203	33
7. Idaho Maryland Rd / Railroad Ave				
EB	90	75	80	<25
8. Main St / Brunswick Rd – W. Olympia Dr				
NB left	110	<25	<25	<25
NB right	125	43	119	60
SB left (2 lanes)	355	60	179	99
WB left (2 lanes)	150	45	90	61
WB right	150	54	153	71
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr				
NB left	100	<25	75	57
NB right	100	32	135	85
SB left (2 lanes)	260	117	191	136
SB right	260	47	86	52
EB	160	47	210	123
WB left	145	62	107	89

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 8B (continued)
EPAP QUEUES
(PROJECT TRAFFIC HOURS)

Location	Length*	EPAP 6:30 – 7:30 AM Queue (feet)	EPAP 3:30 – 4:30 PM Queue (feet)	EPAP 6:30 – 7:30 PM Queue (feet)
10. Brunswick Rd / SR 49 EB Ramps				
NB left	200	165	225	177
NB right	---	93	245	91
11. Brunswick Rd / Sutton Way				
NB left (2 lanes)	280	56	241	110
SB left	190	43	102	55
SB right	180	---	---	---
EB left (2 lanes)	185	59	124	67
EB right	250	45	150	87
WB left	125	44	144	69
12. Brunswick Rd / Idaho Maryland Rd				
NB left	540	<25	<25	<25
SB left	120	<25	<25	<25
EB right	---	<25	40	<25
WB left	60	25	68	<25
13. Brunswick Rd / Whispering Pines Ln				
NB left	210	<25	<25	<25
EB left	110	<25	<25	<25
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd				
NB left	225	<25	<25	<25
SB left	260	<25	<25	<25
EB	---	<25	<25	<25
WB	---	<25	<25	<25
15. Brunswick Rd / SR 174				
SB left	90	25	205	43
EB left	130	<25	<25	<25
19. Idaho Maryland Rd / Centennial Dr				
NB	---	<25	315	<25
WB left	130	<25	<25	<25
20. Idaho Maryland Rd /Sutton Way				
SB right	90	<25	45	<25
SB left	---	<25	<25	<25
ÈB	---	<25	98	<25
WB	---	<25	63	<25

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 8B (continued)
EPAP QUEUES
(PROJECT TRAFFIC HOURS)

Location	Length*	EPAP 6:30 – 7:30 AM Queue (feet)	EPAP 3:30 – 4:30 PM Queue (feet)	EPAP 6:30 – 7:30 PM Queue (feet)
21. Sutton Way / Dorsey Dr				
SB right	120	<25	38	<25
SB thru	---	<25	43	<25
NB	---	<25	98	<25
EB	---	<25	110	40
22. Dorsey Dr / SR 49 EB Ramps				
NB Left (2 lanes)	215	112	104	56
NB right	215	41	98	48
EB left	180	60	155	56
23. Dorsey Dr / SR 49 EB Ramps				
SB right	400	50	58	48
SB left-thru	400	53	154	67
EB right	155	36	199	41
WB left	180	81	184	84

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

EPAP Roadway Segment Levels of Service. Table 9 summarizes the Levels of Service based on the EPAP traffic volumes on study area roads with the existing roadway configuration. All segments along Brunswick Road and E. Bennett Road will continue to operate at LOS D or better while the SR 174 segment will continue to operate at LOS E. The SR 174 segment exceeds the LOS C threshold in both directions.

TABLE 9
EPAP ROADWAY SEGMENT LEVELS OF SERVICE

Roadway	Location	Facility Classification	ATS/PTSF/LOS EPAP PM Peak Hour
Brunswick Rd	SR 49 to Whispering Pines Ln	Class I Highway	
	NB		31.5 / 76.4 / D
	SB		31.4 / 77.1 / D
	Whispering Pines Ln to E. Bennett Rd	Class I Highway	
	NB		37.1 / 67.7 / C
	SB		36.3 / 82.9 / D
	E. Bennett Rd to Project Driveway	Class I Highway	
	NB		35.6 / 61.7 / C
	SB		35.5 / 78.1 / C
	Project Driveway to SR 174	Class I Highway	
	NB		33.9 / 67.4 / C
	SB		33.2 / 80.9 / D
E. Bennett Rd	Project Driveway to Brunswick Rd	Class III Highway	
	EB		35.0 / 36.1 / B
	WB		35.9 / 52.7 / B
SR 174	Brunswick Rd to Empire St	Class I Highway	
	EB		**30.3 / 59.8 / E**
	WB		**29.3 / 76.9 / E**

ATS – average travel speed
PTSF – percent time spent following
LOS – level of service
Bold indicates LOS threshold exceeded

V. PROJECT CHARACTERISTICS

The development of the Idaho Maryland Mine project will attract traffic to the project site. The amount of additional traffic on a particular section of the street network is dependent upon two factors:

- Trip Generation, the number of new trips generated by the project, and
- Trip Distribution and Assignment, the specific routes that the new traffic takes.

V.1. Trip Generation

Trip generation is determined by identifying the type and size of land use being developed. Recognized sources of trip generation data may then be used to calculate the total number of trip ends resulting from the day to day operation of the project.

The *Trip Generation Manual* (Institute of Transportation Engineers, 10th Edition, 2017) is often used to calculate project trips for more common land use codes. However, this publication does not have trip generation data for mining operations. Instead, the project trip generation was developed based on projected employment rates, projected truck trips for hauling engineered fill and mining concentrate off site, and projected material and supply deliveries.

Rise anticipates employing approximately 312 direct employees during full mining operations, as detailed in Table 10. At full operations, approximately 44 employees will work regular 8-hour days, 5 days per week, and approximately 268 employees will work 12-hour shifts, 7 days on and 7 days off. Shift change for 12-hour employees will be 7 a.m. and 7 p.m. Work shifts for 8-hour employees will be from 7 a.m. to 3:30 p.m.

The Brunswick site will generate a maximum of 174 employee trips per day. The Centennial site will generate a maximum of 4 employee trips per day.

TABLE 10
OPERATIONS WORKFORCE & HOURS OF OPERATION

Workforce	Shift	Total Employees
Administrative Personnel: Management, technical, construction, administrative staff	8 hours a day,5 days a week 7:00 a.m. – 3:30 p.m.	40
Mining Operations: Underground mining, mineral processing, engineered fill transport staff	12 hours a day, 7 days on, 7 days off 7:00 a.m. – 7:00 p.m. & 7:00 p.m. – 7:00 a.m.	268
Grading Operations: Centennial* or Brunswick Industrial Site – placement and compaction of engineered fill	8 hours a day, 5 days per week 7:00 a.m. – 3:30 p.m.	4
	TOTAL WORKFORCE	**312**
***** Staffing at the Centennial site is projected to occur over an approximate five-year span within the analysis.		

In addition to employee traffic, the Idaho-Maryland Mine project will result in daily operational truck traffic, including but not limited to engineering fill trucking, concentrate trucking, and materials and supplies deliveries, and ancillary vehicle traffic to support operations. The truck traffic, hours, and projected trip generation are detailed in Table 11.

TABLE 11
PROJECT TRUCK TRAFFIC & HOURS

Truck Traffic	Hours	Maximum Daily Trips	Average Daily Trips
Brunswick Site			
Engineered Fill	6:00 a.m. – 10:00 p.m. 7 days a week	100	50
Concentrate	6:00 a.m. – 10:00 p.m. 7 days a week	5	1
Materials / Supplies / Outside services	7:00 a.m. – 7:00 p.m. 7 days a week	12	6
Centennial Site			
Fuel Supplies	7:00 a.m. – 3:30 p.m. 5 days a week	1	0.3
	TOTAL TRIPS	**118**	**57.3**
NOTE: Traffic analysis studies the worst-case scenario of maximum daily trips and shorter hours of operation as shown in Table 9.			

As discussed previously, a.m. and p.m. periods were analyzed during the "standard" peak of adjacent street traffic, generally from 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m., and at the three time periods when project employee trips are expected to occur based on actual proposed work schedules. Table 12 presents the projected trip generation for the project during the five analysis periods, considering the worst-case scenarios for both Brunswick and Centennial sites.

For purposes of a worst-case analysis, the County requested that a worst-case scenario be analyzed, assuming the project traffic occurred during the "standard" peak hours. However, as noted, the project schedule intends to have employee commute during off-peak hours typically, as previously described.

As noted, the Centennial site is expected to be an active site with delivery of engineered fill occurring for a period of approximately 5 years. The engineered fill is projected to be delivered to construction sites accessible from SR 49 for the remaining 15 years of the analysis. It is unknown which years will be used for each scenario; therefore, two scenarios were analyzed, with each scenario assumed to be active at build-out:

Scenario 1: Transporting of engineered fill to the Centennial Industrial site.
Scenario 2: Transporting of engineered fill to construction sites accessible via SR 49/20.

TABLE 12
TRIP GENERATION

	Employee Trips (Hourly)									
	AM Peak Hour		PM Peak Hour		6:30 – 7:30 AM		3:30 – 4:30 PM		6:30 -7:30 PM	
	In	Out	In	Out	In	Out	In	Out	In	Out
Brunswick Site										
AM Peak Hour	107*	67‡								
PM Peak Hour			67‡	107*						
7:00 AM Shift Change M-F					107*	67‡				
3:30 PM End of Administrative Day M-F							0	40†		
6:30 PM Shift change M-F									67‡	67‡
Centennial Site										
AM Peak Hour	4	0								
PM Peak Hour			0	4						
7:00 AM Shift Change M-F					4	0				
3:30 PM End of Administrative Day M-F							0	4		
6:30 PM Shift change M-F									0	0
Haul Traffic										
Brunswick Site										
Engineered Fill ◊	8	8	8	8	8	8	8	8	8	8
Concentrate □	1	1	1	1	1	1	1	1	1	1
Materials / Supplies ⌂	2	2	2	2	2	2	2	2	2	2
Centennial Site										
Fuel Supplies Δ	1	1	1	1	1	1	1	1	1	1
Total Trips	**123**	**79**	**79**	**123**	**123**	**79**	**12**	**56**	**79**	**79**

Notes:
- Trip generation assumes worst case scenario. Daily operations workforce and truck traffic are detailed in Table 9 and Table 10.
- Brunswick site operational on weekends and generate 67 inbound / outbound trips at shift change

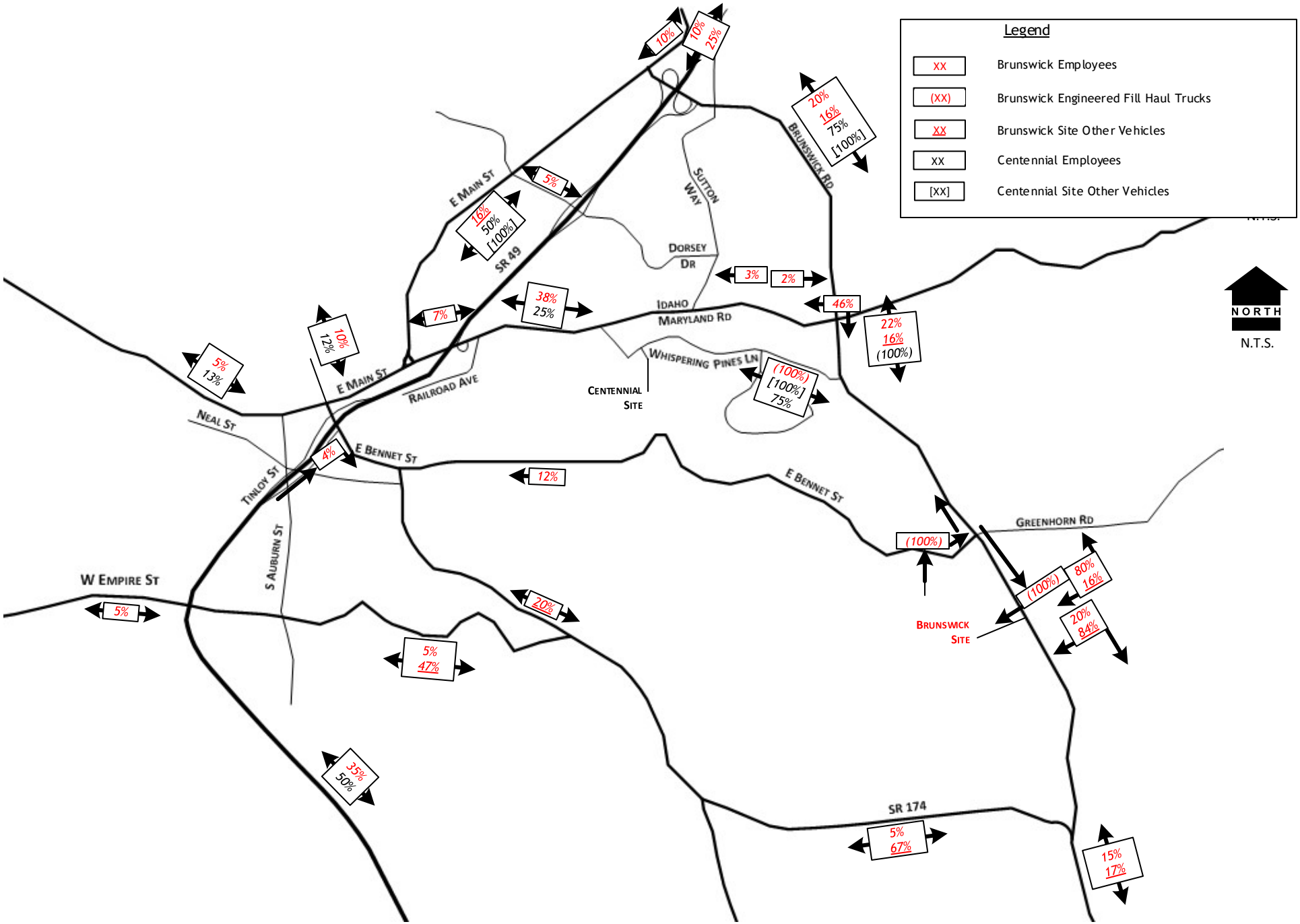
* includes mining and administrative operations
† includes administrative operations
□ 5 trips / day averaged over 8-hour day (worst case)
Δ 1 trip per day
‡ includes mining operations
◊ 100 trucks / day averaged over 12 hours (worst case)
⌂ 12 trips / day averaged over 8-hour day

V.2. Trip Distribution & Assignment

The distribution of traffic was developed based on existing traffic patterns in the Grass Valley area and where employees may be expected to live. Engineered fill will be hauled to either the Centennial site or to off-site construction sites and mining concentrate will be shipped off-site via SR 49. Other trucks providing materials and supplies are expected to access the site from both SR 49 and SR 174. Trip distribution for the various trip elements are shown in Table 13. The trip distribution shown in Figure 6A considers hauling to the Centennial site while Figure 6B provides trip distribution to construction sites accessible via SR 49/20. Project traffic volumes are shown in Figures 7A through 7D with the Centennial site used for engineered fill and Figures 8A through 8D with engineered fill hauled to off-site construction locations. The project distribution was reviewed by both Nevada County and Grass Valley staff.

TABLE 13
PROJECT TRIP DISTRIBUTION

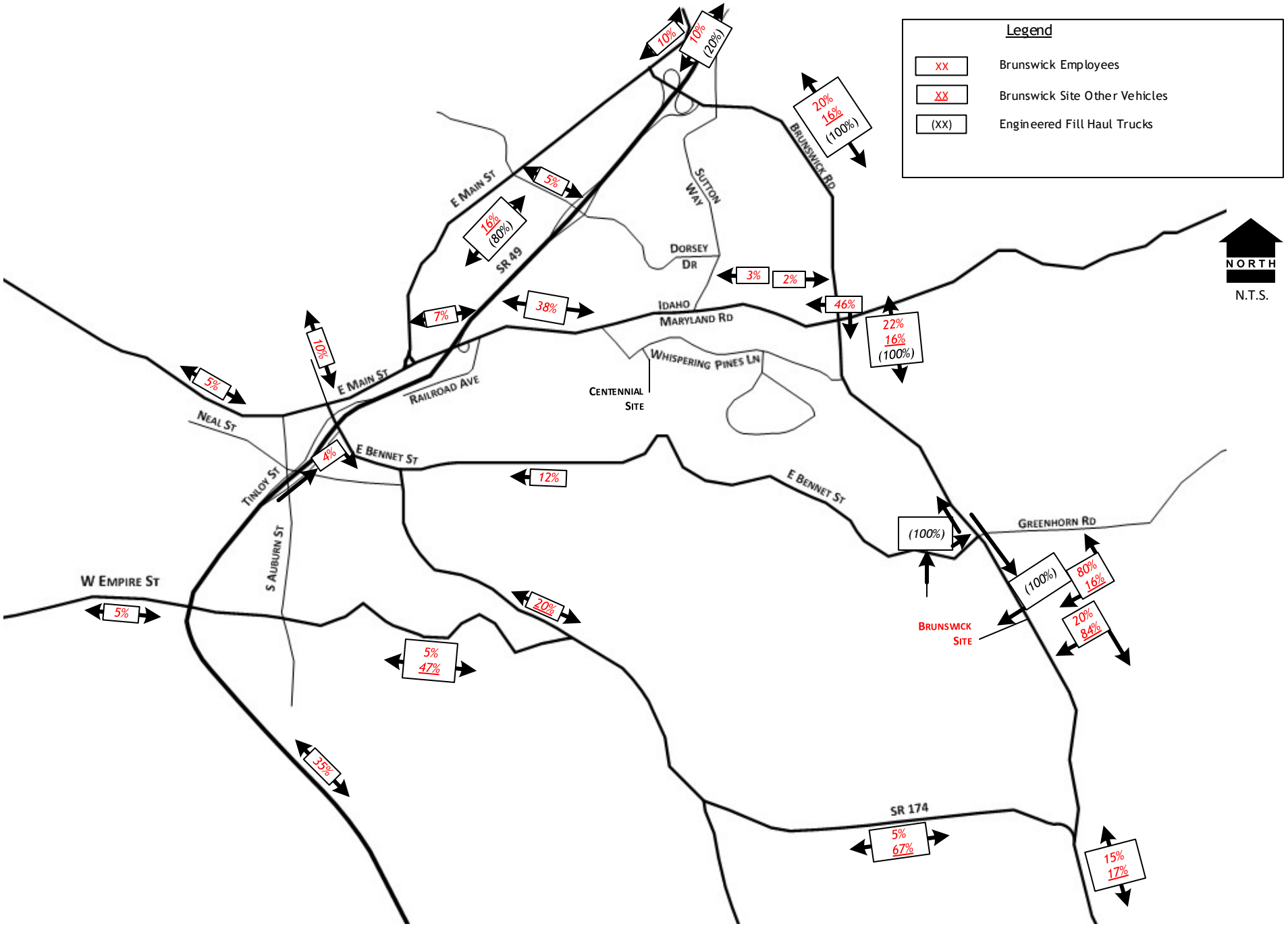
Route	% of Total Trips				
	Brunswick Site			Centennial Site (Scenario #1 only)	
	Employees	Engineered Fill Trucks	Other Vehicles	Employees	Other Vehicles
West to Grass Valley	15%	0%	0%	25%	0%
West on SR 174	5%	0%	67%	0%	0%
West on SR 49/20	0%	0%	16%	0%	0%
South to Auburn via SR 49	35%	0%	0%	0%	0%
South to Auburn via SR 174	15%	0%	17%	0%	0%
East on Nevada City Highway	10%	0%	0%	25%	0%
East on SR 49/20	10%	0%	0%	0%	0%
North to Loma Rica	5%	0%	0%	0%	0%
North to Grass Valley via Dorsey	5%	0%	0%	0%	0%
West on SR 49/20 (scenario #1)	0%	0%	0%	50%	100%
To Centennial Site (scenario #1)	0%	100%	0%	0%	0%
East on SR 49/20 (scenario #2)	0%	20%	0%	0%	0%
West on SR 49/20 (scenario#2)	0%	80%	0%	0%	0%
Total	100%	100%	100%	100%	100%



KD Anderson & Associates, Inc.
Transportation Engineers
5875-01 RA 2/17/2020

TRIP DISTRIBUTION PERCENTAGES
SCENARIO #1 – CENTENNIAL SITE

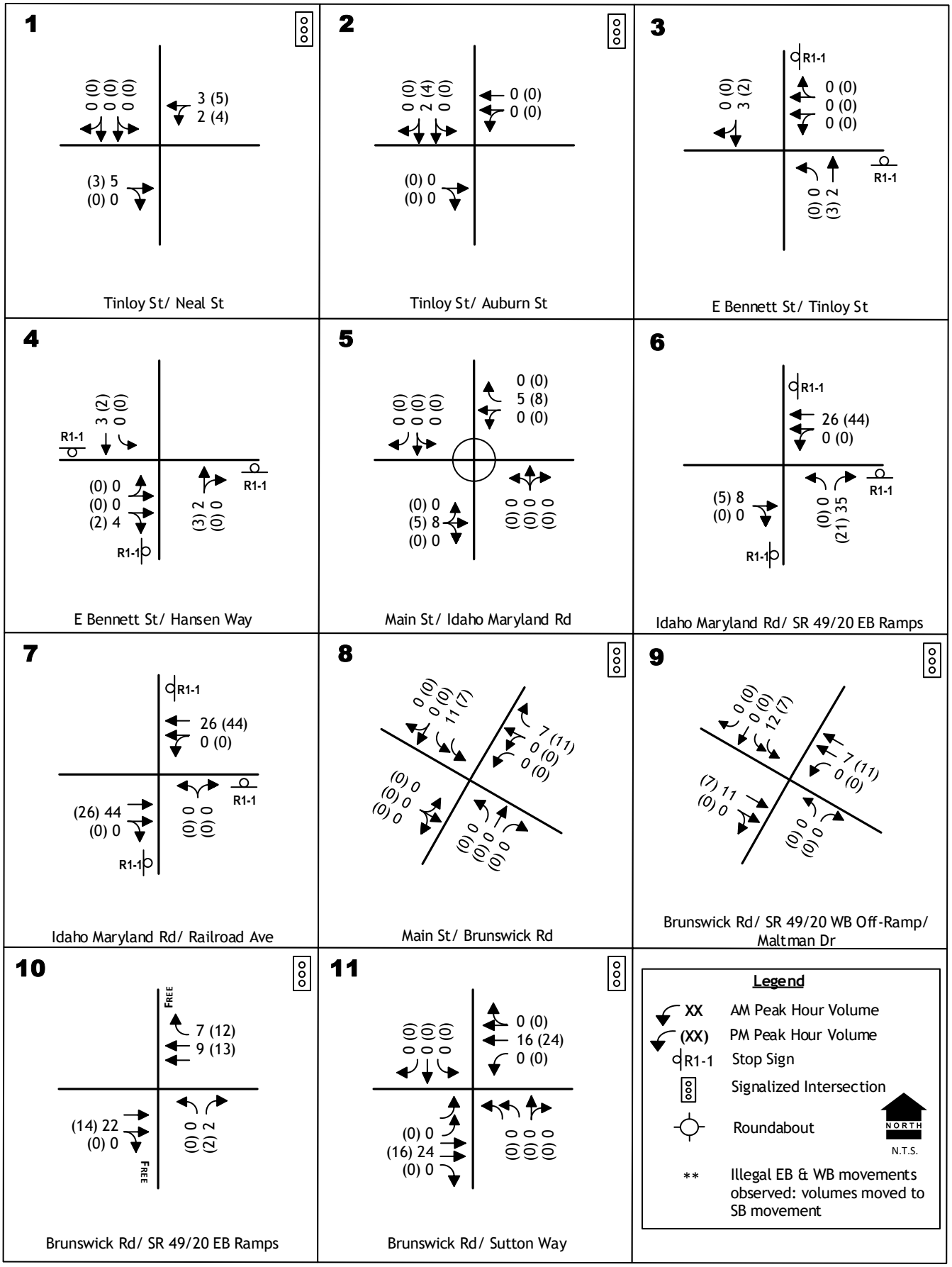
figure 6a



KD Anderson & Associates, Inc.
Transportation Engineers
5875-01 RA 2/17/2020

TRIP DISTRIBUTION PERCENTAGES
SCENARIO #2 – SR 49

figure 6b

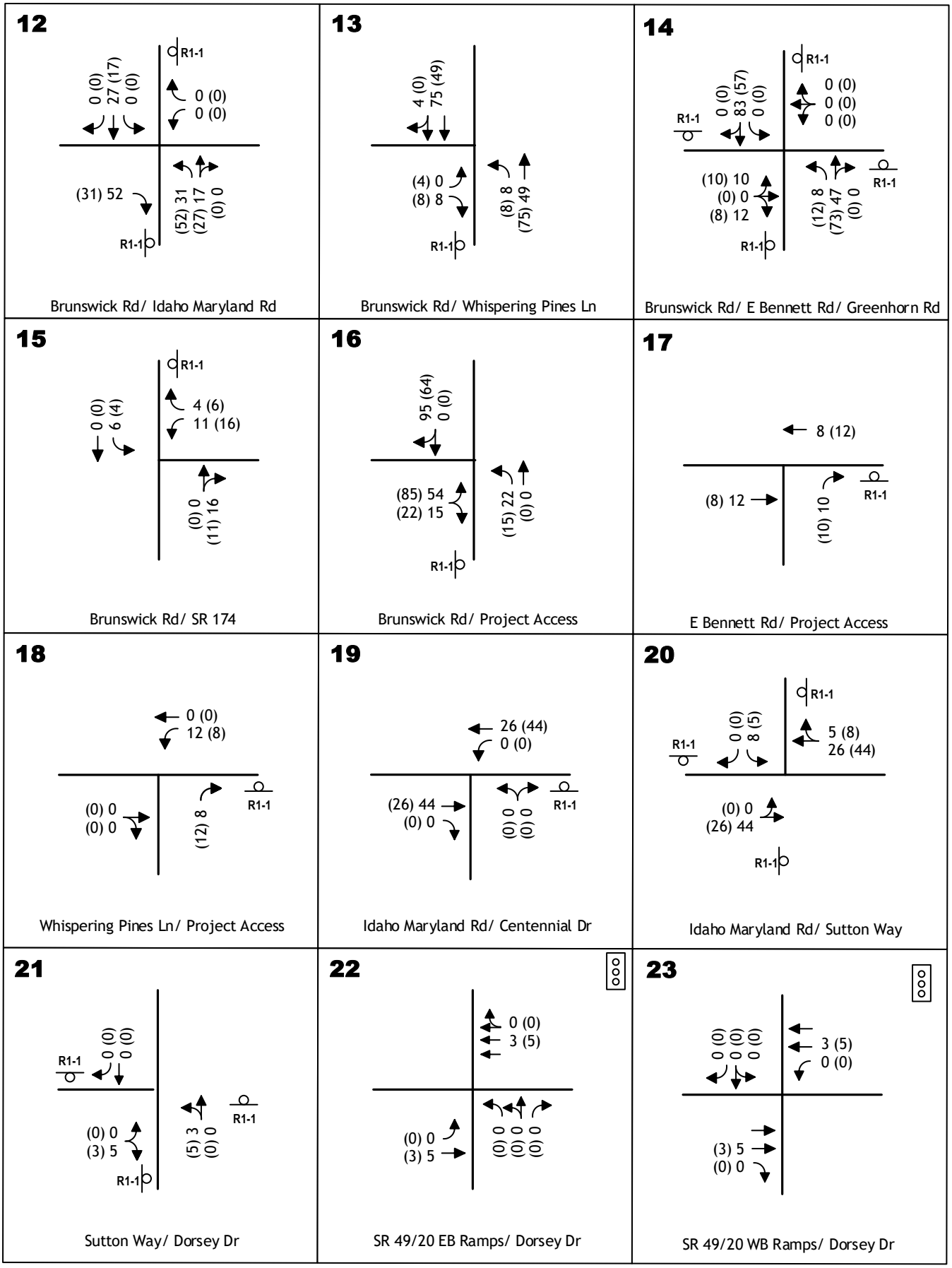


AM/PM PEAK HOURS PROJECT TRIPS
TRAFFIC VOLUMES AND LANE CONFIGURATIONS
(TO CENTENNIAL SITE)

figure 7a

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

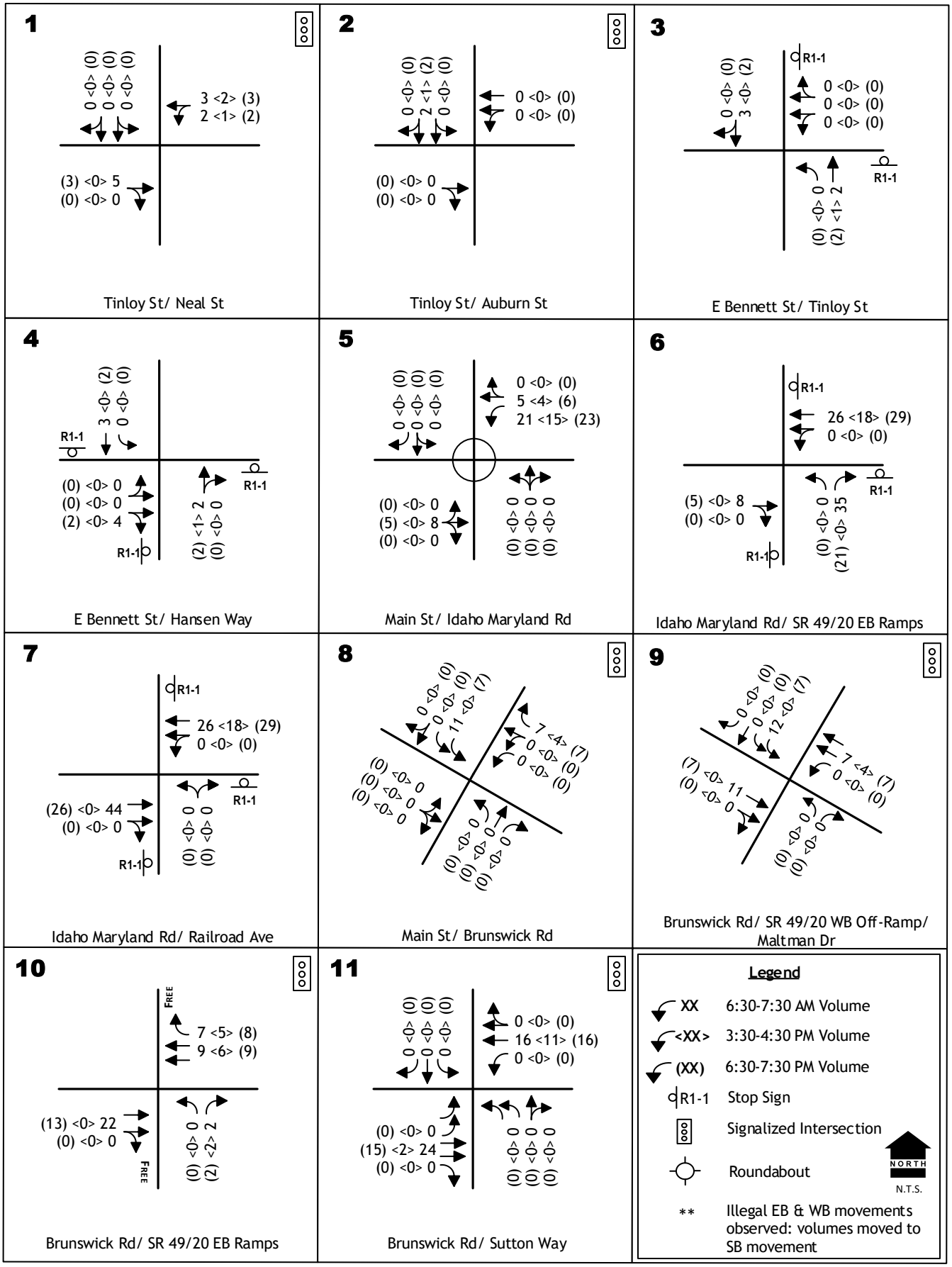


AM/PM PEAK HOURS PROJECT TRIPS
TRAFFIC VOLUMES AND LANE CONFIGURATIONS
(TO CENTENNIAL SITE)

figure 7b

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

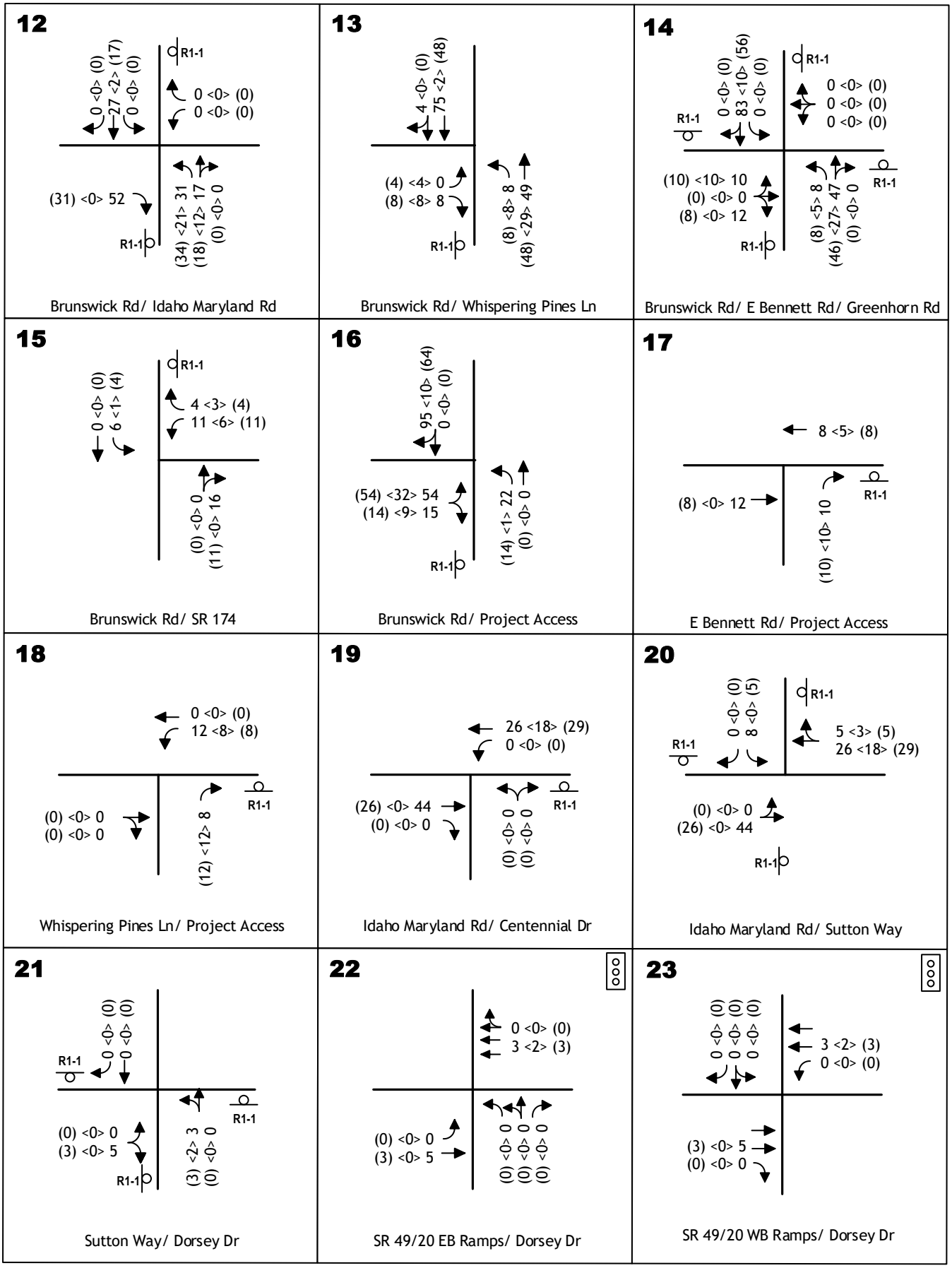


PROJECT TRAFFIC HOURS PROJECT TRIPS
TRAFFIC VOLUMES AND LANE CONFIGURATIONS
(TO CENTENNIAL SITE)

figure 7c

KD Anderson & Associates, Inc.
Transportation Engineers

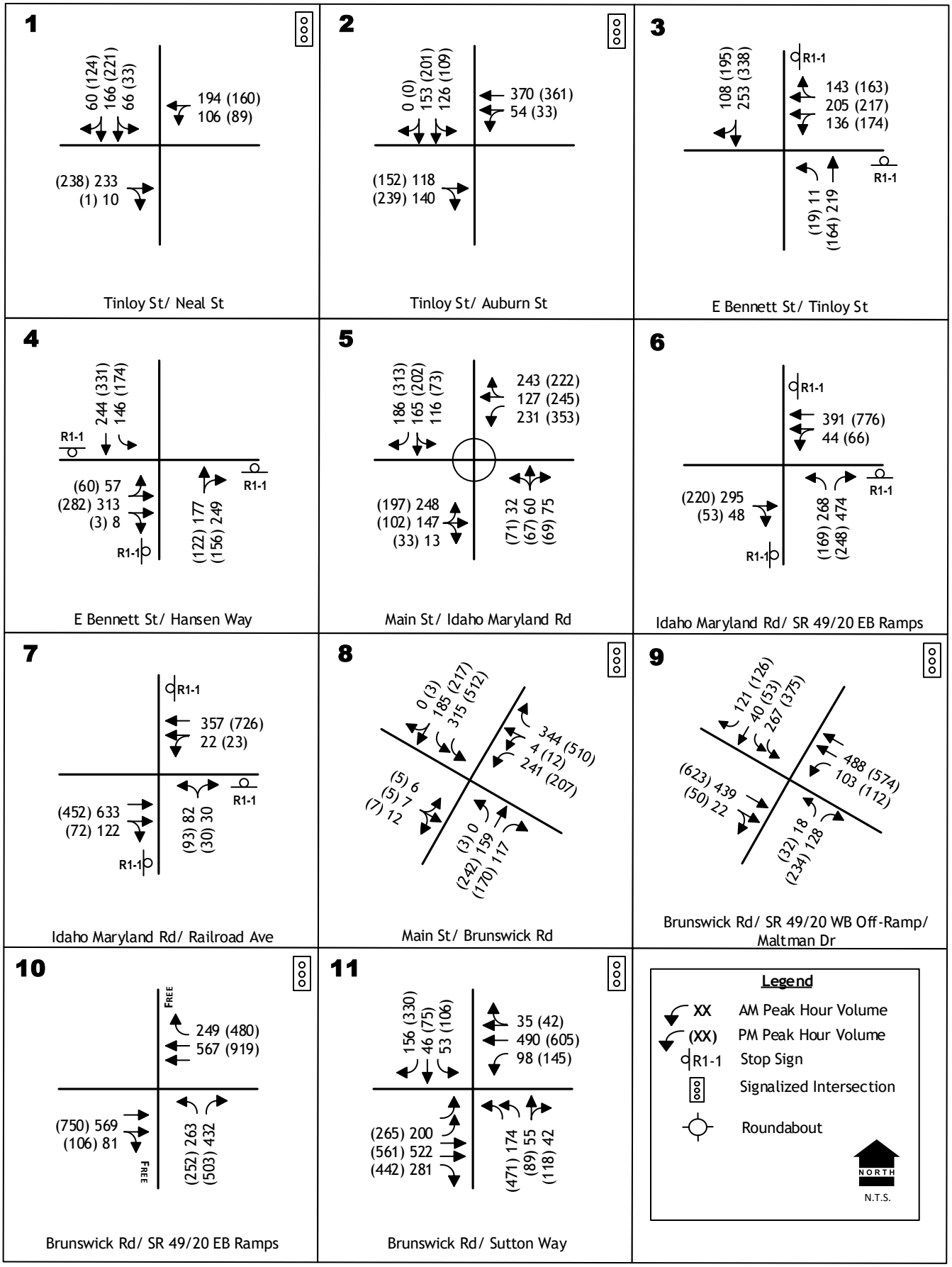
5875-01 RA 2/17/2020



PROJECT TRAFFIC HOURS PROJECT TRIPS
TRAFFIC VOLUMES AND LANE CONFIGURATIONS
(TO CENTENNIAL SITE)

figure 7d

KD Anderson & Associates, Inc.
Transportation Engineers

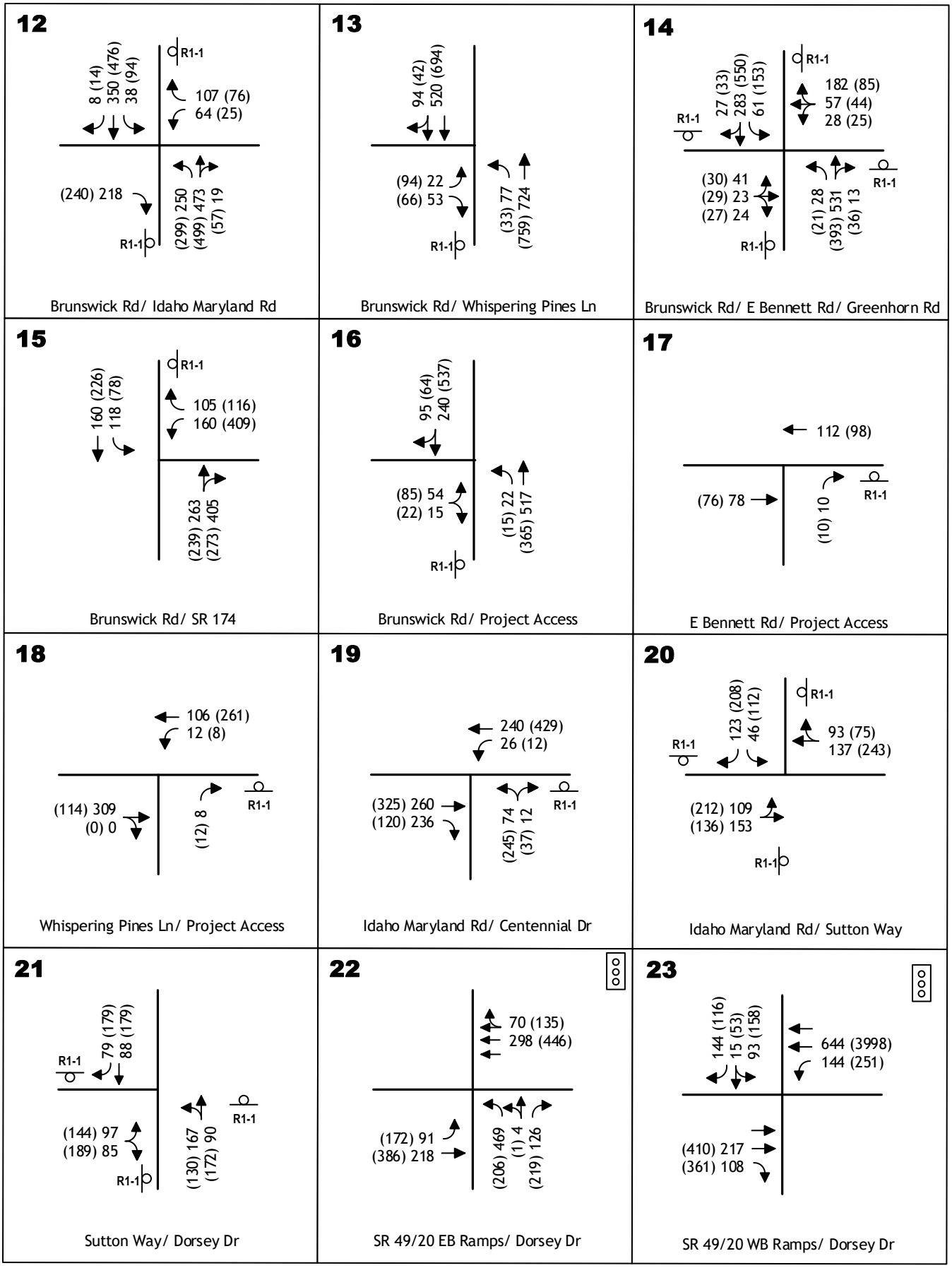


AM/PM PEAK HOURS EPAP PLUS PROJECT
TRAFFIC VOLUMES AND LANE CONFIGURATIONS
(TO CENTENNIAL SITE)

figure 8a

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

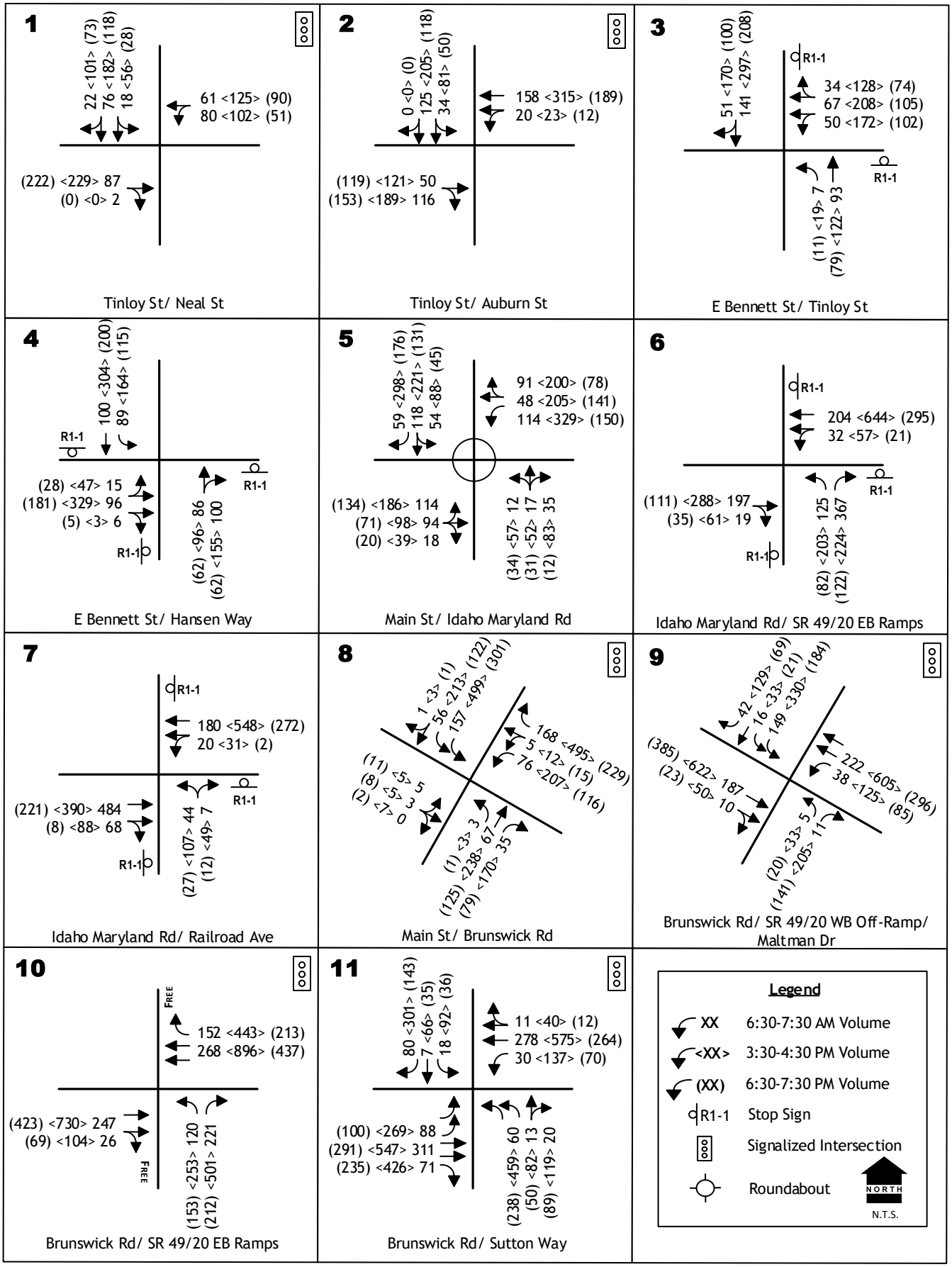


KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

AM/PM PEAK HOURS EPAP PLUS PROJECT TRAFFIC VOLUMES AND LANE CONFIGURATIONS (TO CENTENNIAL SITE)

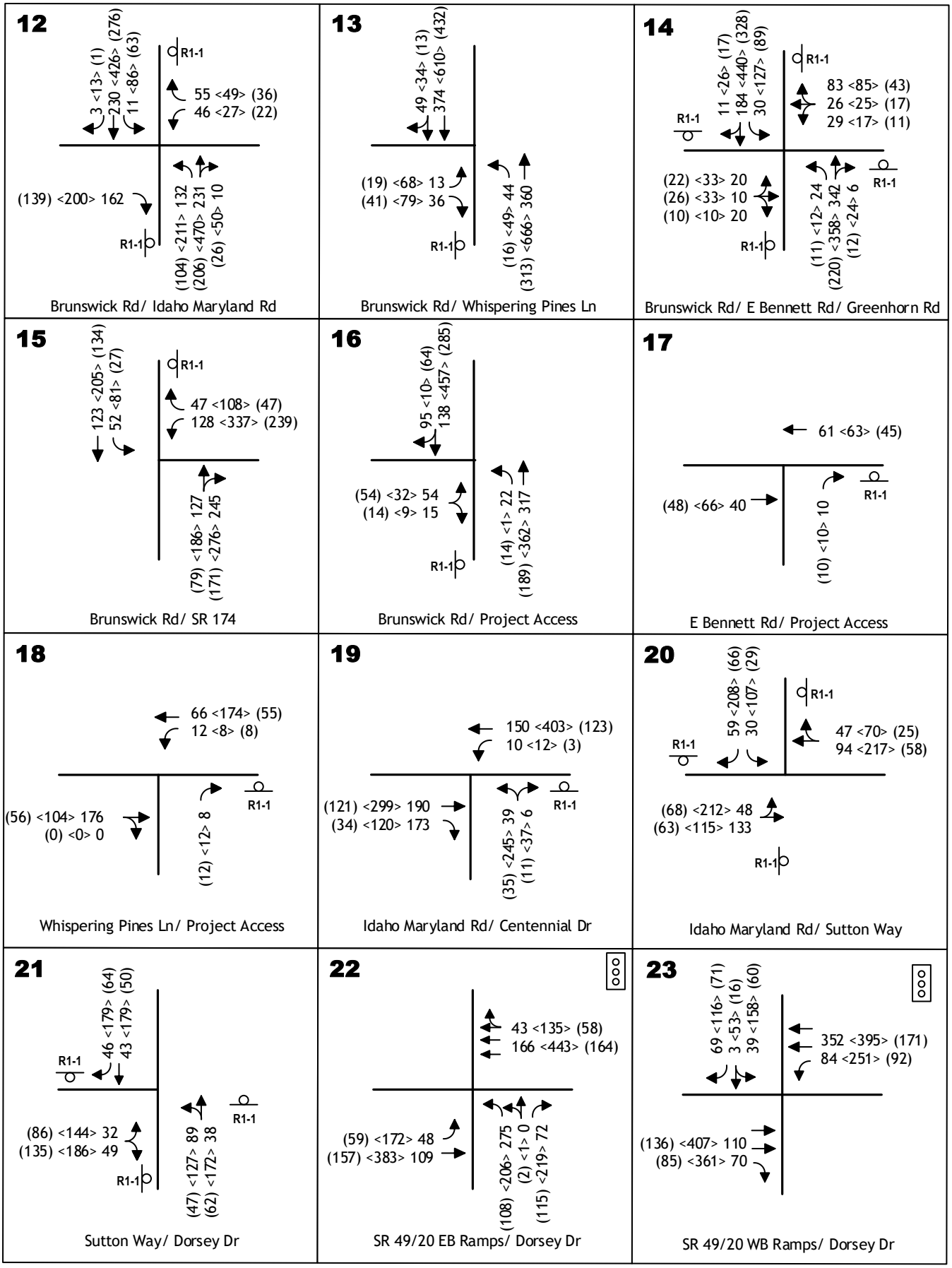
figure 8b



PROJECT TRAFFIC HOURS EPAP PLUS PROJECT TRAFFIC VOLUMES AND LANE CONFIGURATIONS (TO CENTENNIAL SITE)

figure 8c

KD Anderson & Associates, Inc.
Transportation Engineers



PROJECT TRAFFIC HOURS EPAP PLUS PROJECT TRAFFIC VOLUMES AND LANE CONFIGURATIONS (TO CENTENNIAL SITE)

figure 8d

KD Anderson & Associates, Inc.
Transportation Engineers

VI. PROJECT TRAFFIC IMPACTS

VI.1. EPAP Plus Project Conditions (Scenario #1)

Scenario #1 considers transporting of engineered fill to the Centennial Industrial site.

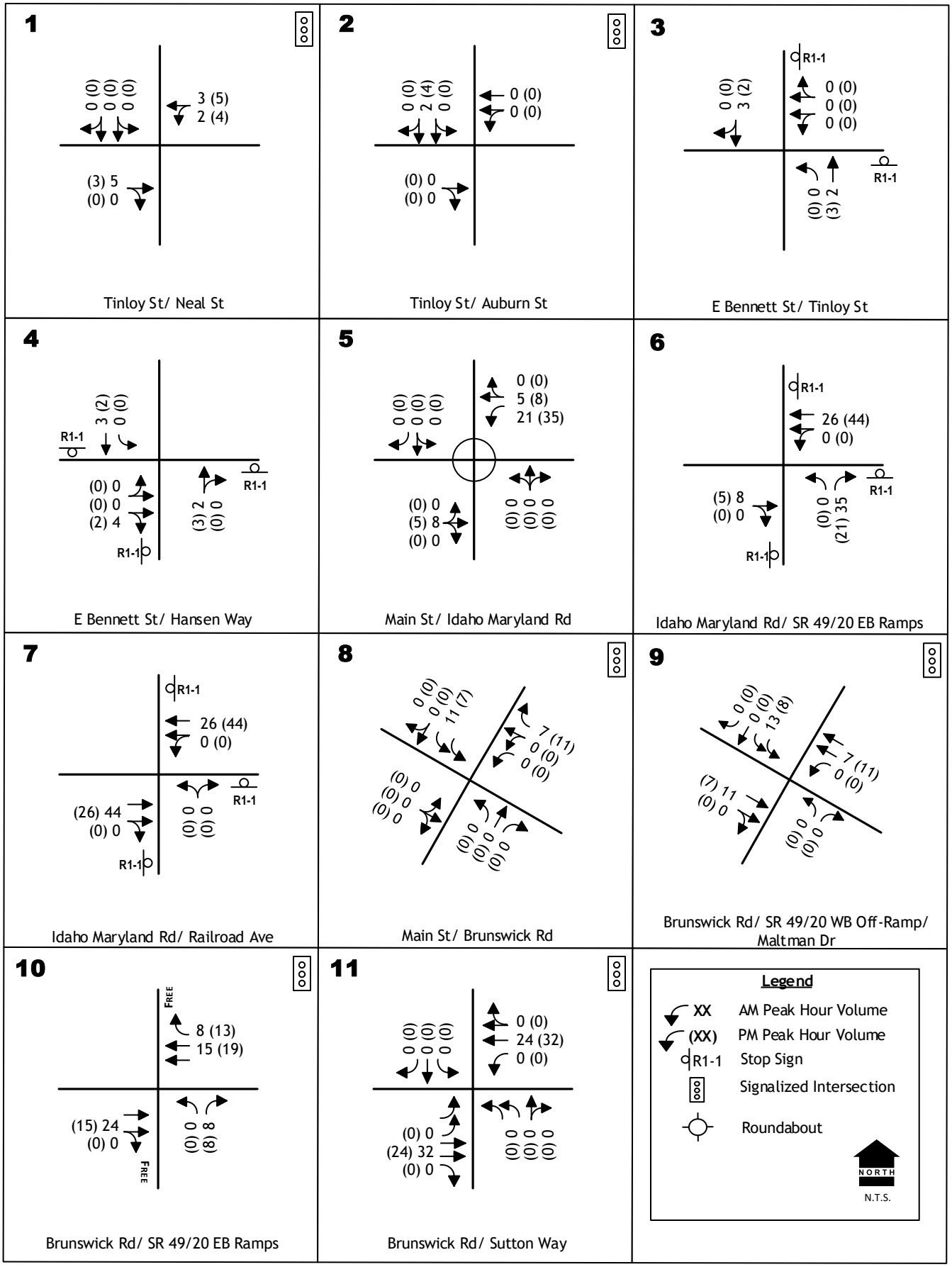
Traffic Volumes. The LOS impacts of the Idaho-Maryland Mine project have been identified by superimposing project traffic onto EPAP conditions. Figures 9A through 9D display the "EPAP Plus Project" traffic volumes at each study intersection for each of the five study time periods.

EPAP plus Project volumes under Scenario #1 were used to recalculate operating Levels of Service at the study intersections. No roadway improvements at the study area intersections, other than those incorporated as part of the EPAP scenario, were identified. Tables 14A and 14B summarize operating Levels of Service at the study area intersections for each of the five study time periods.

During the peak hour scenario three intersections would continue to operate at unacceptable Levels of Service, at LOS E or F, which include Brunswick Road at Idaho Maryland Road, Brunswick Road at SR 174, and Idaho Maryland Road at Centennial Drive. Two additional intersections will decline to LOS E, Idaho Maryland Road at SR 49/20 Eastbound Ramps and Brunswick Road at E. Bennett Road – Greenhorn Road.

During the project traffic hours, when the project employee traffic occurs, three intersections will operate below the LOS threshold. These intersections include Brunswick Road at Idaho Maryland Road, Brunswick Road at SR 174, and Idaho Maryland Road at Centennial Drive.

Seven intersections will meet the peak hour signal warrant during the a.m. and p.m. peak hours and the 3:30 – 4:30 p.m. project traffic hour scenario. These include E. Bennett Road at Tinloy Street, Idaho Maryland Road at SR 49/20 EB Ramps, Brunswick Road at Idaho Maryland Road, Brunswick Road at Whispering Pines Lane, Brunswick Road at E. Bennett Road, Brunswick Road at SR 174 and Idaho Maryland Road at Centennial Drive. The Idaho Maryland Road / SR 49/20 EB Ramps intersection, Brunswick Road / Idaho Maryland Road intersection, Brunswick Road / E. Bennett Road intersection, Brunswick Road / SR 174 intersection and Idaho Maryland Road at Centennial Drive intersection also operate below the accepted LOS D threshold.

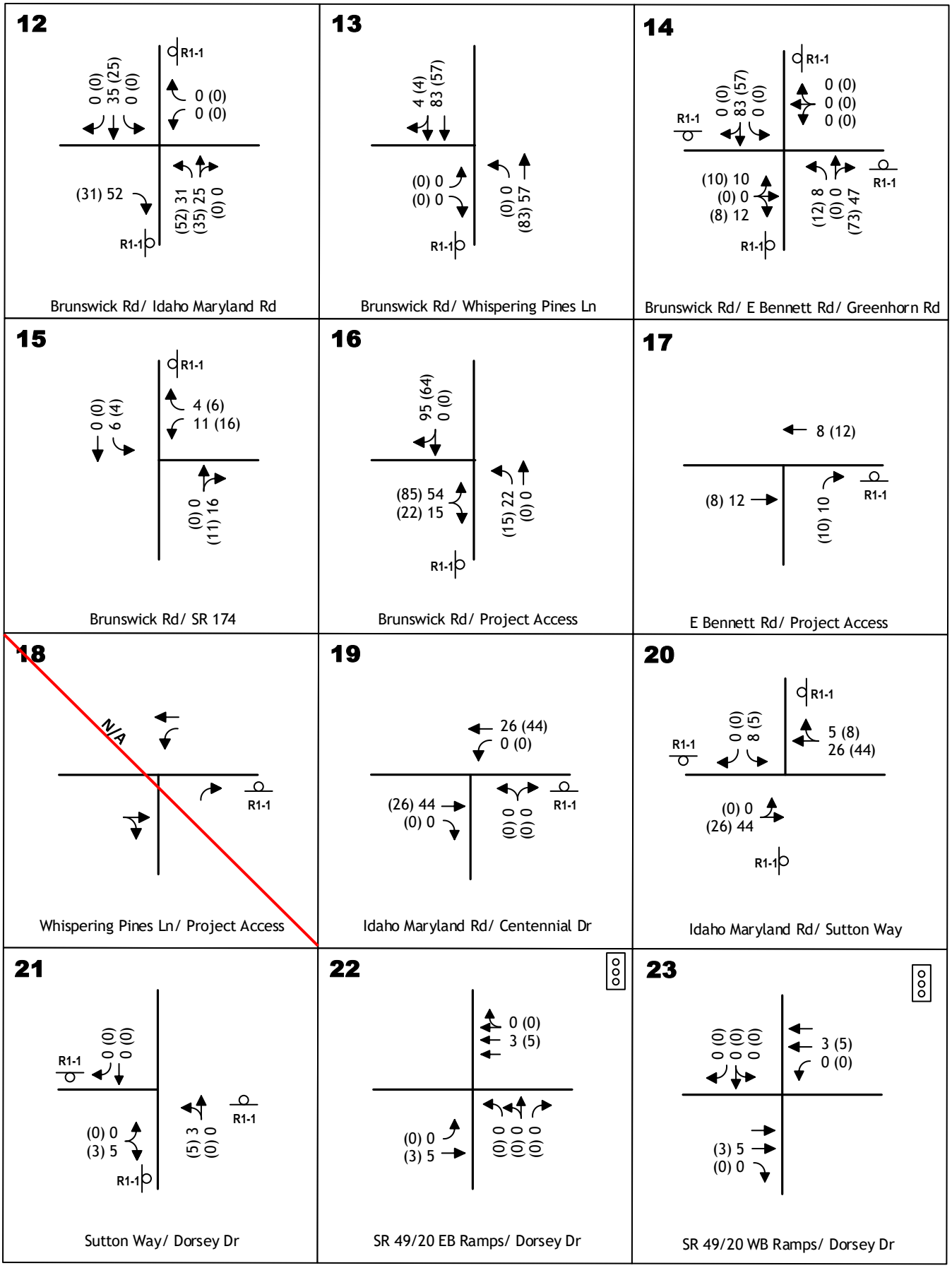


AM/PM PEAK HOURS PROJECT TRIPS
TRAFFIC VOLUMES AND LANE CONFIGURATIONS
(TO SR 49)

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

figure 9a

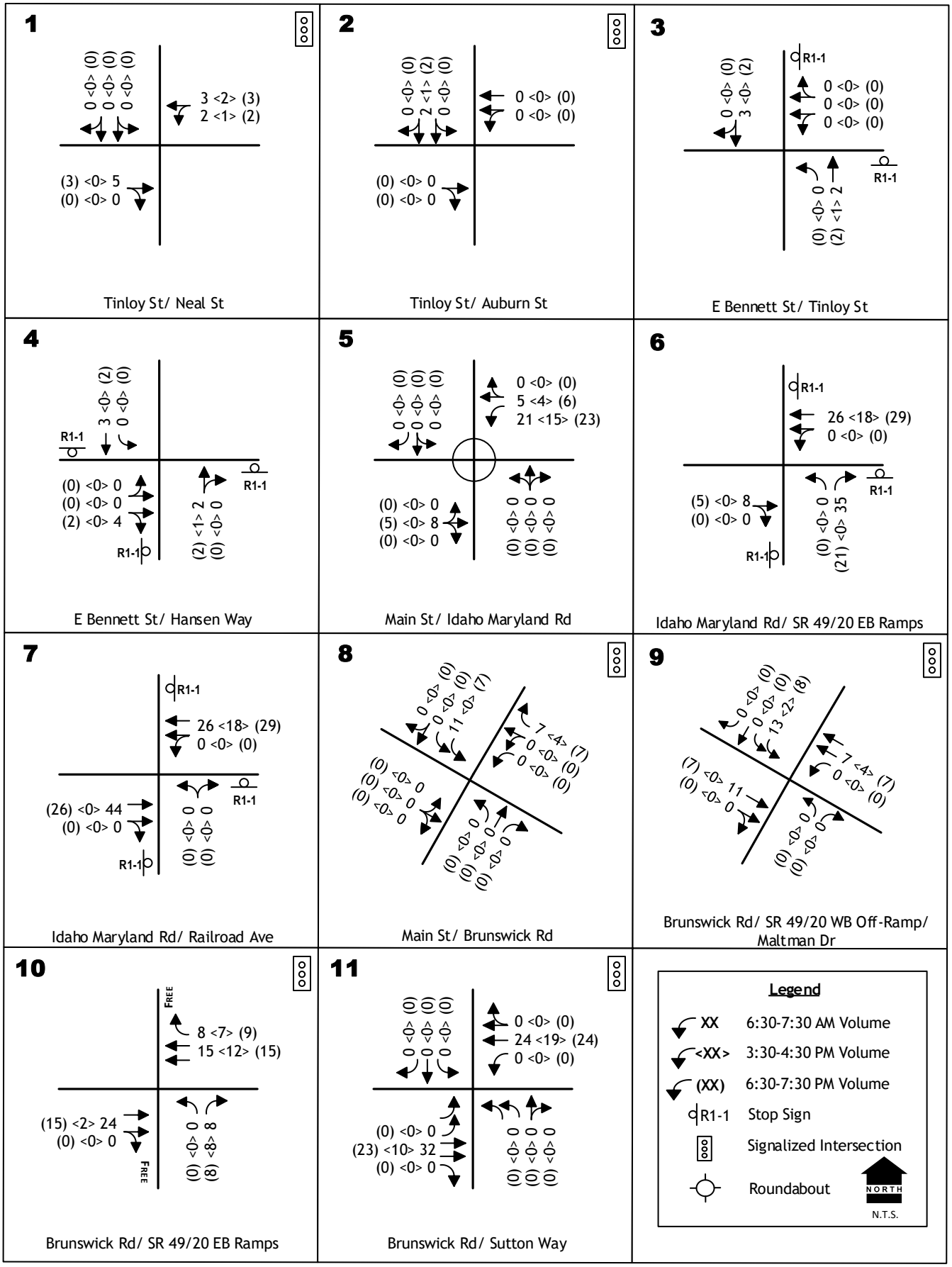


AM/PM PEAK HOURS PROJECT TRIPS
TRAFFIC VOLUMES AND LANE CONFIGURATIONS
(TO SR 49)

KD Anderson & Associates, Inc.
Transportation Engineers

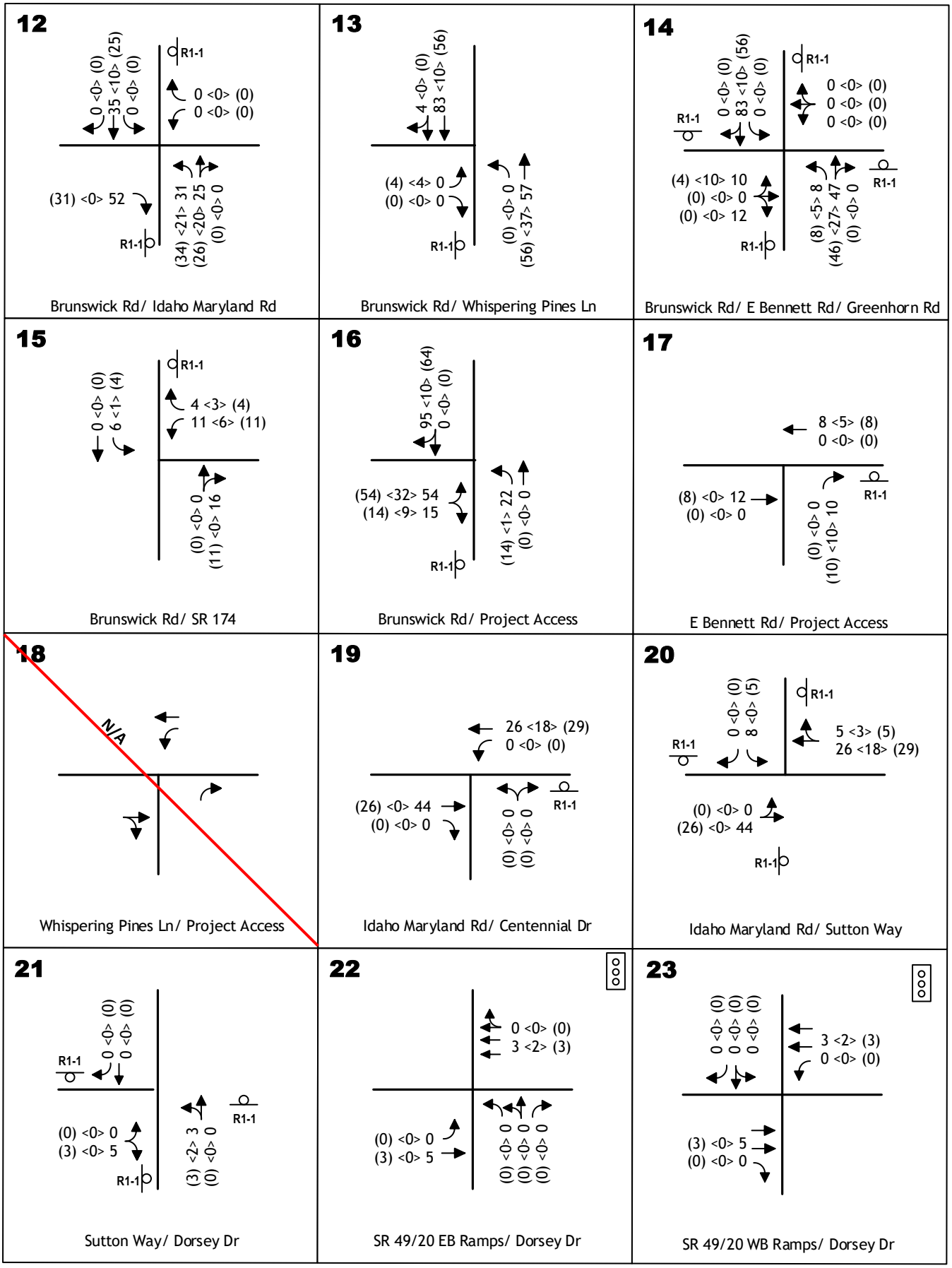
5875-01 RA 2/17/2020

figure 9b



PROJECT TRAFFIC HOURS PROJECT TRIPS
TRAFFIC VOLUMES AND LANE CONFIGURATIONS
(TO SR 49)

KD Anderson & Associates, Inc.
Transportation Engineers



PROJECT TRAFFIC HOURS PROJECT TRIPS
TRAFFIC VOLUMES AND LANE CONFIGURATIONS
(TO SR 49)

figure 9d

TABLE 14A
EPAP PLUS PROJECT – CENTENNIAL SITE (SCENARIO #1)
LEVELS OF SERVICE AT INTERSECTIONS
(PEAK HOURS)

Location	Control	EPAP plus Project AM Peak Hour		EPAP plus Project PM Peak Hour		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	
1. Neal St / Tinloy St	Signal	B	15.7	B	12.4	N/A
2. S. Auburn St / Tinloy St	Signal	B	10.1	B	11.1	N/A
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp	SB / WB Stop	A	6.1	A	7.3	Yes
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp	AWS	C	20.0	C	16.1	No
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps	Roundabout	A	7.8	A	7.6	N/A
6. Idaho Maryland Rd / SR 49 EB Ramps	AWS	D	27.8	**E**	**38.9**	Yes
7. Idaho Maryland Rd / Railroad Ave	AWS	B	14.0	C	22.3	No
8. Main St / Brunswick Rd – W. Olympia Dr	Signal	B	10.4	B	14.6	N/A
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr	Signal	B	18.0	C	21.5	N/A
10. Brunswick Rd / SR 49 EB Ramps	Signal	B	12.6	B	13.9	N/A
11. Brunswick Rd / Sutton Way	Signal	B	12.8	C	24.4	N/A
12. Brunswick Rd / Idaho Maryland Rd						
NB Left		A	8.9	A	9.8	
SB Left	EB/WB Stop	A	8.6	A	9.0	Yes
EB		B	13.1	C	15.8	
WB		**F**	**187.3**	**F**	**164.1**	
13. Brunswick Rd / Whispering Pines Ln						
NB Left	EB Stop	A	9.4	A	9.5	Yes
EB		B	13.3	C	18.7	
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd	AWS	**E**	**47.3**	**E**	**37.5**	Yes

AWS – all way stop
Bold indicates intersection operates below threshold

TABLE 14A (continued)
EPAP PLUS PROJECT – CENTENNIAL SITE (SCENARIO #1)
LEVELS OF SERVICE AT INTERSECTIONS
(PEAK HOURS)

Location	Control	EPAP plus Project AM Peak Hour		EPAP plus Project PM Peak Hour		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	
15. Brunswick Rd / SR 174	SB Stop					Yes
SB		C	18.3	**F**	**95.2**	
EB Left		A	8.1	A	8.0	
16. Brunswick Rd / Project Driveway	EB Stop					No
NB Left		A	8.0	A	8.9	
EB		B	12.9	C	15.7	
17. E. Bennett Rd / Millsite Rd	NB Stop					No
NB		A	8.7	A	8.7	
18. Whispering Pines Ln / Centennial Site Driveway	NB Stop					No
NB		B	10.4	A	9.1	
WB Left		A	8.1	A	7.5	
19. Idaho Maryland Rd / Centennial Dr	NB Stop					Yes
NB		B	13.8	**F**	**148.4**	
WB Left		A	8.5	A	8.6	
20. Idaho Maryland Rd /Sutton Way	AWS	B	10.2	C	15.4	No
21. Sutton Way / Dorsey Dr	AWS	A	9.9	C	15.9	No
22. Dorsey Dr / SR 49 EB Ramps	Signal	B	15.2	B	13.7	N/A
23. Dorsey Dr / SR 49 WB Ramps	Signal	B	10.0	B	15.7	N/A

AWS – all way stop
Bold indicates intersection operates below threshold

TABLE 14B
EPAP PLUS PROJECT – CENTENNIAL SITE (SCENARIO #1)
PEAK HOUR LEVELS OF SERVICE AT INTERSECTIONS
(PROJECT TRAFFIC HOURS)

Location	Control	EPAP plus Project 6:30 – 7:30 AM		EPAP plus Project 3:30 – 4:30 PM		EPAP plus Project 6:30 – 7:30 PM		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	
1. Neal St / Tinloy St	Signal	A	5.1	A	8.2	A	7.1	N/A
2. S. Auburn St / Tinloy St	Signal	A	6.1	A	8.7	A	7.0	N/A
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp	SB / WB Stop	A	3.8	A	6.3	A	4.0	Yes*
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp	AWS	A	9.3	B	15.2	B	10.2	No
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps	Roundabout	A	4.8	A	7.0	A	4.6	N/A
6. Idaho Maryland Rd / SR 49 EB Ramps	AWS	C	17.2	C	23.7	B	10.3	Yes*
7. Idaho Maryland Rd / Railroad Ave	AWS	B	11.5	C	17.0	A	8.9	No
8. Main St / Brunswick Rd – W. Olympia Dr	Signal	A	5.9	B	13.4	A	9.0	N/A
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr	Signal	B	16.8	B	19.8	B	16.9	N/A
10. Brunswick Rd / SR 49 EB Ramps	Signal	A	8.7	B	13.6	A	8.9	N/A
11. Brunswick Rd / Sutton Way	Signal	A	5.2	C	22.0	A	9.2	N/A
12. Brunswick Rd / Idaho Maryland Rd								
NB Left	EB/WB Stop	A	8.2	A	9.1	A	8.2	Yes*
SB Left		A	7.9	A	8.9	A	7.9	
EB		B	11.3	B	14.1	B	11.2	
WB		D	25.4	**F**	**98.2**	C	18.3	
13. Brunswick Rd / Whispering Pines Ln								
NB Left	EB Stop	A	8.8	A	9.1	A	8.5	Yes*
EB		B	11.4	B	14.8	B	11.1	
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd	AWS	B	12.7	C	20.7	B	12.4	Yes*

AWS – all way stop
Bold indicates intersection operates below threshold
* meets warrant in 3:30 p.m. hour

TABLE 14B (continued)
EPAP PLUS PROJECT – CENTENNIAL SITE (SCENARIO #1)
PEAK HOUR LEVELS OF SERVICE AT INTERSECTIONS
(PROJECT TRAFFIC HOURS)

Location	Control	EPAP plus Project 6:30 – 7:30 AM		EPAP plus Project 3:30 – 4:30 PM		EPAP plus Project 6:30 – 7:30 PM		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	
15. Brunswick Rd / SR 174	SB Stop							Yes*
SB		B	13.0	**E**	**38.1**	B	13.0	
EB Left		A	7.7	A	7.8	A	7.4	
16. Brunswick Rd / Project Driveway	EB Stop							No
NB Left		A	7.8	A	8.4	A	8.2	
EB		B	11.5	B	12.5	B	11.7	
17. E. Bennett Rd / Millsite Rd	NB Stop							No
NB		A	8.5	A	8.7	A	8.6	
18. Whispering Pines Ln / Centennial Site Driveway	NB Stop							No
NB		A	9.6	A	9.0	A	8.7	
WB Left		A	7.8	A	7.5	A	7.4	
19. Idaho Maryland Rd / Centennial Dr	NB Stop							Yes*
NB		B	12.2	**F**	**112.3**	B	10.8	
WB Left		A	8.4	A	8.5	A	7.7	
20. Idaho Maryland Rd /Sutton Way	AWS	A	8.5	B	14.3	A	8.5	No
21. Sutton Way / Dorsey Dr	AWS	A	8.2	C	15.7	A	9.3	No
22. Dorsey Dr / SR 49 EB Ramps	Signal	A	9.3	B	14.0	A	8.3	N/A
23. Dorsey Dr / SR 49 WB Ramps	Signal	A	6.2	B	15.9	A	7.4	N/A

AWS – all way stop
Bold indicates intersection operates below threshold
* meets warrant in 3:30 p.m. hour

Intersection Queues. Tables 15A and 15B present information regarding queuing at each study intersection under EPAP plus Project conditions. 95th percentile queues with lengths exceeding the available storage are highlighted. The 95th percentile queue exceeds available storage in 18 locations at 12 intersections. The intersections of Neal Street at Tinloy Street and Tinloy Street at S. Auburn Street have queues that will continue to exceed the available storage and back up through the adjacent intersection. Similar conditions will continue to exist at the westbound approach of the Idaho Maryland Road / SR 49 EB Ramps intersection and the eastbound approach of Brunswick Road at SR 49 Westbound Off-Ramp - Maltman Drive intersection. It is assumed that one additional vehicle (25') can store in the available left or right turn taper and this occurs at four locations.

TABLE 15A
EPAP PLUS PROJECT QUEUES
CENTENNIAL SITE (SCENARIO #1)
PEAK HOURS

Location	Length*	EPAP plus Project AM Peak Hour Queue (feet)	EPAP plus Project PM Peak Hour Queue (feet)
1. Neal St / Tinloy St			
EB	70	116	116
WB	150	293	208
2. S. Auburn St / Tinloy St			
NB through	80	145	149
NB through-left	80	88	81
SB	75	102	141
WB	95	113	124
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp			
NB left turn	60	32	39
NB through	150	68	66
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp			
SB left turn	60	35	40
SB through	150	68	113
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps			
NB	---	28	29
SB	---	37	48
EB	---	99	64
WB	---	55	83
6. Idaho Maryland Rd / SR 49 EB Ramps			
NB right	---	263	73
NB left	355	98	50
WB	90	90	415

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 15A (continued)
EPAP PLUS PROJECT QUEUES
CENTENNIAL SITE (SCENARIO #1)
PEAK HOURS

Location	Length*	EPAP plus Project AM Peak Hour Queue (feet)	EPAP plus Project PM Peak Hour Queue (feet)
7. Idaho Maryland Rd / Railroad Ave			
EB	90	123	93
8. Main St / Brunswick Rd – W. Olympia Dr			
NB left	110	---	<25
NB right	125	66	123
SB left (2 lanes)	355	105	199
WB left (2 lanes)	150	91	91
WB right	150	105	154
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr			
NB left	100	51	85
NB right	100	76	148
SB left (2 lanes)	260	181	206
SB right	260	76	81
EB	160	139	208
WB left	145	99	102
10. Brunswick Rd / SR 49 EB Ramps			
NB left	200	230	226
NB right	---	212	257
11. Brunswick Rd / Sutton Way			
NB left (2 lanes)	280	106	265
SB left	190	67	120
SB right	180	---	---
EB left (2 lanes)	185	85	129
EB right	250	98	174
WB left	125	88	153
12. Brunswick Rd / Idaho Maryland Rd			
NB left	540	<25	30
SB left	120	<25	<25
EB right	---	38	53
WB left	60	170	90
13. Brunswick Rd / Whispering Pines Ln			
NB left	210	<25	<25
EB left	110	<25	38
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd			
NB left	225	<25	<25
SB left	260	<25	30
EB	---	<25	<25
WB	---	75	33

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 15A (continued)
EPAP PLUS PROJECT QUEUES
CENTENNIAL SITE (SCENARIO #1)
PEAK HOURS

Location	Length*	EPAP plus Project AM Peak Hour Queue (feet)	EPAP plus Project PM Peak Hour Queue (feet)
15. Brunswick Rd / SR 174			
SB left	90	60	415
EB left	130	<25	<25
16. Brunswick Rd / Project Driveway			
NB left	350	<25	<25
EB	---	<25	25
17. E. Bennett Rd / Millsite Rd			
NB right	---	<25	<25
18. Whispering Pines Ln / Project Driveway			
NB	---	<25	<25
WB left	100	<25	<25
19. Idaho Maryland Rd / Centennial Dr			
NB	---	<25	385
WB left	130	<25	<25
20. Idaho Maryland Rd /Sutton Way			
SB right	90	<25	48
SB left	---	<25	25
ÈB	---	38	115
WB	---	30	85
21. Sutton Way / Dorsey Dr			
SB right	120	<25	38
SB thru	---	<25	45
NB	---	25	100
EB	---	<25	113
22. Dorsey Dr / SR 49 EB Ramps			
NB Left (2 lanes)	215	217	108
NB right	215	75	102
EB left	180	106	156
23. Dorsey Dr / SR 49 EB Ramps			
SB right	400	68	62
SB left-thru	400	101	156
EB right	155	78	203
WB left	180	130	184

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 15B
EPAP PLUS PROJECT QUEUES
CENTENNIAL SITE (SCENARIO #1)
(PROJECT TRAFFIC HOURS)

Location	Length*	EPAP 6:30 – 7:30 AM Queue (feet)	EPAP 3:30 – 4:30 PM Queue (feet)	EPAP 6:30 – 7:30 PM Queue (feet)
1. Neal St / Tinloy St				
EB	70	69	103	99
WB	150	86	126	92
2. S. Auburn St / Tinloy St				
NB through	80	73	117	73
NB through-left	80	53	78	52
SB	75	76	109	101
WB	95	85	99	75
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp				
NB left turn	60	28	42	28
NB through	150	45	56	47
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp				
SB left turn	60	<25	38	<25
SB through	150	<25	95	35
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps				
NB	---	<25	26	<25
SB	---	<25	51	<25
EB	---	32	60	29
WB	---	<25	53	27
6. Idaho Maryland Rd / SR 49 EB Ramps				
NB right	---	163	55	<25
NB left	355	38	63	<25
WB	90	35	220	40
7. Idaho Maryland Rd / Railroad Ave				
EB	90	88	83	<25
8. Main St / Brunswick Rd – W. Olympia Dr				
NB left	110	<25	<25	<25
NB right	125	42	114	55
SB left (2 lanes)	355	66	173	100
WB left (2 lanes)	150	41	88	63
WB right	150	57	148	72
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr				
NB left	100	<25	77	54
NB right	100	28	131	82
SB left (2 lanes)	260	125	197	135
SB right	260	50	79	55
EB	160	63	207	135
WB left	145	62	103	96

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 15B (continued)
EPAP PLUS PROJECT QUEUES
CENTENNIAL SITE (SCENARIO #1)
(PROJECT TRAFFIC HOURS)

Location	Length*	EPAP 6:30 – 7:30 AM Queue (feet)	EPAP 3:30 – 4:30 PM Queue (feet)	EPAP 6:30 – 7:30 PM Queue (feet)
10. Brunswick Rd / SR 49 EB Ramps				
NB left	200	159	221	177
NB right	---	98	250	96
11. Brunswick Rd / Sutton Way				
NB left (2 lanes)	280	53	247	112
SB left	190	41	110	57
SB right	180	---	<25	---
EB left (2 lanes)	185	55	122	64
EB right	250	47	155	82
WB left	125	44	137	64
12. Brunswick Rd / Idaho Maryland Rd				
NB left	540	<25	<25	<25
SB left	120	<25	<25	<25
EB right	---	25	40	<25
WB left	60	40	73	<25
13. Brunswick Rd / Whispering Pines Ln				
NB left	210	<25	<25	<25
EB left	110	<25	<25	<25
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd				
NB left	225	<25	<25	<25
SB left	260	<25	<25	<25
EB	---	<25	<25	<25
WB	---	<25	<25	<25
15. Brunswick Rd / SR 174				
SB left	90	30	215	48
EB left	130	<25	<25	<25
16. Brunswick Rd / Project Driveway				
NB left	350	<25	<25	<25
EB	---	<25	<25	<25
17. E. Bennett Rd / Millsite Rd				
NB right	---	<25	<25	<25
18. Whispering Pines Ln / Project Driveway				
NB	---	<25	<25	<25
WB left	100	<25	<25	<25
19. Idaho Maryland Rd / Centennial Dr				
NB	---	<25	335	<25
WB left	130	<25	<25	<25

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 15B (continued)
EPAP PLUS PROJECT QUEUES
CENTENNIAL SITE (SCENARIO #1)
(PROJECT TRAFFIC HOURS)

Location	Length*	EPAP 6:30 – 7:30 AM Queue (feet)	EPAP 3:30 – 4:30 PM Queue (feet)	EPAP 6:30 – 7:30 PM Queue (feet)
20. Idaho Maryland Rd /Sutton Way				
SB right	90	<25	45	<25
SB left	---	<25	<25	<25
ÈB	---	25	100	<25
WB	---	<25	70	<25
21. Sutton Way / Dorsey Dr				
SB right	120	<25	38	<25
SB thru	---	<25	45	<25
NB	---	<25	98	<25
EB	---	<25	110	40
22. Dorsey Dr / SR 49 EB Ramps				
NB Left (2 lanes)	215	113	108	60
NB right	215	43	96	51
EB left	180	60	150	66
23. Dorsey Dr / SR 49 EB Ramps				
SB right	400	50	60	48
SB left-thru	400	52	165	68
EB right	155	40	205	44
WB left	180	81	183	82

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

EPAP Plus Project Conditions (Scenario #1) Roadway Segment Levels of Service. Table 16 summarizes the Levels of Service based on the EPAP plus Project traffic volumes on study area roads with the existing roadway configuration. All segments along Brunswick Road and E. Bennett Road will continue to operate at LOS D or better while the SR 174 segment will continue to operate at LOS E. The SR 174 segment exceeds the LOS C threshold in both directions.

TABLE 16
EPAP PLUS PROJECT
CENTENNIAL SITE (SCENARIO #1)
ROADWAY SEGMENT LEVELS OF SERVICE

Roadway	Location	Facility Classification	ATS/PTSF/LOS EPAP plus Project PM Peak Hour
Brunswick Rd	SR 49 to Whispering Pines Ln	Class I Highway	
	NB		31.2 / 77.1 / D
	SB		31.2 / 78.4 / D
	Whispering Pines Ln to E. Bennett Rd	Class I Highway	
	NB		36.1 / 72.5 / D
	SB		35.5 / 83.6 / D
	E. Bennett Rd to Project Driveway	Class I Highway	
	NB		34.9 / 68.3 / D
	SB		34.8 / 80.1 / D
	Project Driveway to SR 174	Class I Highway	
	NB		33.7 / 67.9 / D
	SB		33.2 / 83.9 / D
E. Bennett Rd	Project Driveway to Brunswick Rd	Class III Highway	
	EB		36.1 / 37.6 / B
	WB		34.8 / 53.4 / B
SR 174	Brunswick Rd to Empire St	Class I Highway	
	EB		**30.2 / 59.8 / E**
	WB		**29.2 / 78.2 / E**

ATS – average travel speed
PTSF – percent time spent following
LOS – level of service
Bold indicates LOS threshold exceeded

VI.2. EPAP Plus Project Conditions (Scenario #2)

Scenario #2 considers transporting of engineered fill to construction sites accessible via SR 49/20.

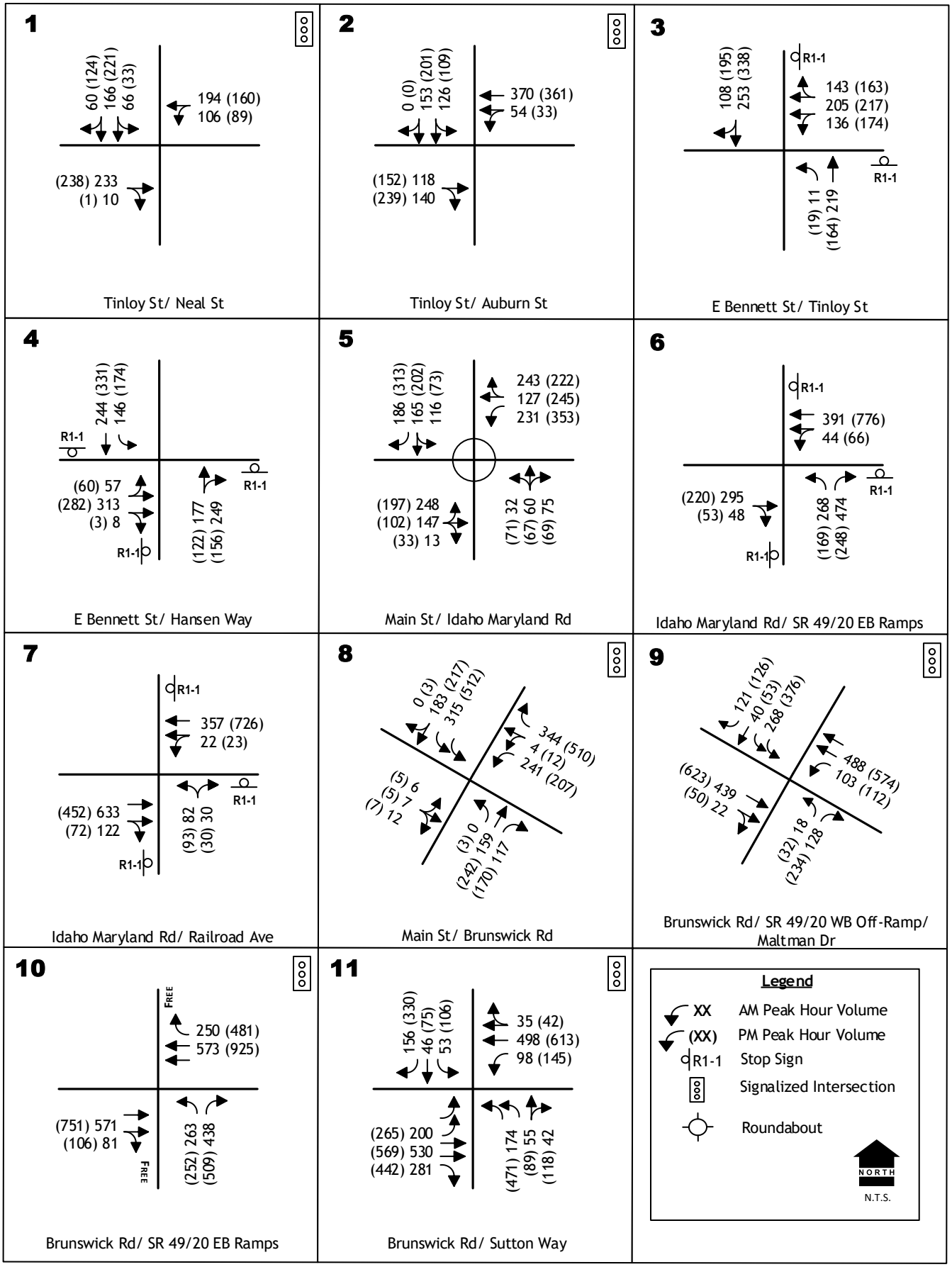
Traffic Volumes. The LOS impacts of the Idaho-Maryland Mine project have been identified by superimposing project traffic onto EPAP conditions. Figures 10A through 10D display the "EPAP Plus Project" traffic volumes at each study intersection for each of the five study time periods.

EPAP plus Project volumes under Scenario #2 were used to recalculate operating Levels of Service at the study intersections. No roadway improvements at the study area intersections, other than those incorporated as part of the EPAP scenario, were identified. Tables 17A and 17B summarize operating Levels of Service at the study area intersections for each of the five study time periods.

During the peak hour scenario, three intersections will continue to operate at unacceptable Levels of Service, at LOS E or F, which include Brunswick Road at Idaho Maryland Road, Brunswick Road at SR 174, and Idaho Maryland Road at Centennial Drive. Two additional intersections will decline to LOS E, Idaho Maryland Road at SR 49/20 Eastbound Ramps and Brunswick Road at E. Bennett Road – Greenhorn Road.

During the project traffic hours, when the project employee traffic occurs, three intersections will operate below the LOS threshold. These intersections include the Brunswick Road at Idaho Maryland Road, Brunswick Road at SR 174, and Idaho Maryland Road at Centennial Drive.

Seven intersections will meet the peak hour signal warrant during the a.m. and p.m. peak hours and the 3:30 – 4:30 p.m. project traffic hour scenario. These include E. Bennett Road at Tinloy Street, Idaho Maryland Road at SR 49/20 EB Ramps, Brunswick Road at Idaho Maryland Road, Brunswick Road at Whispering Pines Lane, Brunswick Road at E. Bennett Road, Brunswick Road at SR 174 and Idaho Maryland Road at Centennial Drive. The Idaho Maryland Road / SR 49/20 EB Ramps intersection, Brunswick Road / Idaho Maryland Road intersection, Brunswick Road / E. Bennett Road intersection, Brunswick Road / SR 174 intersection and Idaho Maryland Road at Centennial Drive intersection also operate below the accepted LOS D threshold.

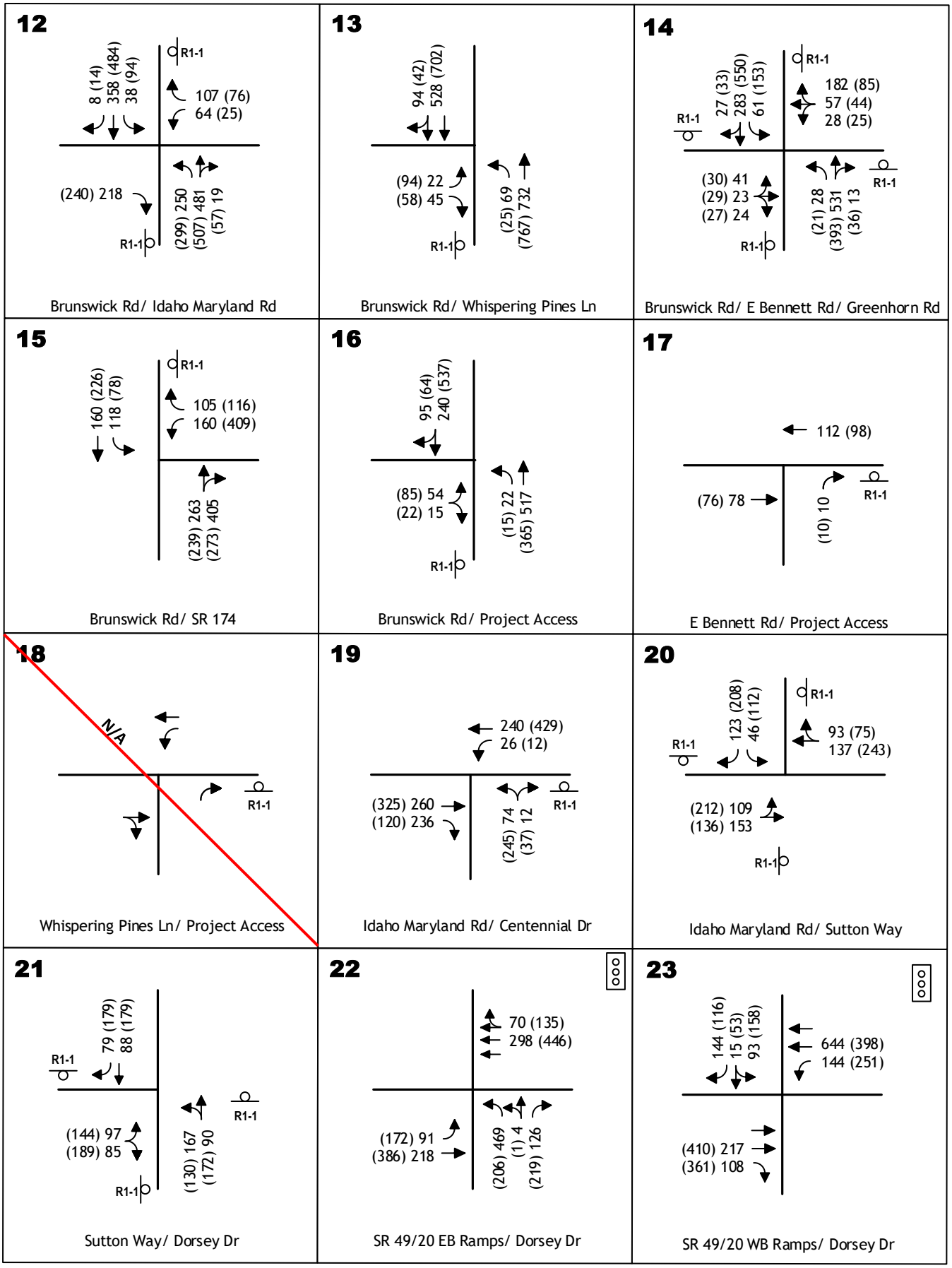


AM/PM PEAK HOURS EPAP PLUS PROJECT
TRAFFIC VOLUMES AND LANE CONFIGURATIONS
(TO SR 49)

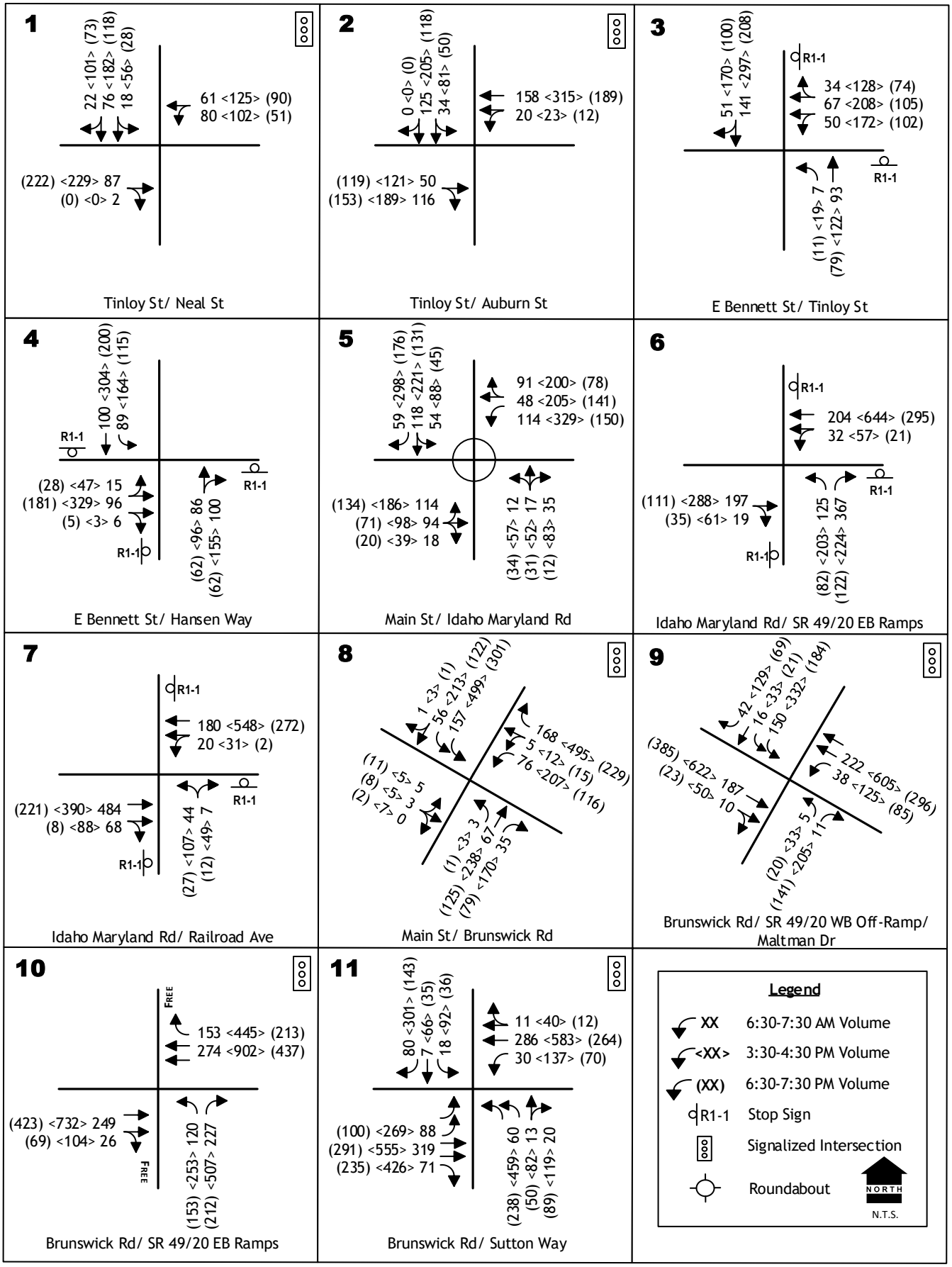
figure 10a

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020



AM/PM PEAK HOURS EPAP PLUS PROJECT
TRAFFIC VOLUMES AND LANE CONFIGURATIONS
(TO SR 49)



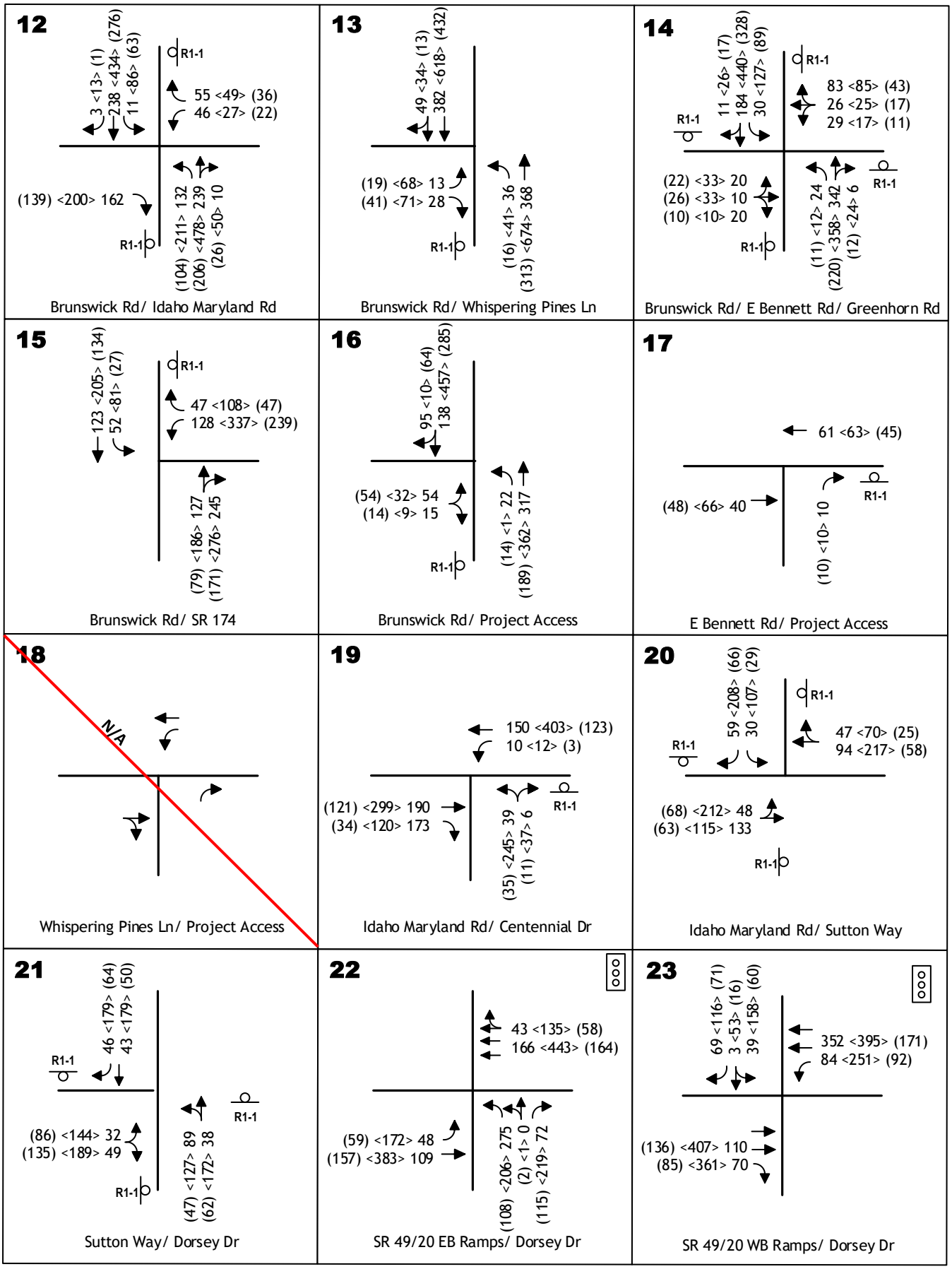
PROJECT TRAFFIC HOURS EPAP PLUS PROJECT TRAFFIC VOLUMES AND LANE CONFIGURATIONS

(TO SR 49)

figure 10c

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020



PROJECT TRAFFIC HOURS EPAP PLUS PROJECT TRAFFIC VOLUMES AND LANE CONFIGURATIONS

(TO SR 49)

TABLE 17A
EPAP PLUS PROJECT – SR 49 (SCENARIO #2)
LEVELS OF SERVICE AT INTERSECTIONS
(PEAK HOURS)

Location	Control	EPAP plus Project AM Peak Hour		EPAP plus Project PM Peak Hour		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	
1. Neal St / Tinloy St	Signal	B	13.3	B	11.9	N/A
2. Auburn St / Tinloy St	Signal	B	10.2	B	10.7	N/A
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp	SB / WB Stop	A	6.2	A	7.3	Yes
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp	AWS	C	20.0	C	16.1	No
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps	Roundabout	A	7.8	A	7.6	N/A
6. Idaho Maryland Rd / SR 49 EB Ramps	AWS	D	27.8	**E**	**38.9**	Yes
7. Idaho Maryland Rd / Railroad Ave	AWS	B	14.0	C	22.3	No
8. Main St / Brunswick Rd – W. Olympia Dr	Signal	B	10.5	B	15.2	N/A
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr	Signal	B	17.5	C	21.6	N/A
10. Brunswick Rd / SR 49 EB Ramps	Signal	B	12.7	B	13.5	N/A
11. Brunswick Rd / Sutton Way	Signal	B	12.6	C	23.9	N/A
12. Brunswick Rd / Idaho Maryland Rd						
NB Left		A	9.0	A	9.8	
SB Left	EB/WB Stop	A	8.6	A	9.0	Yes
EB		B	13.3	C	16.0	
WB		**F**	**201.7**	**F**	**176.6**	
13. Brunswick Rd / Whispering Pines Ln						
NB Left	EB Stop	A	9.4	A	9.5	Yes
EB		B	13.6	C	19.0	
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd	AWS	**E**	**47.3**	**E**	**37.5**	Yes

AWS – all way stop
Bold indicates intersection operates below threshold

TABLE 17A (continued)
EPAP PLUS PROJECT – SR 49 (SCENARIO #2)
LEVELS OF SERVICE AT INTERSECTIONS
(PEAK HOURS)

Location	Control	EPAP plus Project AM Peak Hour		EPAP plus Project PM Peak Hour		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	
15. Brunswick Rd / SR 174	SB Stop					Yes
SB		C	18.3	**F**	**95.2**	
EB Left		A	8.1	A	8.0	
16. Brunswick Rd / Project Driveway	EB Stop					No
NB Left		A	8.0	A	8.9	
EB		B	12.9	C	15.7	
17. E. Bennett Rd / Millsite Rd	NB Stop					No
NB		A	8.7	A	8.7	
18. Whispering Pines Ln / Centennial Site Driveway	NB Stop	Not Applicable				
19. Idaho Maryland Rd / Centennial Dr	NB Stop					Yes
NB		B	13.8	**F**	**148.4**	
WB Left		A	8.5	A	8.6	
20. Idaho Maryland Rd /Sutton Way	AWS	B	10.2	C	15.4	No
21. Sutton Way / Dorsey Dr	AWS	A	9.9	C	15.9	No
22. Dorsey Dr / SR 49 EB Ramps	Signal	B	15.5	B	13.6	N/A
23. Dorsey Dr / SR 49 WB Ramps	Signal	B	10.0	B	15.0	N/A

AWS – all way stop
Bold indicates intersection operates below threshold

TABLE 17B
EPAP PLUS PROJECT –SR 49 (SCENARIO #2)
PEAK HOUR LEVELS OF SERVICE AT INTERSECTIONS
(PROJECT TRAFFIC HOURS)

Location	Control	EPAP plus Project 6:30 – 7:30 AM		EPAP plus Project 3:30 – 4:30 PM		EPAP plus Project 6:30 – 7:30 PM		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	
1. Neal St / Tinloy St	Signal	A	5.0	A	8.6	A	6.8	N/A
2. S. Auburn St / Tinloy St	Signal	A	6.2	A	8.6	A	7.0	N/A
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp	SB / WB Stop	A	3.8	A	6.4	A	4.1	Yes*
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp	AWS	A	9.3	B	15.2	B	10.2	No
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps	Roundabout	A	4.8	A	7.0	A	4.6	N/A
6. Idaho Maryland Rd / SR 49 EB Ramps	AWS	C	17.2	C	23.7	B	10.3	Yes*
7. Idaho Maryland Rd / Railroad Ave	AWS	B	11.5	C	17.0	A	8.9	No
8. Main St / Brunswick Rd – W. Olympia Dr	Signal	A	6.1	B	13.5	A	9.0	N/A
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr	Signal	B	16.8	C	20.3	B	16.4	N/A
10. Brunswick Rd / SR 49 EB Ramps	Signal	A	8.7	B	14.0	A	8.8	N/A
11. Brunswick Rd / Sutton Way	Signal	A	5.3	C	22.1	A	9.6	N/A
12. Brunswick Rd / Idaho Maryland Rd								
NB Left	EB/WB Stop	A	8.2	A	9.2	A	8.2	Yes*
SB Left		A	7.9	A	8.9	A	7.9	
EB		B	11.5	B	14.3	B	11.3	
WB		D	26.7	**F**	**107.3**	C	18.8	
13. Brunswick Rd / Whispering Pines Ln								
NB Left	EB Stop	A	8.8	A	9.1	A	8.5	Yes*
EB		B	11.5	B	14.9	B	11.2	
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd	AWS	B	12.7	C	20.7	B	12.4	Yes*

AWS – all way stop
Bold indicates intersection operates below threshold
* meets warrant in 3:30 p.m. hour

TABLE 17B (continued)
EPAP PLUS PROJECT –SR 49 (SCENARIO #2)
PEAK HOUR LEVELS OF SERVICE AT INTERSECTIONS
(PROJECT TRAFFIC HOURS)

Location	Control	EPAP plus Project 6:30 – 7:30 AM		EPAP plus Project 3:30 – 4:30 PM		EPAP plus Project 6:30 – 7:30 PM		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	
15. Brunswick Rd / SR 174	SB Stop							Yes*
SB		B	13.0	**E**	**38.1**	B	13.0	
EB Left		A	7.7	A	7.8	A	7.4	
16. Brunswick Rd / Project Driveway	EB Stop							No
NB Left		A	7.8	A	8.4	A	8.2	
EB		B	11.5	B	12.5	B	11.7	
17. E. Bennett Rd / Millsite Rd	NB Stop							No
NB		A	8.5	A	8.7	A	8.6	
18. Whispering Pines Ln / Centennial Site Driveway	NB Stop	Not Applicable						
19. Idaho Maryland Rd / Centennial Dr	NB Stop							Yes*
NB		B	12.2	**F**	**112.3**	B	10.8	
WB Left		A	8.4	A	8.5	A	7.7	
20. Idaho Maryland Rd /Sutton Way	AWS	A	8.5	B	14.3	A	8.5	No
21. Sutton Way / Dorsey Dr	AWS	A	8.2	C	15.7	A	9.3	No
22. Dorsey Dr / SR 49 EB Ramps	Signal	A	9.0	B	13.7	A	8.4	N/A
23. Dorsey Dr / SR 49 WB Ramps	Signal	A	6.1	B	15.6	A	7.3	N/A

AWS – all way stop
Bold indicates intersection operates below threshold
* meets warrant in 3:30 p.m. hour

Intersection Queues. Tables 18A and 18B present information regarding queuing at each study intersection under EPAP plus Project conditions. 95th percentile queues with lengths exceeding the available storage are highlighted. The 95th percentile queue exceeds available storage in 18 locations at 12 intersections. The intersections of Neal Street at Tinloy Street and Tinloy Street at S. Auburn Street have queues that will continue to exceed the available storage and back up through the adjacent intersection. Similar conditions will continue to exist at the westbound approach of the Idaho Maryland Rd / SR 49 EB Ramps intersection and the eastbound approach of Brunswick Road at SR 49 Westbound Off-Ramp - Maltman Drive intersection. It is assumed that one additional vehicle (25') can store in the available left or right turn taper and this occurs at five locations.

TABLE 18A
EPAP PLUS PROJECT QUEUES
SR 49 (SCENARIO #2)
PEAK HOURS

Location	Length*	EPAP plus Project AM Peak Hour Queue (feet)	EPAP plus Project PM Peak Hour Queue (feet)
1. Neal St / Tinloy St			
EB	70	114	116
WB	150	214	193
2. S. Auburn St / Tinloy St			
NB through	80	146	147
NB through-left	80	91	78
SB	75	97	141
WB	95	111	117
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp			
NB left turn	60	33	41
NB through	150	72	67
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp			
SB left turn	60	35	40
SB through	150	68	113
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps			
NB	---	28	29
SB	---	37	47
EB	---	99	64
WB	---	55	83
6. Idaho Maryland Rd / SR 49 EB Ramps			
NB right	---	263	73
NB left	355	98	50
WB	90	90	415
7. Idaho Maryland Rd / Railroad Ave			
EB	90	123	93

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 18A (continued)
EPAP PLUS PROJECT QUEUES
SR 49 (SCENARIO #2)
PEAK HOURS

Location	Length*	EPAP plus Project AM Peak Hour Queue (feet)	EPAP plus Project PM Peak Hour Queue (feet)
8. Main St / Brunswick Rd – W. Olympia Dr			
NB left	110	---	26
NB right	125	77	128
SB left (2 lanes)	355	114	204
WB left (2 lanes)	150	83	93
WB right	150	103	156
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr			
NB left	100	51	86
NB right	100	81	158
SB left (2 lanes)	260	172	210
SB right	260	71	86
EB	160	150	207
WB left	145	98	100
10. Brunswick Rd / SR 49 EB Ramps			
NB left	200	226	220
NB right	---	223	250
11. Brunswick Rd / Sutton Way			
NB left (2 lanes)	280	97	269
SB left	190	62	113
SB right	180	---	---
EB left (2 lanes)	185	86	129
EB right	250	96	171
WB left	125	88	161
12. Brunswick Rd / Idaho Maryland Rd			
NB left	540	<25	30
SB left	120	<25	<25
EB right	---	40	55
WB left	60	173	90
13. Brunswick Rd / Whispering Pines Ln			
NB left	210	<25	<25
EB left	110	<25	35
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd			
NB left	225	<25	<25
SB left	260	<25	30
EB	---	<25	<25
WB	---	75	33

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 18A (continued)
EPAP PLUS PROJECT QUEUES
SR 49 (SCENARIO #2)
PEAK HOURS

Location	Length*	EPAP plus Project AM Peak Hour Queue (feet)	EPAP plus Project PM Peak Hour Queue (feet)
15. Brunswick Rd / SR 174			
SB left	90	60	415
EB left	130	<25	<25
16. Brunswick Rd / Project Driveway			
NB left	350	<25	<25
EB	---	<25	25
17. E. Bennett Rd / Millsite Rd			
NB right	---	<25	<25
18. Whispering Pines Ln / Project Driveway – Not Applicable			
19. Idaho Maryland Rd / Centennial Dr			
NB	---	<25	385
WB left	130	<25	<25
20. Idaho Maryland Rd /Sutton Way			
SB right	90	<25	48
SB left	---	<25	25
ÈB	---	48	115
WB	---	38	85
21. Sutton Way / Dorsey Dr			
SB right	120	<25	38
SB thru	---	<25	45
NB	---	45	100
EB	---	28	113
22. Dorsey Dr / SR 49 EB Ramps			
NB Left (2 lanes)	215	223	111
NB right	215	89	95
EB left	180	106	160
23. Dorsey Dr / SR 49 EB Ramps			
SB right	400	71	62
SB left-thru	400	105	154
EB right	155	70	190
WB left	180	123	178

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 18B
EPAP PLUS PROJECT QUEUES
SR 49 (SCENARIO #2)
(PROJECT TRAFFIC HOURS)

Location	Length*	EPAP 6:30 – 7:30 AM Queue (feet)	EPAP 3:30 – 4:30 PM Queue (feet)	EPAP 6:30 – 7:30 PM Queue (feet)
1. Neal St / Tinloy St				
EB	70	66	103	94
WB	150	87	138	89
2. S. Auburn St / Tinloy St				
NB through	80	71	109	76
NB through-left	80	52	67	52
SB	75	71	104	100
WB	95	82	103	75
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp				
NB left turn	60	27	43	32
NB through	150	45	56	45
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp				
SB left turn	60	<25	38	<25
SB through	150	<25	95	35
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps				
NB	---	<25	26	<25
SB	---	<25	51	<25
EB	---	32	60	29
WB	---	<25	53	27
6. Idaho Maryland Rd / SR 49 EB Ramps				
NB right	---	163	55	<25
NB left	355	33	63	<25
WB	90	35	220	40
7. Idaho Maryland Rd / Railroad Ave				
EB	90	88	83	<25
8. Main St / Brunswick Rd – W. Olympia Dr				
NB left	110	<25	<25	<25
NB right	125	39	126	59
SB left (2 lanes)	355	64	177	99
WB left (2 lanes)	150	36	88	60
WB right	150	56	149	74
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr				
NB left	100	25	75	52
NB right	100	28	129	83
SB left (2 lanes)	260	127	199	143
SB right	260	50	76	54
EB	160	56	204	128
WB left	145	63	104	85

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 18B (continued)
EPAP PLUS PROJECT QUEUES
SR 49 (SCENARIO #2)
(PROJECT TRAFFIC HOURS)

Location	Length*	EPAP 6:30 – 7:30 AM Queue (feet)	EPAP 3:30 – 4:30 PM Queue (feet)	EPAP 6:30 – 7:30 PM Queue (feet)
10. Brunswick Rd / SR 49 EB Ramps				
NB left	200	160	226	172
NB right	---	100	259	99
11. Brunswick Rd / Sutton Way				
NB left (2 lanes)	280	52	251	111
SB left	190	41	105	56
SB right	180	---	<25	---
EB left (2 lanes)	185	60	128	63
EB right	250	46	161	86
WB left	125	45	147	67
12. Brunswick Rd / Idaho Maryland Rd				
NB left	540	<25	<25	<25
SB left	120	<25	<25	<25
EB right	---	25	40	<25
WB left	60	43	75	<25
13. Brunswick Rd / Whispering Pines Ln				
NB left	210	<25	<25	<25
EB left	110	<25	<25	<25
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd				
NB left	225	<25	<25	<25
SB left	260	<25	<25	<25
EB	---	<25	<25	<25
WB	---	<25	<25	<25
15. Brunswick Rd / SR 174				
SB left	90	30	215	48
EB left	130	<25	<25	<25
16. Brunswick Rd / Project Driveway				
NB left	350	<25	<25	<25
EB	---	<25	<25	<25
17. E. Bennett Rd / Millsite Rd				
NB right	---	<25	<25	<25
18. Whispering Pines Ln / Project Driveway – Not Applicable				
19. Idaho Maryland Rd / Centennial Dr				
NB	---	<25	335	<25
WB left	130	<25	<25	<25

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 18B (continued)
EPAP PLUS PROJECT QUEUES
SR 49 (SCENARIO #2)
(PROJECT TRAFFIC HOURS)

Location	Length*	EPAP 6:30 – 7:30 AM Queue (feet)	EPAP 3:30 – 4:30 PM Queue (feet)	EPAP 6:30 – 7:30 PM Queue (feet)
20. Idaho Maryland Rd /Sutton Way				
SB right	90	<25	45	<25
SB left	---	<25	<25	<25
ÈB	---	25	100	<25
WB	---	<25	70	<25
21. Sutton Way / Dorsey Dr				
SB right	120	<25	38	<25
SB thru	---	<25	45	<25
NB	---	<25	98	<25
EB	---	<25	110	40
22. Dorsey Dr / SR 49 EB Ramps				
NB Left (2 lanes)	215	107	113	59
NB right	215	41	99	54
EB left	180	62	157	65
23. Dorsey Dr / SR 49 EB Ramps				
SB right	400	50	57	49
SB left-thru	400	57	151	69
EB right	155	39	196	41
WB left	180	77	179	84

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

EPAP Plus Project Conditions (Scenario #2) Roadway Segment Levels of Service. Table 19 summarizes the Levels of Service based on the EPAP traffic volumes on study area roads with the existing roadway configuration. All segments along Brunswick Road and E. Bennett Road will continue to operate at LOS D or better while the SR 174 segment will continue to operate at LOS E. The SR 174 segment exceeds the LOS C threshold in both directions.

TABLE 19
EPAP PLUS PROJECT
SR 49 (SCENARIO #2)
ROADWAY SEGMENT LEVELS OF SERVICE

Roadway	Location	Facility Classification	ATS/PTSF/LOS EPAP plus Project PM Peak Hour
Brunswick Rd	SR 49 to Whispering Pines Ln	Class I Highway	
	NB		31.2 / 77.7 / D
	SB		31.1 / 78.0 / D
	Whispering Pines Ln to E. Bennett Rd	Class I Highway	
	NB		36.1 / 72.5 / D
	SB		35.5 / 83.6 / D
	E. Bennett Rd to Project Driveway	Class I Highway	
	NB		34.9 / 68.3 / D
	SB		34.8 / 80.1 / D
	Project Driveway to SR 174	Class I Highway	
	NB		33.7 / 67.9 / D
	SB		33.2 / 83.9 / D
E. Bennett Rd	Project Driveway to Brunswick Rd	Class III Highway	
	EB		36.1 / 37.6 / B
	WB		34.8 / 53.4 / B
SR 174	Brunswick Rd to Empire St	Class I Highway	
	EB		**30.2 / 59.8 / E**
	WB		**29.2 / 78.2 / E**

ATS – average travel speed
PTSF – percent time spent following
LOS – level of service
Bold indicates LOS threshold exceeded

VII. CUMULATIVE IMPACTS (2035)

The analysis of the long range 2035 cumulative condition is intended to consider the impact of this project within the context of the Nevada County region buildout projected to occur by 2035.

VII.1. Year 2035 Forecasts / Conditions

2035 Traffic Forecasts

Year 2035 traffic forecasts were based on the most recent Nevada County Transportation Commission (NCTC) regional travel demand model and includes those projects identified in the EPAP scenario. Fehr & Peers maintains the NCTC model and provided a.m., p.m. and daily model volumes for the base year 2012 and the build out year 2035. Based on direction from the Nevada County Public Works Department the differential method was used to develop peak hour turning movements at all study intersections. The method adds the difference between the two model results to the existing traffic conditions. Turning movements at each intersection for the remaining three scenarios were developed by applying the differential method with the proportional traffic rate between the off-peak scenarios and the peak hour scenarios. Figures 11A through 11D display the Cumulative No Project traffic volumes at each study intersection for each of the five study time periods.

Roadway Conditions

The roadways studied for this project are generally projected to remain with their current lane configurations in 2035. The following changes to the projected 2035 roadway network were identified based on Nevada County, Grass Valley and Caltrans project lists:

- SR 49/20 Eastbound On-Ramp / E. Bennett Road
    - Install traffic signal

- SR 49/20 Westbound Off-Ramp / E. Bennett Road
    - Install traffic signal

- Idaho Maryland Road / SR 49/20 Ramps
    - Install traffic signal with NB overlap

- Idaho Maryland Road / Railroad Avenue
    - Install traffic signal

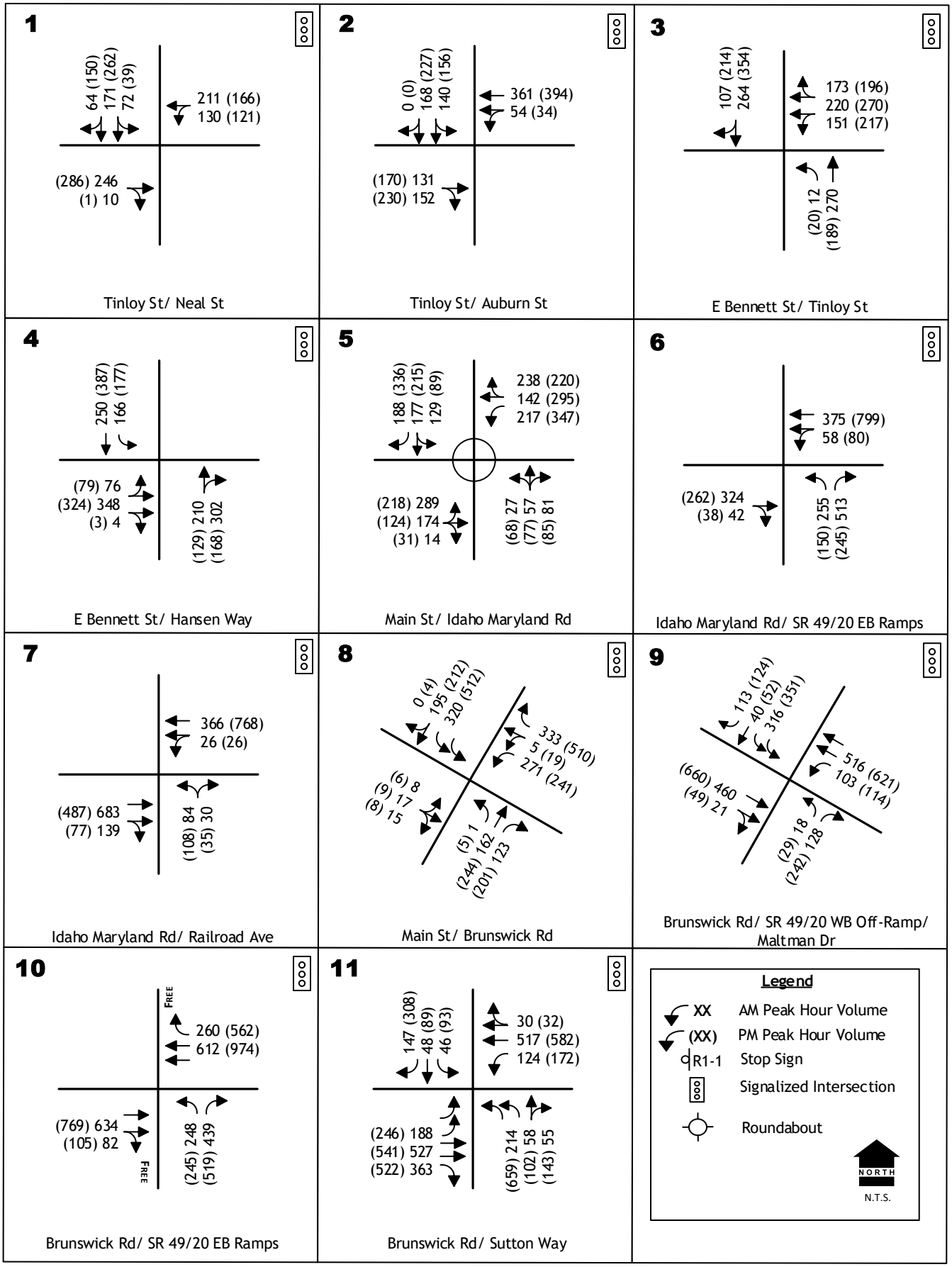
- Brunswick Road / Idaho Maryland Road
    - Install traffic signal, split phase on Idaho Maryland Road with EB overlap
    - Lane configuration to include:
        - eastbound left-through lane and right turn lane
        - westbound left-through lane and right turn lane
        - northbound left turn lane and through-right lane
        - southbound left turn lane, through lane and through-right lane

- Idaho Maryland Road / Centennial Drive
    - Install traffic signal

- Idaho Maryland Road / Sutton Way
    - Install traffic signal, split phase along Idaho Maryland Road

Signal timing was optimized at all intersections. Other roadway improvements were identified; however, none were operational and have not been listed.

One intersection, SR 174 at Brunswick Road was previously identified to be signalized in the NCTC Regional Transportation Program (RTP). The most recent study, the NCTC 2016 Nexus Study, removed the project from the program as this study showed acceptable intersection levels of service. The Caltrans SR 174 TCR continues to identify this intersection as a planned, but unfunded improvement which could include either a traffic signal or roundabout. Based on this data, the intersection was analyzed under current traffic operations.

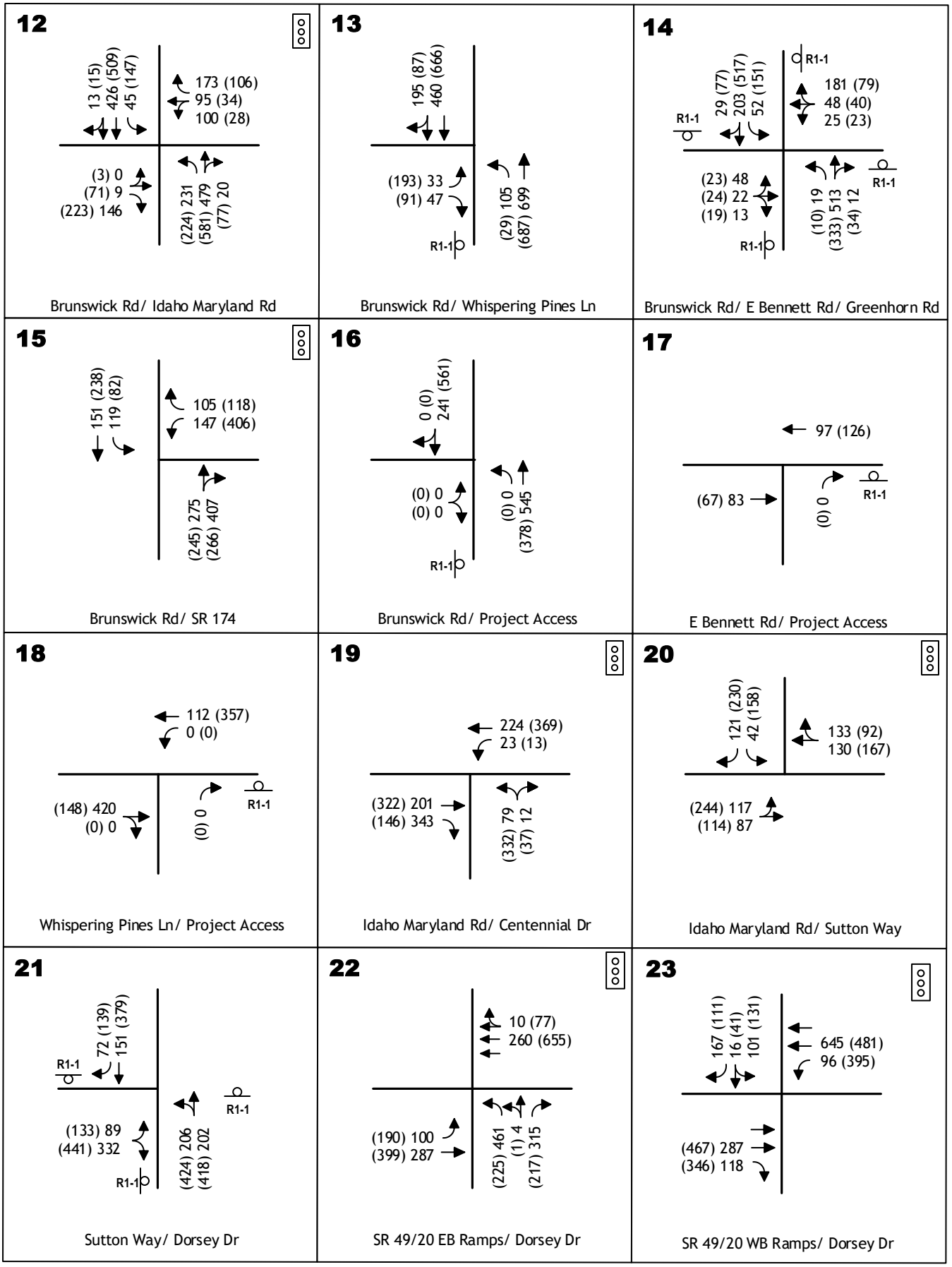


AM/PEAK HOURS CUMULATIVE
TRAFFIC VOLUMES AND LANE CONFIGURATIONS

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

figure 11a

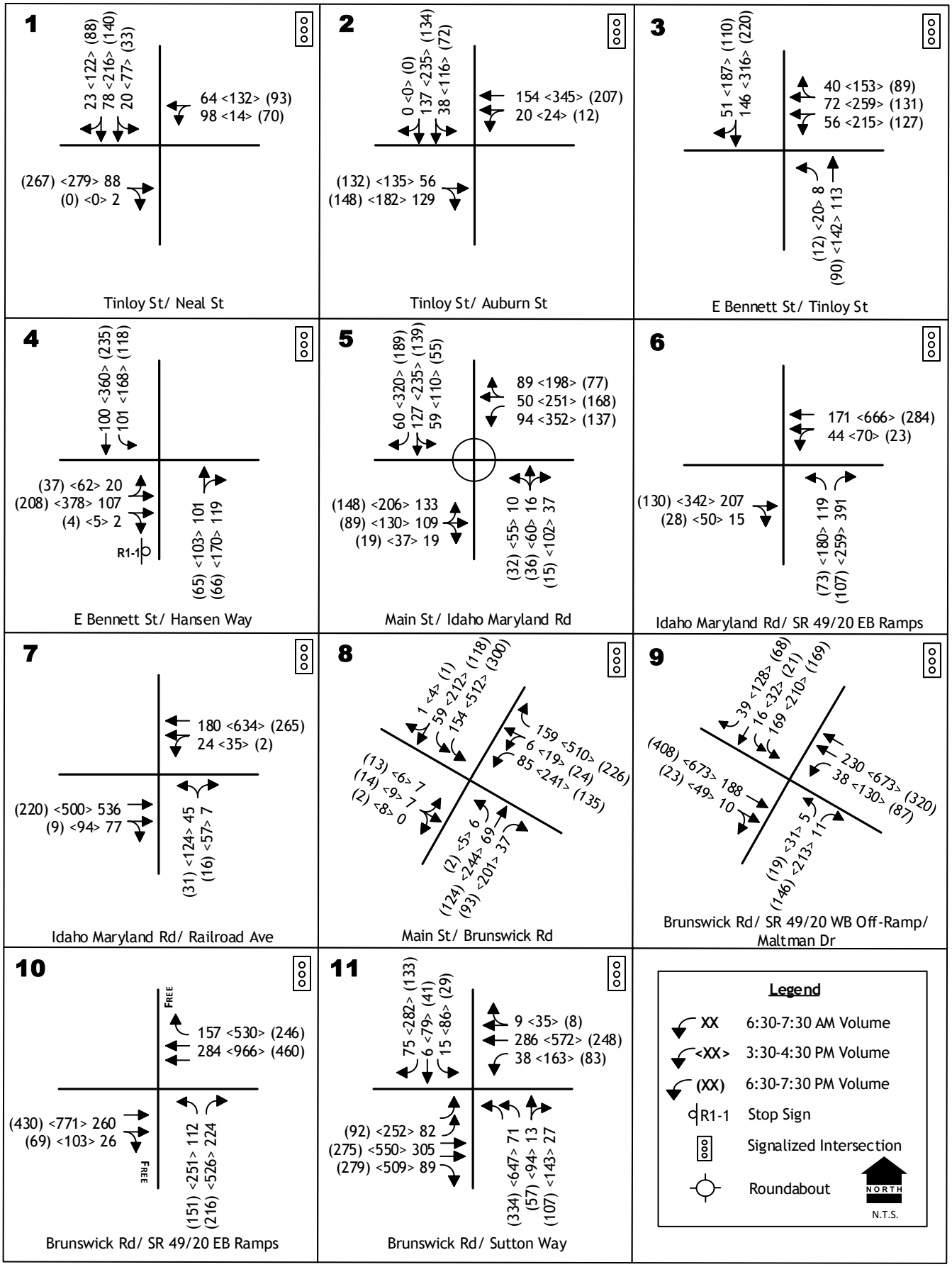


AM/PEAK HOURS CUMULATIVE
TRAFFIC VOLUMES AND LANE CONFIGURATIONS

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

figure 11b

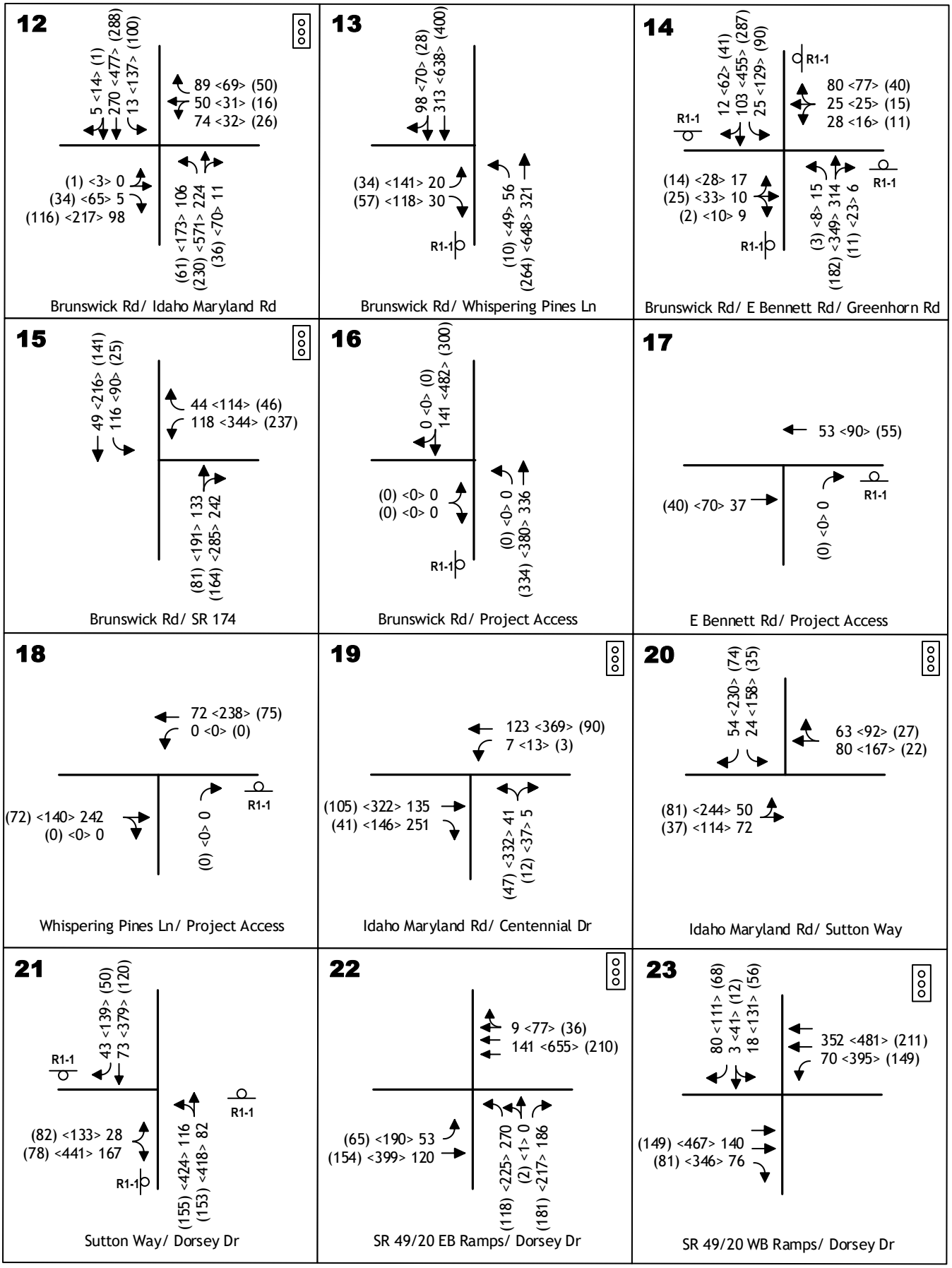


AM/PEAK HOURS CUMULATIVE
TRAFFIC VOLUMES AND LANE CONFIGURATIONS

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

figure 11c



AM/PEAK HOURS CUMULATIVE
TRAFFIC VOLUMES AND LANE CONFIGURATIONS

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

figure 11d

2035 Intersection Levels of Service. The Cumulative volumes were used to recalculate operating Levels of Service at the study intersections. Tables 20A and 20B summarize operating Levels of Service at the study area intersections for each of the five study time periods.

During the peak hour scenario three intersections will operate at unacceptable Levels of Service, at LOS E or F, which include Brunswick Road at E. Bennett Road – Greenhorn Road, SR 174 at Brunswick Road and Sutton Way at Dorsey Drive.

During the project traffic hours when most of the project traffic occurs, two intersections will operate below the LOS threshold during the 3:30 to 4:30 period when administrative staff is departing. These include Sutton Way at Dorsey Drive which will operate at LOS F and SR 174 at Brunswick Road which will operate at LOS E.

Four intersections will meet the peak hour signal warrant during the a.m. and p.m. peak hour scenarios and the 3:30 – 4:30 p.m. project traffic scenario. These include Brunswick Road at Whispering Pines Lane, Brunswick Road at E. Bennett Road – Greenhorn Road, SR 174 at Brunswick Road and Sutton Way at Dorsey Drive. As identified above, the Brunswick Road at E. Bennett Road – Greenhorn Road, SR 174 at Brunswick Road and Sutton Way at Dorsey Drive intersections also operate below the accepted LOS D threshold.

TABLE 20A
CUMULATIVE CONDITIONS
LEVELS OF SERVICE AT INTERSECTIONS
PEAK HOURS

Location	Control	Cumulative AM Peak Hour		Cumulative PM Peak Hour		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	
1. Neal St / Tinloy St	Signal	B	17.2	D	40.2	N/A
2. S. Auburn St / Tinloy St	Signal	B	10.8	B	14.6	N/A
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp	Signal	B	11.5	B	17.8	N/A
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp	Signal	B	18.9	B	13.1	N/A
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps	Roundabout	A	9.1	A	8.7	N/A
6. Idaho Maryland Rd / SR 49 EB Ramps	Signal	C	20.4	B	18.7	N/A
7. Idaho Maryland Rd / Railroad Ave	Signal	B	14.9	B	20.0	N/A
8. Main St / Brunswick Rd – W. Olympia Dr	Signal	B	11.9	B	17.1	N/A
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr	Signal	B	18.5	C	21.0	N/A
10. Brunswick Rd / SR 49 EB Ramps	Signal	B	12.7	B	13.9	N/A
11. Brunswick Rd / Sutton Way	Signal	B	13.5	C	30.8	N/A
12. Brunswick Rd / Idaho Maryland Rd	Signal	C	25.1	D	35.0	N/A
13. Brunswick Rd / Whispering Pines Ln NB Left EB	EB Stop	 A B	 9.7 14.7	 A D	 9.5 28.8	Yes
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd	AWS	**E**	**35.4**	D	29.4	Yes
15. Brunswick Rd / SR 174 EB Left SB	SB Stop	 A C	 8.2 17.5	 A **F**	 8.0 **106.8**	Yes
16. Brunswick Rd / Project Driveway	EB Stop	Not Studied				
17. E. Bennett Rd / Millsite Rd	NB Stop	Not Studied				
18. Whispering Pines Ln / Centennial Site Driveway	NB Stop	Not Studied				
19. Idaho Maryland Rd / Centennial Dr	Signal	A	7.7	B	14.1	N/A
20. Idaho Maryland Rd /Sutton Way	Signal	B	14.3	C	22.2	N/A
21. Sutton Way / Dorsey Dr	AWS	C	19.1	**F**	**213.1**	Yes
22. Dorsey Dr / SR 49 EB Ramps	Signal	B	13.7	B	14.7	N/A
23. Dorsey Dr / SR 49 WB Ramps	Signal	A	9.3	B	18.4	N/A

AWS – all way stop **Bold** indicates intersection operates below threshold

TABLE 20B
CUMULATIVE CONDITIONS
PEAK HOUR LEVELS OF SERVICE AT INTERSECTIONS
(PROJECT TRAFFIC HOURS)

Location	Control	Cumulative 6:30 – 7:30 AM		Cumulative 3:30 – 4:30 PM		Cumulative 6:30 – 7:30 PM		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	
1. Neal St / Tinloy St	Signal	A	6.7	A	9.0	B	11.7	N/A
2. S. Auburn St / Tinloy St	Signal	A	7.2	A	9.9	A	9.0	N/A
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp	Signal	A	8.5	B	15.0	B	10.7	N/A
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp	Signal	B	10.9	B	12.9	B	10.2	N/A
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps	Roundabout	A	5.1	A	8.3	A	4.9	N/A
6. Idaho Maryland Rd / SR 49 EB Ramps	Signal	B	12.7	B	19.4	B	11.9	N/A
7. Idaho Maryland Rd / Railroad Ave	Signal	B	11.5	B	19.3	B	12.2	N/A
8. Main St / Brunswick Rd – W. Olympia Dr	Signal	A	6.1	B	14.0	A	9.8	N/A
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr	Signal	B	17.1	B	16.9	B	16.1	N/A
10. Brunswick Rd / SR 49 EB Ramps	Signal	A	8.3	B	14.9	A	8.9	N/A
11. Brunswick Rd / Sutton Way	Signal	A	5.3	C	28.2	B	10.7	N/A
12. Brunswick Rd / Idaho Maryland Rd	Signal	B	17.3	C	31.6	B	18.1	N/A
13. Brunswick Rd / Whispering Pines Ln NB Left EB	EB Stop	 A B	 8.4 11.0	 A C	 9.4 19.3	 A B	 8.3 11.0	Yes*
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd	AWS	B	11.0	C	23.7	B	10.9	Yes*
15. Brunswick Rd / SR 174 EB Left SB	SB Stop	 A B	 7.7 12.8	 A **E**	 7.8 **46.2**	 A C	 8.2 17.5	Yes*
16. Brunswick Rd / Project Driveway	EB Stop	Not Studied						
17. E. Bennett Rd / Millsite Rd	NB Stop	Not Studied						
18. Whispering Pines Ln / Centennial Site Driveway	NB Stop	Not Studied						
19. Idaho Maryland Rd / Centennial Dr	Signal	A	6.7	B	11.5	A	7.5	N/A
20. Idaho Maryland Rd /Sutton Way	Signal	B	11.0	B	19.2	B	10.1	N/A
21. Sutton Way / Dorsey Dr	AWS	A	9.0	**F**	**213.1**	B	10.4	Yes*
22. Dorsey Dr / SR 49 EB Ramps	Signal	A	8.9	B	14.8	A	8.7	N/A
23. Dorsey Dr / SR 49 WB Ramps	Signal	A	5.6	B	17.6	A	8.2	N/A

AWS – all way stop **Bold** indicates intersection operates below threshold * meets warrant in 3:30 p.m. hour

Intersection Queues. Tables 21A and 21B present information regarding queuing at each study intersection under Cumulative conditions. 95th percentile queues with lengths exceeding the available storage are highlighted. The 95th percentile queue exceeds available storage in 21 locations at 13 intersections. Some intersections are shown to have excessive queues while maintaining acceptable levels of service. These include Neal Street at Tinloy Street, Idaho Maryland Road at SR 49/20 Eastbound Ramps, Idaho Maryland Road at Railroad Avenue and Brunswick Road / Sutton Way; the level of service is a result of the ability of the intersection to serve those vehicles that enter the intersection. Other intersections with queues exceeding the available storage include intersections identified to be signalized by 2035; with signalization the storage lanes require lengthening. It is assumed that one additional vehicle (25') can store in the available left or right turn taper and this occurs at four locations.

TABLE 21A
CUMULATIVE QUEUES
PEAK HOURS

Location	Length*	Cumulative AM Peak Hour Queue (feet)	Cumulative PM Peak Hour Queue (feet)
1. Neal St / Tinloy St			
EB	70	116	118
WB	150	310	651
2. S. Auburn St / Tinloy St			
NB through	80	141	162
NB through-left	80	84	89
SB	75	110	148
WB	95	121	140
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp			
NB left turn	60	<25	28
NB through	150	104	79
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp			
SB left turn	60	135	141
SB through	150	88	145
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps			
NB	---	30	34
SB	---	41	60
EB	---	148	84
WB	---	68	121
6. Idaho Maryland Rd / SR 49 EB Ramps			
NB right	---	166	29
NB left	355	212	134
WB	90	161	369

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 21A (continued)
CUMULATIVE QUEUES
PEAK HOURS

Location	Length*	Cumulative AM Peak Hour Queue (feet)	Cumulative PM Peak Hour Queue (feet)
7. Idaho Maryland Rd / Railroad Ave			
EB	90	204	162
8. Main St / Brunswick Rd – W. Olympia Dr			
NB left	110	<25	<25
NB right	125	81	142
SB left (2 lanes)	355	115	213
WB left (2 lanes)	150	102	110
WB right	150	107	163
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr			
NB left	100	53	87
NB right	100	87	157
SB left (2 lanes)	260	199	203
SB right	260	67	82
EB	160	159	211
WB left	145	99	108
10. Brunswick Rd / SR 49 EB Ramps			
NB left	200	223	217
NB right	---	231	261
11. Brunswick Rd / Sutton Way			
NB left (2 lanes)	280	115	502
SB left	190	68	117
SB right	180	---	<25
EB left (2 lanes)	185	92	131
EB right	250	129	219
WB left	125	105	188
12. Brunswick Rd / Idaho Maryland Rd			
NB left	540	220	209
SB left	120	55	196
EB left	150	<25	76
WB left	175	163	66
13. Brunswick Rd / Whispering Pines Ln			
NB left	210	<25	<25
EB left	110	<25	110
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd			
NB left	225	<25	<25
SB left	260	<25	28
EB	---	<25	<25
WB	---	68	25

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 21A (continued)
CUMULATIVE QUEUES
PEAK HOURS

Location	Length*	Cumulative AM Peak Hour Queue (feet)	Cumulative PM Peak Hour Queue (feet)
15. Brunswick Rd / SR 174			
SB left	90	53	440
EB left	130	<25	<25
19. Idaho Maryland Rd / Centennial Dr			
NB	---	49	311
WB left	130	<25	<25
20. Idaho Maryland Rd /Sutton Way			
SB right	90	39	46
SB left	---	39	120
ÈB	---	117	278
WB	---	120	156
21. Sutton Way / Dorsey Dr			
SB right	120	<25	30
SB thru	---	33	215
NB	---	153	1350
EB	---	135	455
22. Dorsey Dr / SR 49 EB Ramps			
NB Left (2 lanes)	215	214	114
NB right	215	135	95
EB left	180	99	169
23. Dorsey Dr / SR 49 EB Ramps			
SB right	400	77	59
SB left-thru	400	95	163
EB right	155	64	224
WB left	180	91	258

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 21B
CUMULATIVE QUEUES
(PROJECT TRAFFIC HOURS)

Location	Length*	Cumulative 6:30 – 7:30 AM Queue (feet)	Cumulative 3:30 – 4:30 PM Queue (feet)	Cumulative 6:30 – 7:30 PM Queue (feet)
1. Neal St / Tinloy St				
EB	70	84	116	119
WB	150	115	106	131
2. S. Auburn St / Tinloy St				
NB through	80	73	137	98
NB through-left	80	44	63	44
SB	75	86	139	123
WB	95	68	113	103
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp				
NB left turn	60	<25	28	<25
NB through	150	26	60	29
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp				
SB left turn	60	58	124	64
SB through	150	23	130	58
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps				
NB	---	<25	32	<25
SB	---	<25	70	25
EB	---	39	86	34
WB	---	<25	66	32
6. Idaho Maryland Rd / SR 49 EB Ramps				
NB right	---	39	48	<25
NB left	355	81	151	50
WB	90	61	260	72
7. Idaho Maryland Rd / Railroad Ave				
EB	90	123	166	47
8. Main St / Brunswick Rd – W. Olympia Dr				
NB left	110	<25	<25	<25
NB right	125	42	130	59
SB left (2 lanes)	355	68	175	106
WB left (2 lanes)	150	43	97	75
WB right	150	47	149	69
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr				
NB left	100	<25	68	54
NB right	100	30	131	84
SB left (2 lanes)	260	134	148	140
SB right	260	45	84	54
EB	160	61	202	128
WB left	145	61	106	90

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 21B (continued)
CUMULATIVE QUEUES
(PROJECT TRAFFIC HOURS)

Location	Length*	Cumulative 6:30 – 7:30 AM Queue (feet)	Cumulative 3:30 – 4:30 PM Queue (feet)	Cumulative 6:30 – 7:30 PM Queue (feet)
10. Brunswick Rd / SR 49 EB Ramps				
NB left	200	141	215	180
NB right	---	106	262	110
11. Brunswick Rd / Sutton Way				
NB left (2 lanes)	280	58	435	141
SB left	190	38	115	52
SB right	180	---	---	---
EB left (2 lanes)	185	61	127	66
EB right	250	52	224	98
WB left	125	48	177	84
12. Brunswick Rd / Idaho Maryland Rd				
NB left	540	90	151	56
SB left	120	<25	188	103
EB left	150	34	74	39
WB left	175	100	68	43
13. Brunswick Rd / Whispering Pines Ln				
NB left	210	<25	<25	<25
EB left	110	<25	58	<25
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd				
NB left	225	<25	<25	<25
SB left	260	<25	<25	<25
EB	---	<25	<25	<25
WB	---	<25	<25	<25
15. Brunswick Rd / SR 174				
SB left	90	25	248	45
EB left	130	<25	<25	<25
19. Idaho Maryland Rd / Centennial Dr				
NB	---	28	285	29
WB left	130	<25	<25	<25
20. Idaho Maryland Rd /Sutton Way				
SB right	90	<25	53	<25
SB left	---	<25	119	<25
ÈB	---	59	274	53
WB	---	54	155	<25

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 21B (continued)
CUMULATIVE QUEUES
(PROJECT TRAFFIC HOURS)

Location	Length*	Cumulative 6:30 – 7:30 AM Queue (feet)	Cumulative 3:30 – 4:30 PM Queue (feet)	Cumulative 6:30 – 7:30 PM Queue (feet)
21. Sutton Way / Dorsey Dr				
SB right	120	<25	28	<25
SB thru	---	<25	190	<25
NB	---	30	1333	58
EB	---	25	188	<25
22. Dorsey Dr / SR 49 EB Ramps				
NB left (2 lanes)	215	98	125	58
NB right	215	59	97	62
EB left	180	63	180	65
23. Dorsey Dr / SR 49 EB Ramps				
SB right	400	53	63	49
SB left-thru	400	43	165	64
EB right	155	41	218	40
WB left	180	73	253	108

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

Cumulative Roadway Segment Levels of Service. Table 22 summarizes the Levels of Service based on the Cumulative traffic volumes on study area roads. All segments along Brunswick Road and E. Bennett Road will continue to operate at LOS D or better while the SR 174 segment will continue to operate at LOS E. The SR 174 segment exceeds the LOS C threshold in both directions.

TABLE 22
CUMULATIVE ROADWAY SEGMENT LEVELS OF SERVICE

Roadway	Location	Facility Classification	ATS/PTSF/LOS Cumulative PM Peak Hour
Brunswick Rd	SR 49 to Whispering Pines Ln	Class I Highway	
	NB		29.9 / 81.3 / D
	SB		30.0 / 80.8 / D
	Whispering Pines Ln to E. Bennett Rd	Class I Highway	
	NB		35.0 / 85.8 / D
	SB		35.9 / 72.8 / D
	E. Bennett Rd to Project Driveway	Class I Highway	
	NB		35.4 / 63.1 / C
	SB		35.3 / 79.7 / C
	Project Driveway to SR 174	Class I Highway	
	NB		33.7 / 67.8 / D
	SB		33.0 / 81.7 / D
E. Bennett Rd	Project Driveway to Brunswick Rd	Class III Highway	
	EB		35.9 / 27.3 / B
	WB		35.7 / 56.5 / B
SR 174	Brunswick Rd to Empire St	Class I Highway	
	EB		**29.8 / 60.2 / E**
	WB		**28.6 / 80.4 / E**

ATS – average travel speed
PTSF – percent time spent following
LOS – level of service
Bold indicates LOS threshold exceeded

VII.2. Cumulative Plus Project Conditions (Scenario #1)

Scenario #1 considers transporting of engineered fill to the Centennial Industrial site.

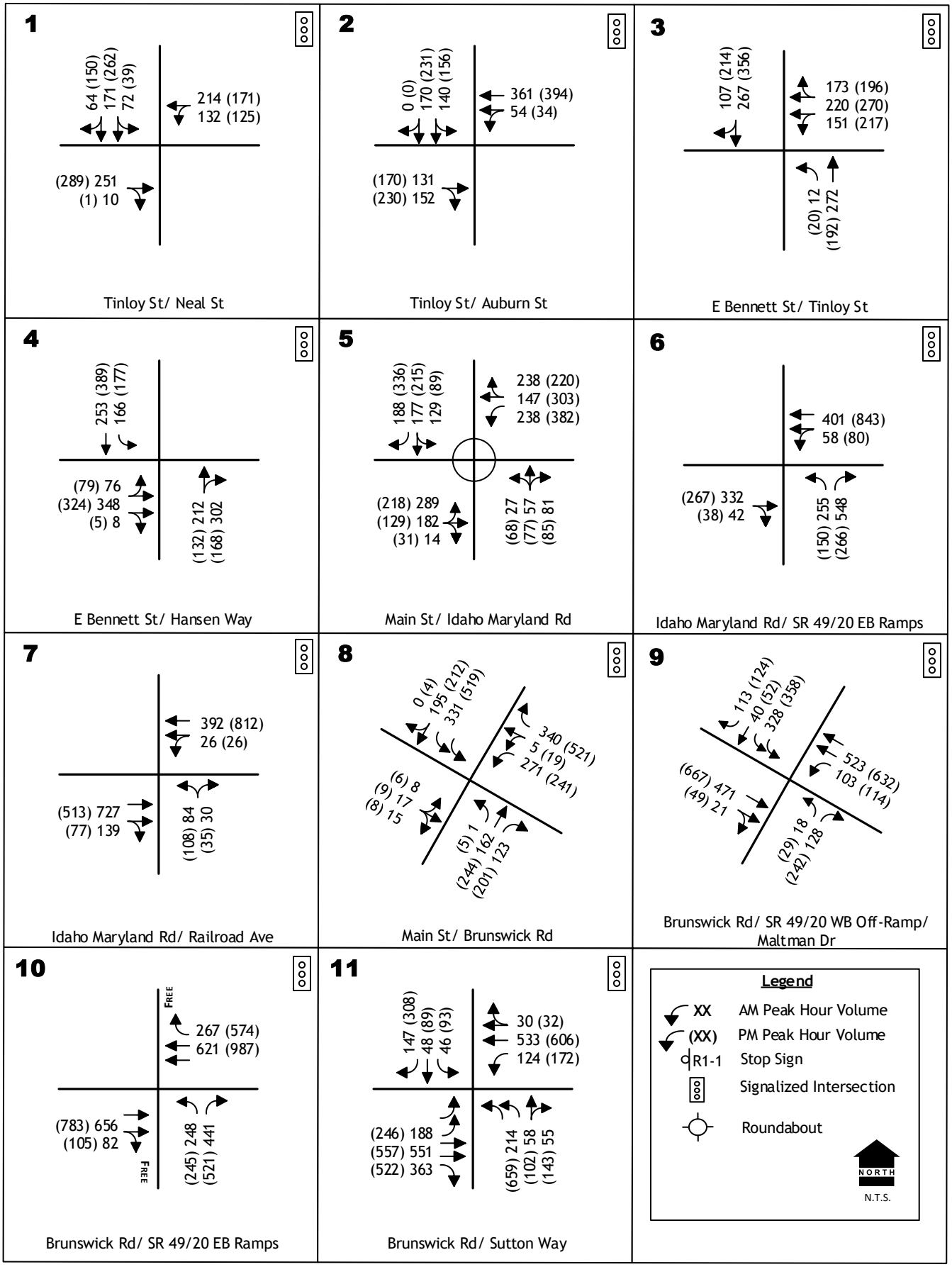
Traffic Volumes. The LOS impacts of the Idaho-Maryland Mine project have been identified by superimposing project traffic onto Cumulative conditions. Figures 12A through 12D display the "Cumulative Plus Project" traffic volumes at each study intersection for each of the five study time periods.

Cumulative plus Project volumes under Scenario #1 were used to recalculate operating Levels of Service at the study intersections. Tables 23A and 23B summarize operating Levels of Service at the study area intersections for each of the five study time periods.

During the peak hour scenario three intersections would continue to operate at unacceptable Levels of Service, at LOS E or F, which include Brunswick Road at E. Bennett Road – Greenhorn Road, SR 174 at Brunswick Road and Sutton Way at Dorsey Drive. One additional intersection, Brunswick Road at Whispering Pines Lane, would decline to LOS E.

During the project traffic hours two intersections will operate below the LOS threshold, at LOS E or F. These include Sutton Way at Dorsey Drive and SR 174 at Brunswick Road.

Five intersections will meet the peak hour signal warrant during the a.m. and p.m. peak hours and the 3:30 – 4:30 p.m. project traffic hour scenario. These include Brunswick Road at Whispering Pines Lane, Brunswick Road at E. Bennett Road – Greenhorn Road, SR 174 at Brunswick Road, Brunswick Road at Project Driveway and Sutton Way at Dorsey Drive. The Brunswick Road at Whispering Pines Lane, Brunswick Road at E. Bennett Road, SR 174 at Brunswick Road and Sutton Way at Dorsey Drive intersections also operate below the accepted LOS D threshold. While the Brunswick Road / Project Driveway meets the peak hour signal warrant during the p.m. peak hour, it operates acceptably.

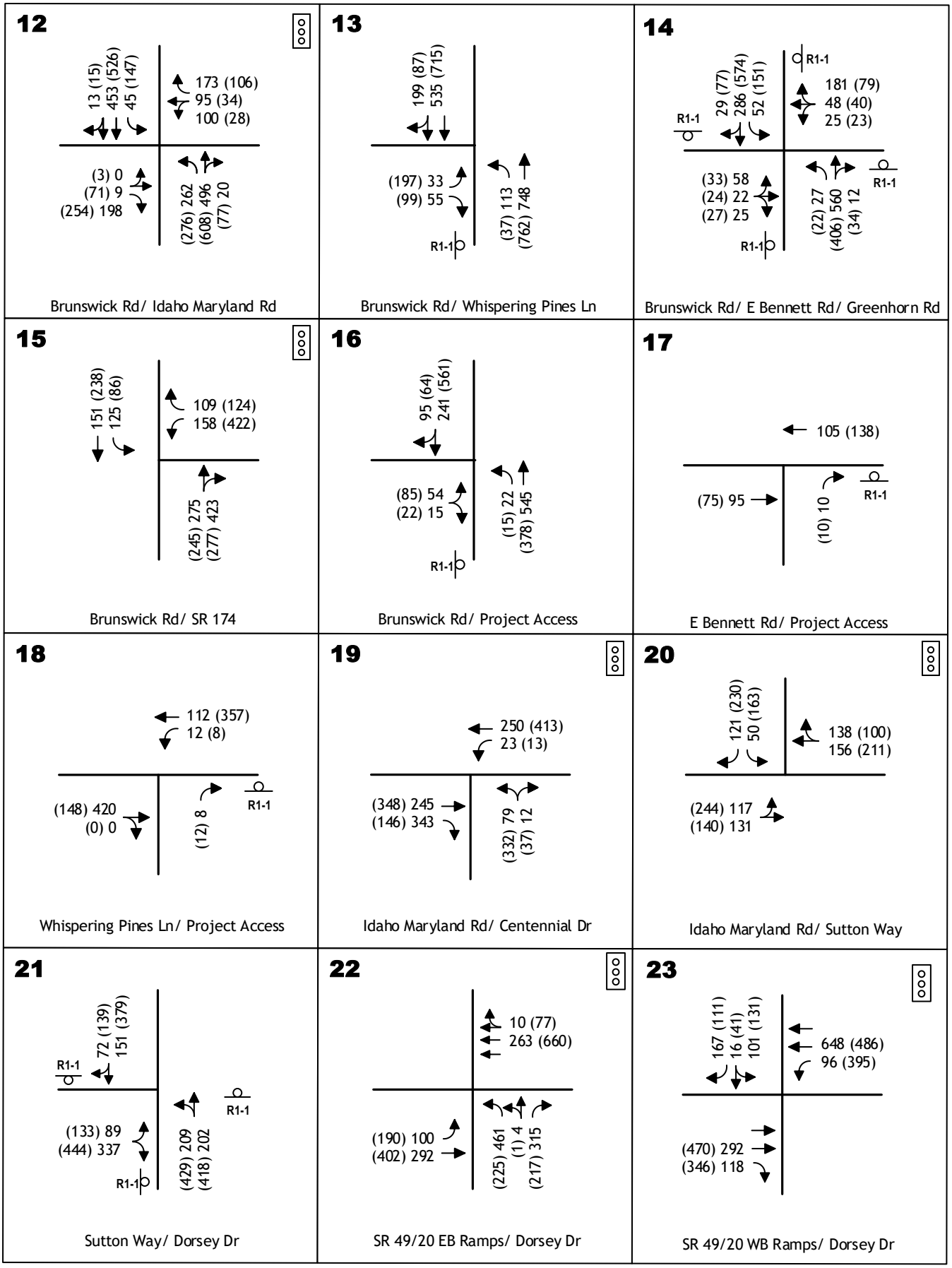


AM/PM PEAK HOURS CUMULATIVE PLUS PROJECT
TRAFFIC VOLUMES AND LANE CONFIGURATIONS
(TO CENTENNIAL SITE)

figure 12a

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

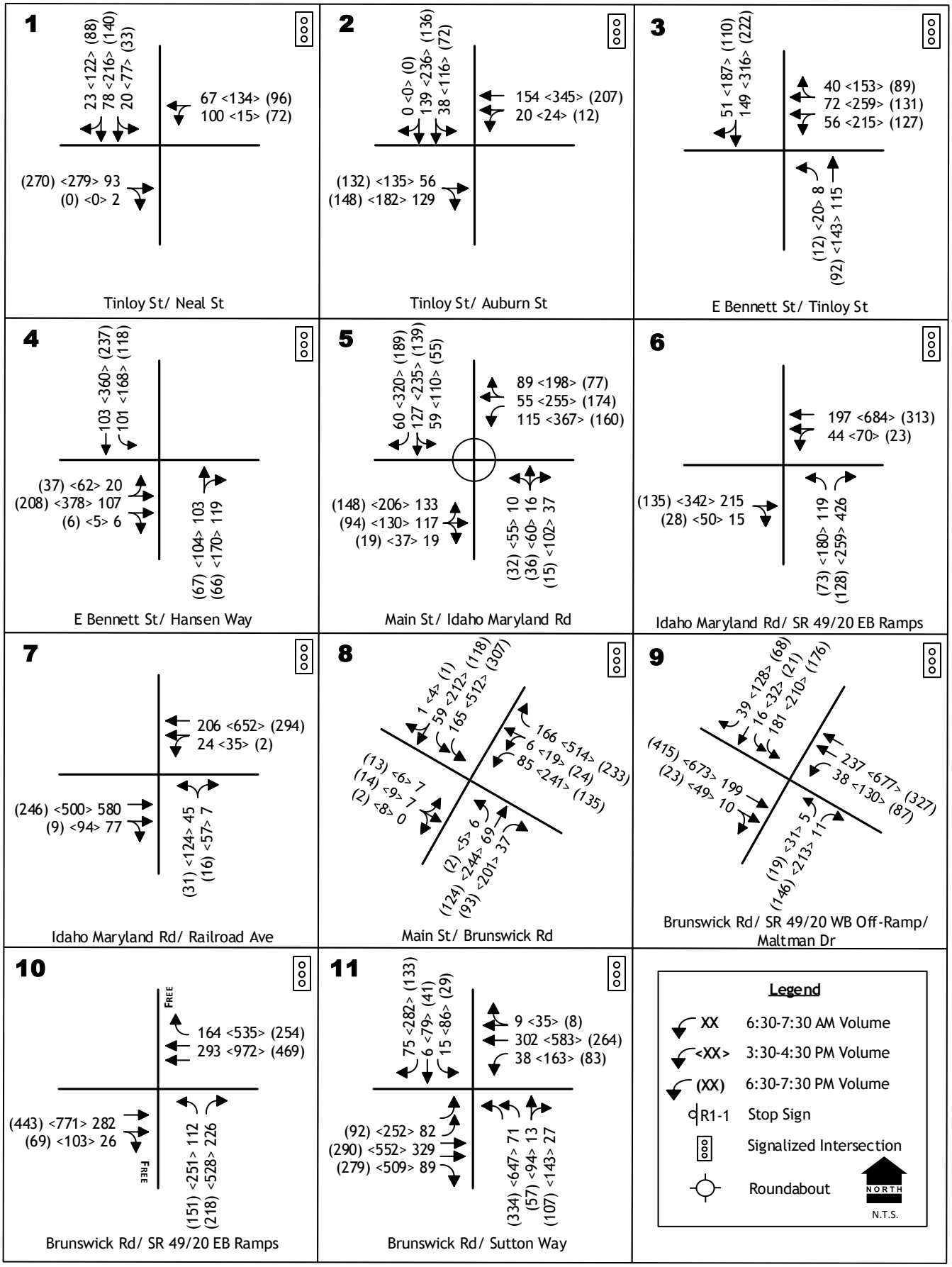


AM/PM PEAK HOURS CUMULATIVE PLUS PROJECT
TRAFFIC VOLUMES AND LANE CONFIGURATIONS
(TO CENTENNIAL SITE)

figure 12b

KD Anderson & Associates, Inc.
Transportation Engineers

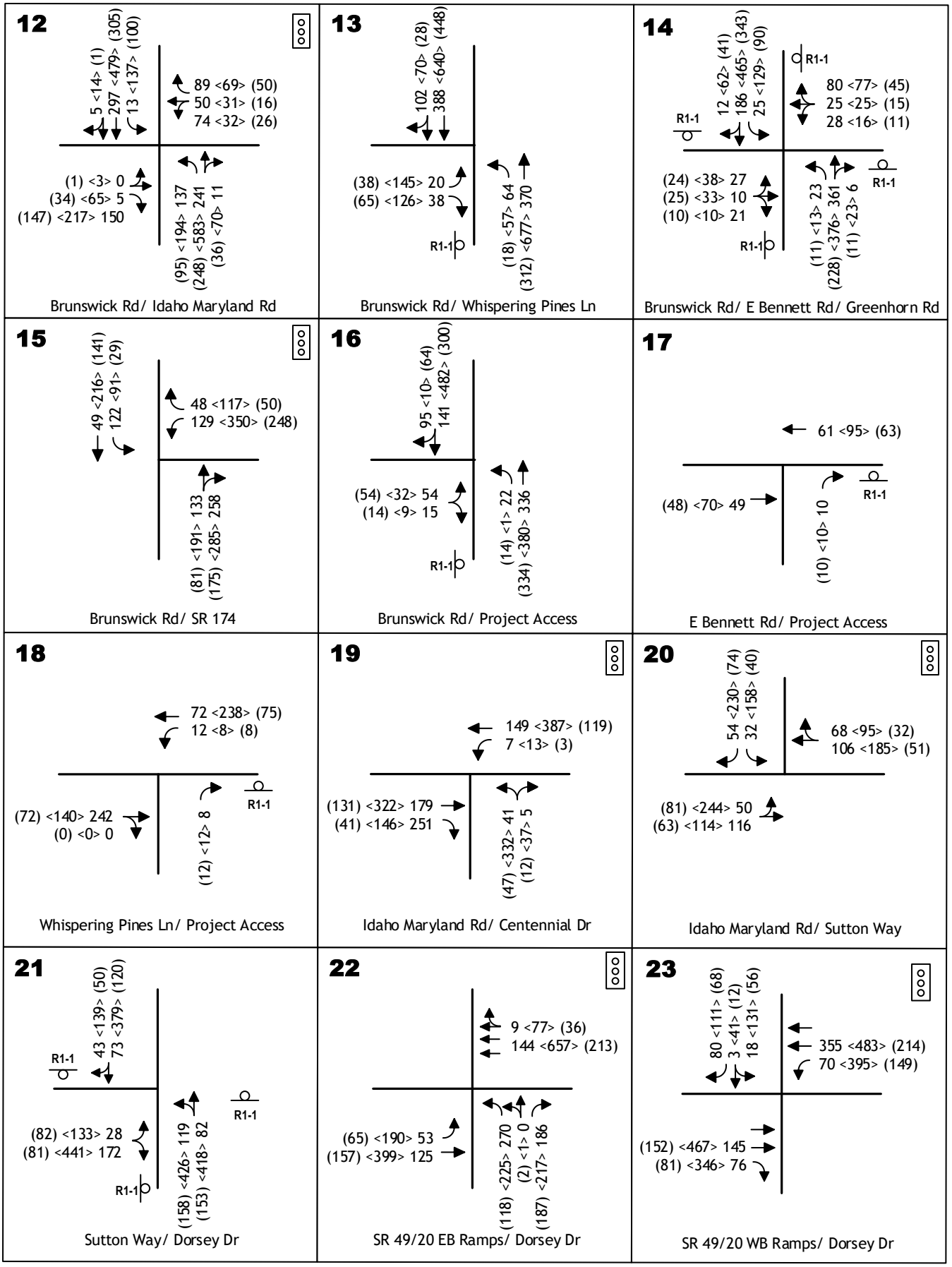
5875-01 RA 2/17/2020



PROJECT TRAFFIC HOURS CUMULATIVE PLUS PROJECT TRAFFIC VOLUMES AND LANE CONFIGURATIONS (TO CENTENNIAL SITE)

figure 12c

KD Anderson & Associates, Inc.
Transportation Engineers



PROJECT TRAFFIC HOURS CUMULATIVE PLUS PROJECT TRAFFIC VOLUMES AND LANE CONFIGURATIONS

(TO CENTENNIAL SITE)

figure 12d

KD Anderson & Associates, Inc.
Transportation Engineers

TABLE 23A
CUMULATIVE PLUS PROJECT – CENTENNIAL SITE (SCENARIO #1)
LEVELS OF SERVICE AT INTERSECTIONS
PEAK HOURS

Location	Control	Cum plus Project AM Peak Hour		Cum plus Project PM Peak Hour		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	
1. Neal St / Tinloy St	Signal	C	24.2	D	48.8	N/A
2. S. Auburn St / Tinloy St	Signal	B	11.5	B	14.0	N/A
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp	Signal	B	11.6	B	17.9	N/A
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp	Signal	B	19.0	B	13.1	N/A
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps	Roundabout	A	9.6	A	9.1	N/A
6. Idaho Maryland Rd / SR 49 EB Ramps	Signal	C	22.0	C	20.1	N/A
7. Idaho Maryland Rd / Railroad Ave	Signal	B	15.4	C	21.3	N/A
8. Main St / Brunswick Rd – W. Olympia Dr	Signal	B	11.8	B	16.5	N/A
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr	Signal	B	19.1	C	21.0	N/A
10. Brunswick Rd / SR 49 EB Ramps	Signal	B	12.6	B	14.5	N/A
11. Brunswick Rd / Sutton Way	Signal	B	13.8	C	32.2	N/A
12. Brunswick Rd / Idaho Maryland Rd	Signal	C	28.2	D	37.6	N/A
13. Brunswick Rd / Whispering Pines Ln NB Left EB	EB Stop	 B C	 10.1 15.5	 A **E**	 9.8 **35.2**	Yes
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd	AWS	**F**	**55.1**	**E**	**49.2**	Yes
15. Brunswick Rd / SR 174 EB Left SB	SB Stop	 A C	 8.2 18.6	 A **F**	 8.0 **125.0**	Yes
16. Brunswick Rd / Project Driveway NB Left EB	EB Stop	 A B	 8.0 13.1	 A C	 9.0 16.2	Yes

AWS – all way stop
Bold indicates intersection operates below threshold

TABLE 23A (continued)
CUMULATIVE PLUS PROJECT – CENTENNIAL SITE (SCENARIO #1)
LEVELS OF SERVICE AT INTERSECTIONS
PEAK HOURS

Location	Control	Cum plus Project AM Peak Hour		Cum plus Project PM Peak Hour		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	
17. E. Bennett Rd / Millsite Rd NB	NB Stop	 A	 8.8	 A	 8.7	 No
18. Whispering Pines Ln / Centennial Site Driveway NB WB Left	NB Stop	 B A	 11.0 8.3	 A A	 9.3 7.6	 No
19. Idaho Maryland Rd / Centennial Dr	Signal	A	7.6	B	14.6	N/A
20. Idaho Maryland Rd /Sutton Way	Signal	B	15.2	C	27.0	N/A
21. Sutton Way / Dorsey Dr	AWS	C	19.5	**F**	**279.9**	Yes
22. Dorsey Dr / SR 49 EB Ramps	Signal	B	13.8	B	15.2	N/A
23. Dorsey Dr / SR 49 WB Ramps	Signal	A	9.6	B	18.6	N/A

AWS – all way stop
Bold indicates intersection operates below threshold

TABLE 23B
CUMULATIVE PLUS PROJECT – CENTENNIAL SITE (SCENARIO #1)
PEAK HOUR LEVELS OF SERVICE AT INTERSECTIONS
PROJECT TRAFFIC HOURS

Location	Control	Cum plus Project 6:30 – 7:30 AM		Cum plus Project 3:30 – 4:30 PM		Cum plus Project 6:30 – 7:30 PM		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	
1. Neal St / Tinloy St	Signal	A	6.9	A	9.0	B	12.2	N/A
2. S. Auburn St / Tinloy St	Signal	A	7.1	A	9.5	A	9.1	N/A
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp	Signal	A	8.5	B	15.0	B	10.7	N/A
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp	Signal	B	10.9	B	12.9	B	10.2	N/A
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps	Roundabout	A	5.3	A	8.4	A	5.1	N/A
6. Idaho Maryland Rd / SR 49 EB Ramps	Signal	B	13.3	B	19.6	B	12.0	N/A
7. Idaho Maryland Rd / Railroad Ave	Signal	B	11.7	B	19.4	B	12.4	N/A
8. Main St / Brunswick Rd – W. Olympia Dr	Signal	A	6.2	B	14.2	A	9.7	N/A
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr	Signal	B	18.1	B	17.2	B	16.4	N/A
10. Brunswick Rd / SR 49 EB Ramps	Signal	A	8.4	B	14.8	A	8.7	N/A
11. Brunswick Rd / Sutton Way	Signal	A	5.2	C	30.2	B	10.5	N/A
12. Brunswick Rd / Idaho Maryland Rd	Signal	B	18.5	C	32.5	B	18.7	N/A
13. Brunswick Rd / Whispering Pines Ln NB Left EB	EB Stop	 A B	 8.7 11.4	 A C	 9.4 19.9	 A B	 8.5 11.3	Yes*
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd	AWS	B	13.0	D	27.2	B	12.6	Yes*
15. Brunswick Rd / SR 174 EB Left SB	SB Stop	 A B	 7.8 13.4	 A **E**	 7.8 **48.9**	 A B	 7.4 13.1	Yes*
16. Brunswick Rd / Project Driveway NB Left EB	EB Stop	 A B	 7.8 11.4	 A B	 8.5 12.9	 A B	 8.1 12.2	Yes*

AWS – all way stop
Bold indicates intersection operates below threshold
* meets warrant in 3:30 p.m. hour

TABLE 23B (continued)
CUMULATIVE PLUS PROJECT – CENTENNIAL SITE (SCENARIO #1)
PEAK HOUR LEVELS OF SERVICE AT INTERSECTIONS
PROJECT TRAFFIC HOURS

Location	Control	Cum plus Project 6:30 – 7:30 AM		Cum plus Project 3:30 – 4:30 PM		Cum plus Project 6:30 – 7:30 PM		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	
17. E. Bennett Rd / Millsite Rd NB	NB Stop	 A	 8.6	 A	 8.7	 A	 8.6	No
18. Whispering Pines Ln / Centennial Site Driveway NB WB Left	NB Stop	 A A	 9.7 7.8	 A A	 9.1 7.5	 A A	 8.7 7.4	No
19. Idaho Maryland Rd / Centennial DR	Signal	A	6.6	B	11.5	A	7.4	N/A
20. Idaho Maryland Rd /Sutton Way	Signal	B	11.7	B	19.7	B	10.9	N/A
21. Sutton Way / Dorsey Dr	AWS	A	9.1	**F**	**214.3**	B	10.5	Yes*
22. Dorsey Dr / SR 49 EB Ramps	Signal	A	8.6	B	15.0	A	8.9	N/A
23. Dorsey Dr / SR 49 WB Ramps	Signal	A	5.5	B	16.9	A	8.4	N/A

AWS – all way stop
Bold indicates intersection operates below threshold
* meets warrant in 3:30 p.m. hour

Intersection Queues. Tables 24A and 24B present information regarding queuing at each study intersection under Cumulative plus Project conditions. 95th percentile queues with lengths exceeding the available storage are highlighted. The 95th percentile queue exceeds available storage in 23 locations at 15 intersections. The queues at the intersections of Neal Street at Tinloy Street, Idaho Maryland Road at SR 49/20 Eastbound Ramps, Idaho Maryland Road at Railroad Avenue and Brunswick Road / Sutton Way will continue to have excessive queues while maintaining acceptable levels of service, serving the vehicles that do enter the intersections. Other intersections will continue to have queues exceeding the available storage include those intersections signalized by 2035. Two additional locations will exceed the available storage. These include the eastbound left turn lane of Whispering Pines Lane at Brunswick Road and the eastbound left turn lane of the Eastbound SR 49/20 ramps at Dorsey Drive. It is assumed that one additional vehicle (25') can store in the available left or right turn taper and this occurs at six locations.

TABLE 24A
CUMULATIVE PLUS PROJECT QUEUES
CENTENNIAL SITE (SCENARIO #1)
PEAK HOURS

Location	Length*	Cum + Project AM Peak Hour Queue (feet)	Cum + Project PM Peak Hour Queue (feet)
1. Neal St / Tinloy St			
EB	70	117	117
WB	150	478	872
2. S. Auburn St / Tinloy St			
NB through	80	159	158
NB through-left	80	98	84
SB	75	109	153
WB	95	123	137
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp			
NB left turn	60	<25	28
NB through	150	105	80
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp			
SB left turn	60	136	143
SB through	150	90	147
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps			
NB	---	30	34
SB	---	42	64
EB	---	160	90
WB	---	70	127

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 24A (continued)
CUMULATIVE PLUS PROJECT QUEUES
CENTENNIAL SITE (SCENARIO #1)
PEAK HOURS

Location	Length*	Cum + Project AM Peak Hour Queue (feet)	Cum + Project PM Peak Hour Queue (feet)
6. Idaho Maryland Rd / SR 49 EB Ramps			
NB right	---	192	35
NB left	355	212	134
WB	90	172	396
7. Idaho Maryland Rd / Railroad Ave			
EB	90	223	170
8. Main St / Brunswick Rd – W. Olympia Dr			
NB left	110	<25	<25
NB right	125	82	141
SB left (2 lanes)	355	123	206
WB left (2 lanes)	150	97	107
WB right	150	108	171
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr			
NB left	100	48	73
NB right	100	83	165
SB left (2 lanes)	260	198	201
SB right	260	67	83
EB	160	168	211
WB left	145	99	103
10. Brunswick Rd / SR 49 EB Ramps			
NB left	200	214	224
NB right	---	230	261
11. Brunswick Rd / Sutton Way			
NB left (2 lanes)	280	116	555
SB left	190	67	117
SB right	180	---	---
EB left (2 lanes)	185	88	141
EB right	250	134	228
WB left	125	103	186
12. Brunswick Rd / Idaho Maryland Rd			
NB left	540	262	275
SB left	120	55	196
EB left	150	<25	76
WB left	175	163	66
13. Brunswick Rd / Whispering Pines Ln			
NB left	210	<25	<25
EB left	110	<25	133

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 24A (continued)
CUMULATIVE PLUS PROJECT QUEUES
CENTENNIAL SITE (SCENARIO #1)
PEAK HOURS

Location	Length*	Cum + Project AM Peak Hour Queue (feet)	Cum + Project PM Peak Hour Queue (feet)
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd			
NB left	225	<25	<25
SB left	260	<25	28
EB	---	<25	<25
WB	---	70	28
15. Brunswick Rd / SR 174			
SB left	90	63	493
EB left	130	<25	<25
16. Brunswick Rd / Project Driveway			
NB left	350	<25	<25
EB	---	<25	28
17. E. Bennett Rd / Millsite Rd			
NB right	---	<25	<25
18. Whispering Pines Ln / Project Driveway			
NB	---	<25	<25
WB left	100	<25	<25
19. Idaho Maryland Rd / Centennial Dr			
NB	---	52	322
WB left	130	<25	<25
20. Idaho Maryland Rd /Sutton Way			
SB right	90	41	46
SB left	---	47	123
ÈB	---	146	309
WB	---	149	194
21. Sutton Way / Dorsey Dr			
SB right	120	<25	35
SB thru	---	33	268
NB	---	158	1595
EB	---	140	600
22. Dorsey Dr / SR 49 EB Ramps			
NB left (2 lanes)	215	226	135
NB right	215	147	99
EB left	180	100	179
23. Dorsey Dr / SR 49 EB Ramps			
SB right	400	73	60
SB left-thru	400	106	167
EB right	155	85	221
WB left	180	97	254

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 24B
CUMULATIVE PLUS PROJECT QUEUES
CENTENNIAL SITE (SCENARIO #1)
PROJECT TRAFFIC HOURS

Location	Length*	Cum + Project 6:30 – 7:30 AM Queue (feet)	Cum + Project 3:30 – 4:30 PM Queue (feet)	Cum + Project 6:30 – 7:30 PM Queue (feet)
1. Neal St / Tinloy St				
EB	70	80	115	120
WB	150	103	109	140
2. S. Auburn St / Tinloy St				
NB through	80	75	136	102
NB through-left	80	45	66	44
SB	75	84	134	133
WB	95	70	113	101
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp				
NB left turn	60	<25	28	<25
NB through	150	27	61	30
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp				
SB left turn	60	58	124	65
SB through	150	<25	130	59
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps				
NB	---	<25	32	<25
SB	---	<25	72	25
EB	---	41	88	36
WB	---	<25	68	33
6. Idaho Maryland Rd / SR 49 EB Ramps				
NB right	---	51	48	<25
NB left	355	87	151	52
WB	90	68	266	78
7. Idaho Maryland Rd / Railroad Ave				
EB	90	136	166	53
8. Main St / Brunswick Rd – W. Olympia Dr				
NB left	110	<25	<25	<25
NB right	125	43	139	62
SB left (2 lanes)	355	67	176	109
WB left (2 lanes)	150	44	102	71
WB right	150	51	159	74
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr				
NB left	100	28	66	53
NB right	100	30	117	85
SB left (2 lanes)	260	142	151	133
SB right	260	46	86	56
EB	160	65	203	141
WB left	145	61	106	93

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 24B (continued)
CUMULATIVE PLUS PROJECT QUEUES
CENTENNIAL SITE (SCENARIO #1)
PROJECT TRAFFIC HOURS

Location	Length*	Cum + Project 6:30 – 7:30 AM Queue (feet)	Cum + Project 3:30 – 4:30 PM Queue (feet)	Cum + Project 6:30 – 7:30 PM Queue (feet)
10. Brunswick Rd / SR 49 EB Ramps				
NB left	200	152	218	177
NB right	---	102	258	97
11. Brunswick Rd / Sutton Way				
NB left (2 lanes)	280	55	545	136
SB left	190	37	110	57
SB right	180	---	<25	---
EB left (2 lanes)	185	53	138	63
EB right	250	50	220	96
WB left	125	49	179	79
12. Brunswick Rd / Idaho Maryland Rd				
NB left	540	108	166	76
SB left	120	<25	188	106
EB left	150	<25	74	39
WB left	175	99	68	43
13. Brunswick Rd / Whispering Pines Ln				
NB left	210	<25	<25	<25
EB left	110	<25	60	<25
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd				
NB left	225	<25	<25	<25
SB left	260	<25	<25	<25
EB	---	<25	<25	<25
WB	---	<25	<25	<25
15. Brunswick Rd / SR 174				
SB left	90	28	260	48
EB left	130	<25	<25	<25
16. Brunswick Rd / Project Driveway				
NB left	350	<25	<25	<25
EB	---	<25	<25	<25
17. E. Bennett Rd / Millsite Rd				
NB right	---	<25	<25	<25
18. Whispering Pines Ln / Project Driveway				
NB	---	<25	<25	<25
WB left	100	<25	<25	<25
19. Idaho Maryland Rd / Centennial Dr				
NB	---	29	285	30
WB left	130	<25	<25	<25

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 24B (continued)
CUMULATIVE PLUS PROJECT QUEUES
CENTENNIAL SITE (SCENARIO #1)
PROJECT TRAFFIC HOURS

Location	Length*	Cum + Project 6:30 – 7:30 AM Queue (feet)	Cum + Project 3:30 – 4:30 PM Queue (feet)	Cum + Project 6:30 – 7:30 PM Queue (feet)
20. Idaho Maryland Rd /Sutton Way				
SB right	90	<25	53	<25
SB left	---	27	119	28
EB	---	81	274	65
WB	---	74	168	36
21. Sutton Way / Dorsey Dr				
SB right	120	<25	28	<25
SB thru	---	<25	190	<25
NB	---	30	1340	60
EB	---	25	188	25
22. Dorsey Dr / SR 49 EB Ramps				
NB Left (2 lanes)	215	103	120	54
NB right	215	57	100	59
EB left	180	60	177	67
23. Dorsey Dr / SR 49 EB Ramps				
SB right	400	52	64	49
SB left-thru	400	42	162	67
EB right	155	44	217	42
WB left	180	74	250	111

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

Cumulative Plus Project Conditions (Scenario #1) Roadway Segment Levels of Service. Table 25 summarizes the Levels of Service based on the Cumulative plus Project traffic volumes on study area roads with the existing roadway configuration. All segments along Brunswick Road and E. Bennett Road will continue to operate at LOS D or better while the SR 174 segment will continue to operate at LOS E. The SR 174 segment exceeds the LOS C threshold in both directions.

TABLE 25
CUMULATIVE PLUS PROJECT
CENTENNIAL SITE (SCENARIO #1)
ROADWAY SEGMENT LEVELS OF SERVICE

Roadway	Location	Facility Classification	ATS/PTSF/LOS Cumulative plus Project PM Peak Hour
Brunswick Rd	SR 49 to Whispering Pines Ln	Class I Highway	
	NB		29.7 / 82.4 / D
	SB		29.9 / 83.2 / D
	Whispering Pines Ln to E. Bennett Rd	Class I Highway	
	NB		34.5 / 87.2 / D
	SB		34.5 / 76.1 / D
	E. Bennett Rd to Project Driveway	Class I Highway	
	NB		34.7 / 69.1 / D
	SB		34.5 / 81.1 / D
	Project Driveway to SR 174	Class I Highway	
	NB		33.4 / 68.8 / D
	SB		32.7 / 81.8 / D
E. Bennett Rd	Project Driveway to Brunswick Rd	Class III Highway	
	EB		34.7 / 38.8 / C
	WB		34.7 / 57.8 / C
SR 174	Brunswick Rd to Empire St	Class I Highway	
	EB		**29.7 / 60.8 / E**
	WB		**28.6 / 81.5 / E**

ATS – average travel speed
PTSF – percent time spent following
LOS – level of service
Bold indicates LOS threshold exceeded

VII.3. Cumulative Plus Project Conditions (Scenario #2)

Scenario #2 considers transporting of engineered fill to construction sites accessible via SR 49/20.

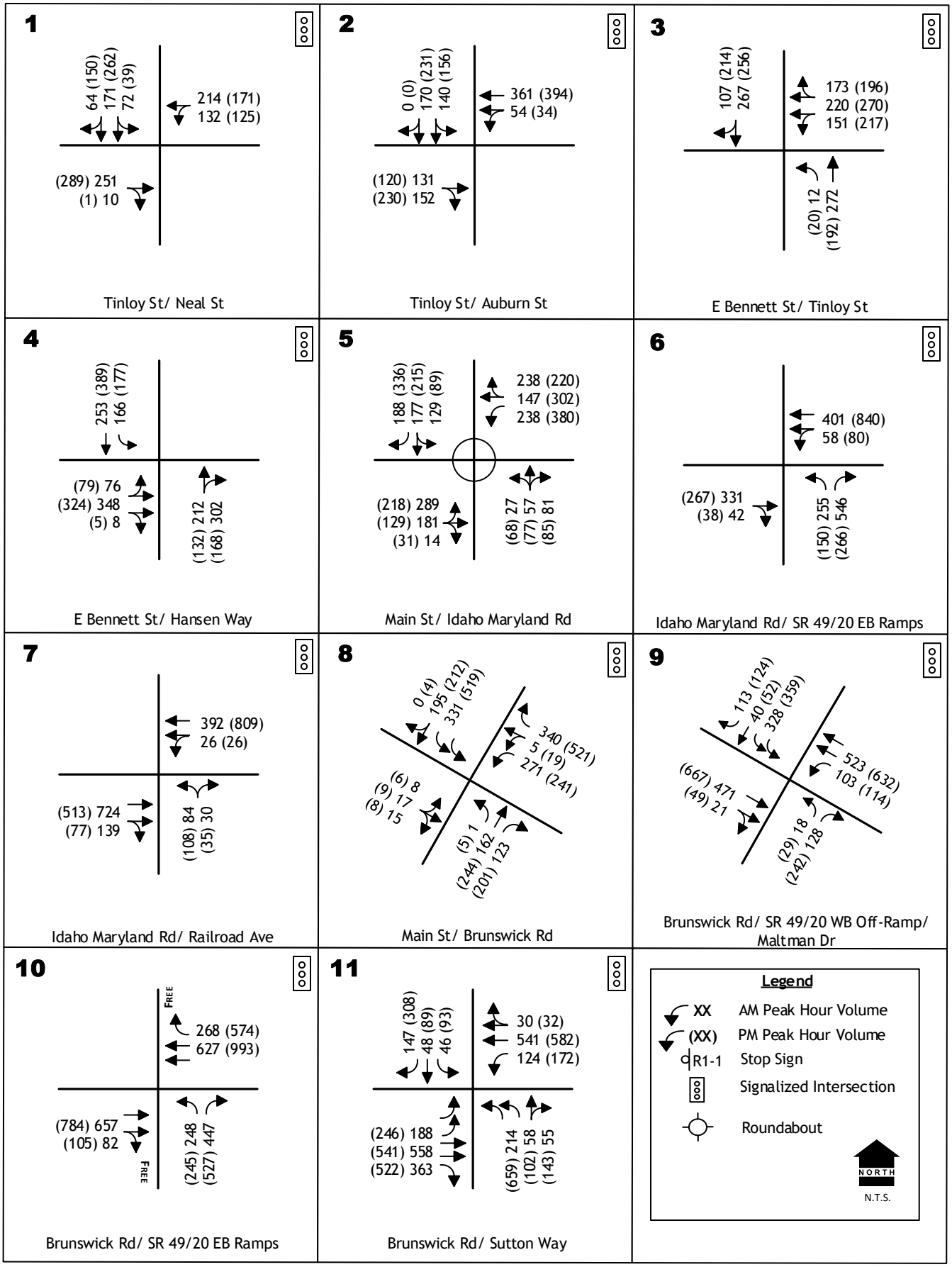
Traffic Volumes. The LOS impacts of the Idaho-Maryland Mine project have been identified by superimposing project traffic onto Cumulative conditions. Figures 13A through 13D display the "Cumulative Plus Project" traffic volumes at each study intersection for each of the five study time periods.

Cumulative plus Project volumes under Scenario #2 were used to recalculate operating Levels of Service at the study intersections. Tables 26A and 26B summarize operating Levels of Service at the study area intersections for each of the five study time periods.

During the peak hour scenario three intersections would continue to operate at unacceptable Levels of Service, at LOS E or F, which include Brunswick Road at E. Bennett Road – Greenhorn Road, SR 174 at Brunswick Road and Sutton Way at Dorsey Drive. One additional intersection, Brunswick Road at Whispering Pines Lane, would decline to LOS E.

During the project traffic hours two intersections will operate below the LOS threshold, at LOS E or F. These include Sutton Way at Dorsey Drive and SR 174 at Brunswick Road.

Five intersections will meet the peak hour signal warrant during the a.m. and p.m. peak hours and the 3:30 – 4:30 p.m. project traffic hour scenario. These include Brunswick Road at Whispering Pines Lane, Brunswick Road at E. Bennett Road – Greenhorn Road, SR 174 at Brunswick Road, Brunswick Road at Project Driveway and Sutton Way at Dorsey Drive. The Brunswick Road at Whispering Pines Lane, Brunswick Road at E. Bennett Road, SR 174 at Brunswick Road and Sutton Way at Dorsey Drive intersections also operate below the accepted LOS D threshold. While the Brunswick Road / Project Driveway meets the peak hour signal warrant during the p.m. peak hour, it operates acceptably.

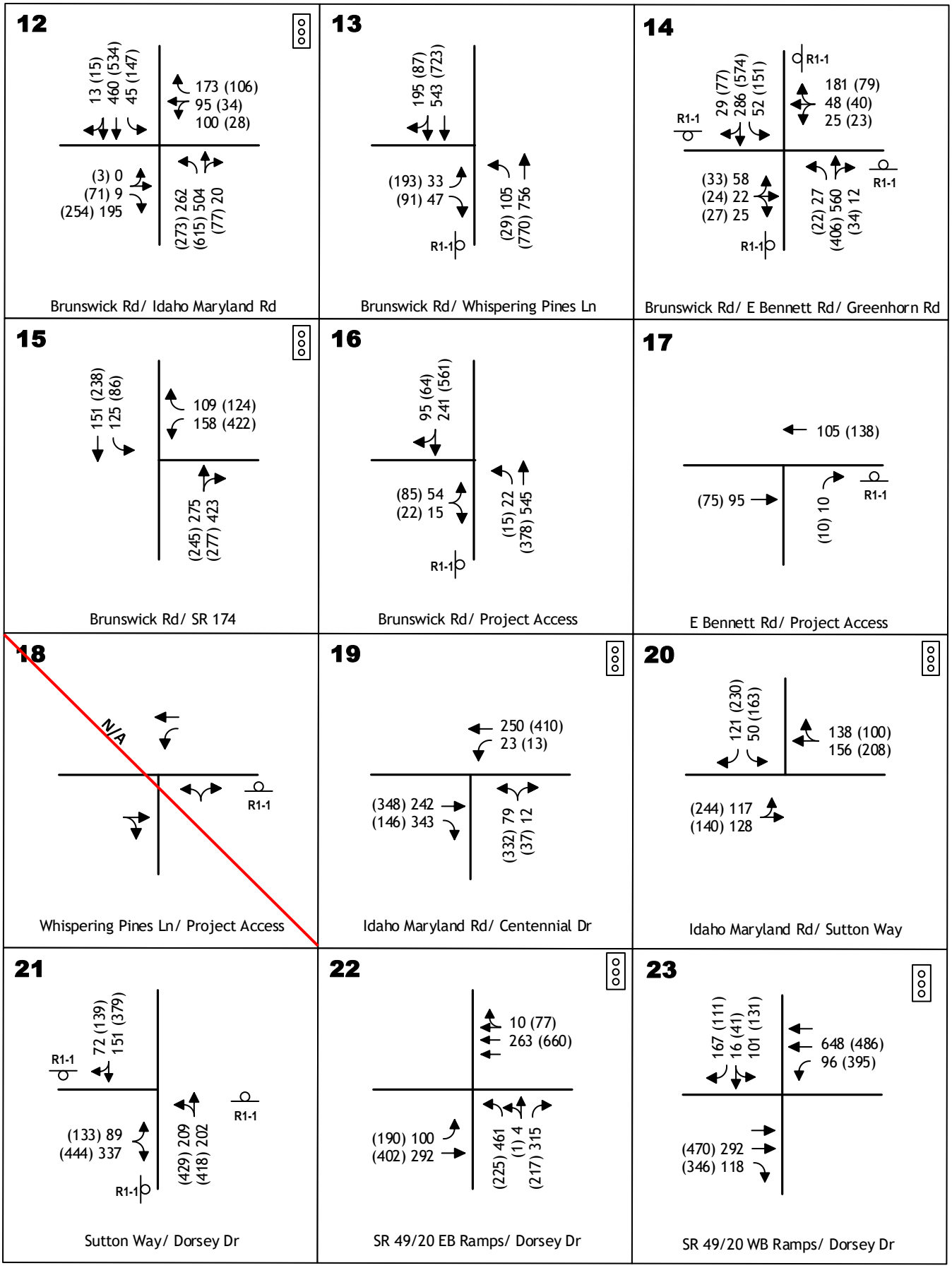


AM/PM PEAK HOURS CUMULATIVE PLUS PROJECT
TRAFFIC VOLUMES AND LANE CONFIGURATIONS
(TO SR 49)

figure 13a

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

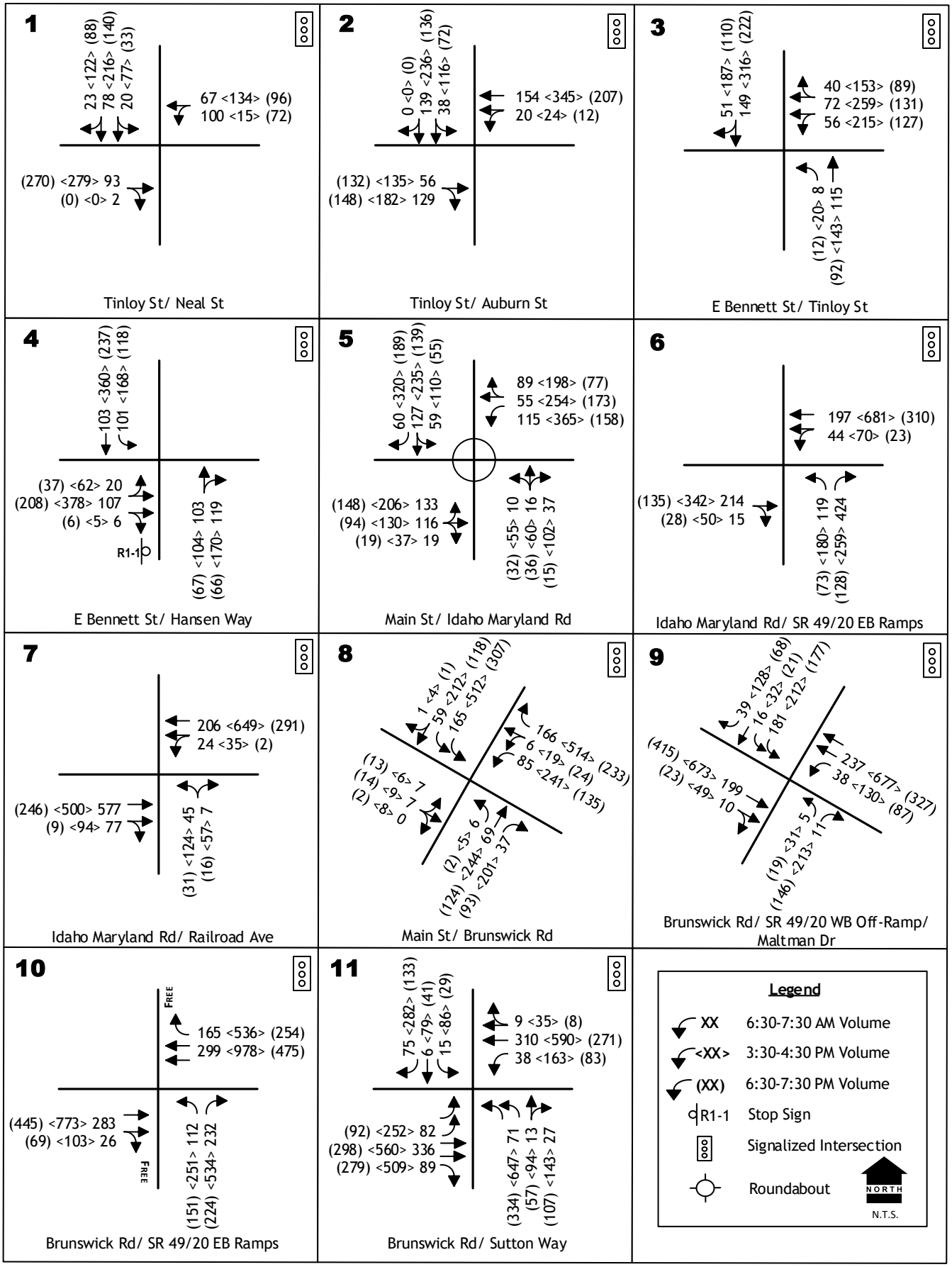


AM/PM PEAK HOURS CUMULATIVE PLUS PROJECT
TRAFFIC VOLUMES AND LANE CONFIGURATIONS
(TO SR 49)

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

figure 13b

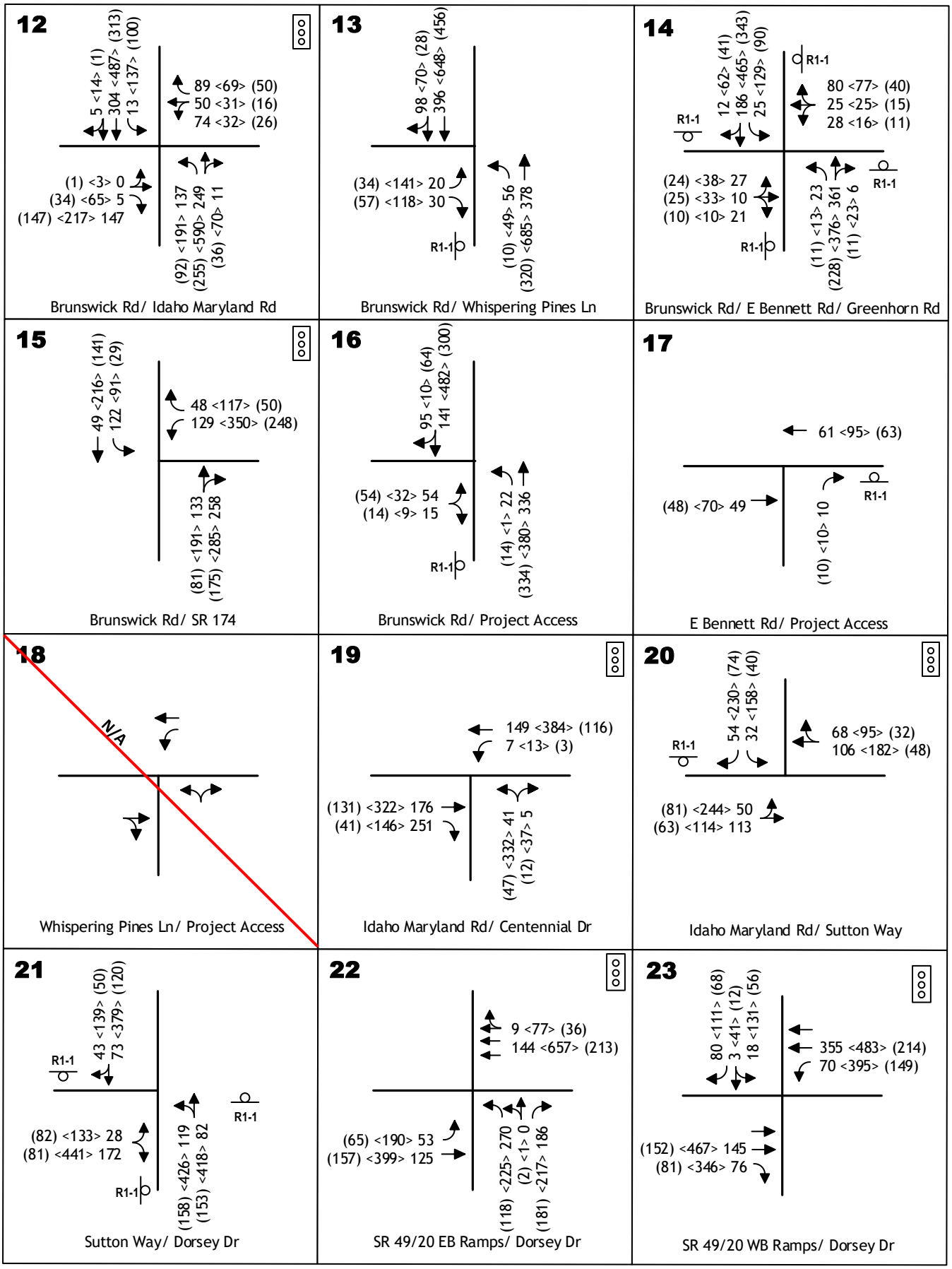


PROJECT TRAFFIC HOURS CUMULATIVE PLUS PROJECT TRAFFIC VOLUMES AND LANE CONFIGURATIONS

(TO SR 49)

figure 13c

KD Anderson & Associates, Inc.
Transportation Engineers



PROJECT TRAFFIC HOURS CUMULATIVE PLUS PROJECT TRAFFIC VOLUMES AND LANE CONFIGURATIONS

(TO SR 49)

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

figure 13d

TABLE 26A
CUMULATIVE PLUS PROJECT – TO SR 49 (SCENARIO #2)
LEVELS OF SERVICE AT INTERSECTIONS
PEAK HOURS

Location	Control	Cum plus Project AM Peak Hour		Cum plus Project PM Peak Hour		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	
1. Neal St / Tinloy St	Signal	B	19.2	C	26.9	N/A
2. S. Auburn St / Tinloy St	Signal	B	10.9	B	13.6	N/A
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp	Signal	B	11.6	B	17.9	N/A
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp	Signal	B	19.0	B	13.1	N/A
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps	Roundabout	A	9.5	A	9.1	N/A
6. Idaho Maryland Rd / SR 49 EB Ramps	Signal	C	22.0	C	20.1	N/A
7. Idaho Maryland Rd / Railroad Ave	Signal	B	15.4	C	21.3	N/A
8. Main St / Brunswick Rd – W. Olympia Dr	Signal	B	11.3	B	17.2	N/A
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr	Signal	B	19.2	C	21.1	N/A
10. Brunswick Rd / SR 49 EB Ramps	Signal	B	12.6	B	14.3	N/A
11. Brunswick Rd / Sutton Way	Signal	B	13.9	C	31.8	N/A
12. Brunswick Rd / Idaho Maryland Rd	Signal	C	28.5	D	38.1	N/A
13. Brunswick Rd / Whispering Pines Ln NB Left EB	EB Stop	 B C	 10.1 15.7	 A **E**	 9.8 **35.3**	Yes
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd	AWS	**F**	**55.1**	**E**	**49.2**	Yes
15. Brunswick Rd / SR 174 EB Left SB	SB Stop	 A C	 8.2 18.6	 A **F**	 8.0 **125.0**	Yes
16. Brunswick Rd / Project Driveway NB Left EB	EB Stop	 A B	 8.0 13.1	 A C	 9.0 16.2	Yes

AWS – all way stop
Bold indicates intersection operates below threshold

TABLE 26A (continued)
CUMULATIVE PLUS PROJECT – TO SR 49 (SCENARIO #2)
LEVELS OF SERVICE AT INTERSECTIONS
PEAK HOURS

Location	Control	Cum plus Project AM Peak Hour		Cum plus Project PM Peak Hour		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	
17. E. Bennett Rd / Millsite Rd NB	NB Stop	A	8.8	A	8.7	No
19. Idaho Maryland Rd / Centennial Dr	Signal	A	7.6	B	14.6	N/A
20 Idaho Maryland Rd /Sutton Way	Signal	B	15.2	C	27.0	N/A
21. Sutton Way / Dorsey Dr	AWS	C	19.5	**F**	**279.9**	Yes
22. Dorsey Dr / SR 49 EB Ramps	Signal	B	13.9	B	14.7	N/A
23. Dorsey Dr / SR 49 WB Ramps	Signal	A	9.6	B	19.6	N/A

AWS – all way stop
Bold indicates intersection operates below threshold

TABLE 26B
CUMULATIVE PLUS PROJECT – TO SR 49 (SCENARIO #2)
PEAK HOUR LEVELS OF SERVICE AT INTERSECTIONS
PROJECT TRAFFIC HOURS

Location	Control	Cum plus Project 6:30 – 7:30 AM		Cum plus Project 3:30 – 4:30 PM		Cum plus Project 6:30 – 7:30 PM		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	
1. Neal St / Tinloy St	Signal	A	7.2	A	9.7	B	12.4	N/A
2. S. Auburn St / Tinloy St	Signal	A	7.2	B	10.0	A	9.0	N/A
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp	Signal	A	8.5	B	15.0	B	10.7	N/A
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp	Signal	B	10.9	B	12.9	B	10.2	N/A
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps	Roundabout	A	5.3	A	8.4	A	5.0	N/A
6. Idaho Maryland Rd / SR 49 EB Ramps	Signal	B	13.3	B	19.6	B	12.0	N/A
7. Idaho Maryland Rd / Railroad Ave	Signal	B	11.7	B	19.4	B	12.4	N/A
8. Main St / Brunswick Rd – W. Olympia Dr	Signal	A	6.5	B	14.3	B	10.2	N/A
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr	Signal	B	17.7	B	17.8	B	16.4	N/A
10. Brunswick Rd / SR 49 EB Ramps	Signal	A	8.2	B	14.9	A	8.7	N/A
11. Brunswick Rd / Sutton Way	Signal	A	5.3	C	30.0	B	10.7	N/A
12. Brunswick Rd / Idaho Maryland Rd	Signal	B	18.5	C	33.0	B	18.8	N/A
13. Brunswick Rd / Whispering Pines Ln NB Left EB	EB Stop	 A B	 8.7 11.6	 A C	 9.4 20.0	 A B	 8.5 11.3	Yes*
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd	AWS	B	13.0	D	27.2	B	12.6	Yes*
15. Brunswick Rd / SR 174 EB Left SB	SB Stop	 A B	 7.8 13.4	 A **E**	 7.8 **48.9**	 A B	 7.4 13.1	Yes*
16. Brunswick Rd / Project Driveway NB Left EB	EB Stop	 A B	 7.8 11.4	 A B	 8.5 12.9	 A B	 8.1 12.2	Yes*

AWS – all way stop
Bold indicates intersection operates below threshold
* meets warrant in 3:30 p.m. hour

TABLE 26B (continued)
CUMULATIVE PLUS PROJECT – TO SR 49 (SCENARIO #2)
PEAK HOUR LEVELS OF SERVICE AT INTERSECTIONS
PROJECT TRAFFIC HOURS

Location	Control	Cum plus Project 6:30 – 7:30 AM		Cum plus Project 3:30 – 4:30 PM		Cum plus Project 6:30 – 7:30 PM		Traffic Signal Warranted?
		LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	
17. E. Bennett Rd / Millsite Rd NB	NB Stop	A	8.6	A	8.7	A	8.6	No
19. Idaho Maryland Rd / Centennial Dr	Signal	A	6.6	B	11.5	A	7.4	N/A
20. Idaho Maryland Rd /Sutton Way	Signal	B	11.7	B	19.7	B	10.9	N/A
21. Sutton Way / Dorsey Dr	AWS	A	9.1	**F**	**214.3**	B	10.5	Yes*
22. Dorsey Dr / SR 49 EB Ramps	Signal	A	8.7	B	15.3	A	9.3	N/A
23. Dorsey Dr / SR 49 WB Ramps	Signal	A	5.8	B	17.6	A	8.5	N/A

AWS – all way stop
Bold indicates intersection operates below threshold
* meets warrant in 3:30 p.m. hour

Intersection Queues. Tables 27A and 27B present information regarding queuing at each study intersection under Cumulative plus Project conditions. 95th percentile queues with lengths exceeding the available storage are highlighted. The 95th percentile queue exceeds available storage in 23 locations at 15 intersections. The queues at the intersections of Neal Street at Tinloy Street, Idaho Maryland Road at SR 49/20 Eastbound Ramps, Idaho Maryland Road at Railroad Avenue and Brunswick Road / Sutton Way will continue to have excessive queues while maintaining acceptable levels of service, serving the vehicles that do enter the intersections. Other intersections will continue to have queues exceeding the available storage include those intersections signalized by 2035. Two additional locations will exceed the available storage. These include the eastbound left turn lane of Whispering Pines Lane at Brunswick Road and the eastbound left turn lane of the Eastbound SR 49/20 ramps at Dorsey Drive. It is assumed that one additional vehicle (25') can store in the available left or right turn taper and this occurs at six locations.

TABLE 27A
CUMULATIVE PLUS PROJECT QUEUES
TO SR 49 (SCENARIO #2)
PEAK HOURS

Location	Length*	Cum + Project AM Peak Hour Queue (feet)	Cum + Project PM Peak Hour Queue (feet)
1. Neal St / Tinloy St			
EB	70	116	118
WB	150	332	451
2. S. Auburn St / Tinloy St			
NB through	80	141	166
NB through-left	80	88	85
SB	75	105	148
WB	95	123	137
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp			
NB left turn	60	<25	28
NB through	150	105	80
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp			
SB left turn	60	136	143
SB through	150	90	147
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps			
NB	---	30	34
SB	---	42	64
EB	---	159	90
WB	---	70	126
6. Idaho Maryland Rd / SR 49 EB Ramps			
NB right	---	192	35
NB left	355	212	134
WB	90	172	396

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 27A (continued)
CUMULATIVE PLUS PROJECT QUEUES
TO SR 49 (SCENARIO #2)
PEAK HOURS

Location	Length*	Cum + Project AM Peak Hour Queue (feet)	Cum + Project PM Peak Hour Queue (feet)
7. Idaho Maryland Rd / Railroad Ave			
EB	90	223	170
8. Main St / Brunswick Rd – W. Olympia Dr			
NB left	110	<25	<25
NB right	125	84	143
SB left (2 lanes)	355	118	209
WB left (2 lanes)	150	100	109
WB right	150	106	162
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr			
NB left	100	52	77
NB right	100	83	161
SB left (2 lanes)	260	198	203
SB right	260	74	84
EB	160	161	211
WB left	145	103	103
10. Brunswick Rd / SR 49 EB Ramps			
NB left	200	220	216
NB right	---	230	261
11. Brunswick Rd / Sutton Way			
NB left (2 lanes)	280	122	604
SB left	190	65	119
SB right	180	---	---
EB left (2 lanes)	185	90	135
EB right	250	130	218
WB left	125	106	190
12. Brunswick Rd / Idaho Maryland Rd			
NB left	540	262	275
SB left	120	55	196
EB left	150	<25	76
WB left	175	163	66
13. Brunswick Rd / Whispering Pines Ln			
NB left	210	<25	<25
EB left	110	<25	130
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd			
NB left	225	<25	<25
SB left	260	<25	28
EB	---	<25	<25
WB	---	70	28

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 27A (continued)
CUMULATIVE PLUS PROJECT QUEUES
TO SR 49 (SCENARIO #2)
PEAK HOURS

Location	Length*	Cum + Project AM Peak Hour Queue (feet)	Cum + Project PM Peak Hour Queue (feet)
15. Brunswick Rd / SR 174			
SB left	90	63	493
EB left	130	<25	<25
16. Brunswick Rd / Project Driveway			
NB left	350	<25	<25
EB	---	<25	28
17. E. Bennett Rd / Millsite Rd			
NB right	---	<25	<25
19. Idaho Maryland Rd / Centennial Dr			
NB	---	52	322
WB left	130	<25	<25
20. Idaho Maryland Rd /Sutton Way			
SB right	90	41	46
SB left	---	47	123
ÈB	---	146	309
WB	---	149	194
21. Sutton Way / Dorsey Dr			
SB right	120	<25	35
SB thru	---	33	268
NB	---	158	1595
EB	---	140	600
22. Dorsey Dr / SR 49 EB Ramps			
NB left (2 lanes)	215	217	121
NB right	215	146	97
EB left	180	95	174
23. Dorsey Dr / SR 49 EB Ramps			
SB right	400	76	61
SB left-thru	400	103	168
EB right	155	72	225
WB left	180	104	259

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 27B
CUMULATIVE PLUS PROJECT QUEUES
TO SR 49 (SCENARIO #2)
PROJECT TRAFFIC HOURS

Location	Length*	Cum + Project 6:30 – 7:30 AM Queue (feet)	Cum + Project 3:30 – 4:30 PM Queue (feet)	Cum + Project 6:30 – 7:30 PM Queue (feet)
1. Neal St / Tinloy St				
EB	70	86	117	118
WB	150	116	110	144
2. S. Auburn St / Tinloy St				
NB through	80	76	144	97
NB through-left	80	46	69	45
SB	75	84	137	129
WB	95	69	117	93
3. E. Bennett Rd / Tinloy St – SR 49 WB Off-Ramp				
NB left turn	60	<25	28	<25
NB through	150	27	61	30
4. E. Bennett Rd / Hansen Way – SR 49 EB On-Ramp				
SB left turn	60	58	124	65
SB through	150	<25	130	59
5. Main St / Idaho Maryland Rd - SR 49 WB Ramps				
NB	---	<25	32	<25
SB	---	<25	71	25
EB	---	41	88	34
WB	---	<25	67	32
6. Idaho Maryland Rd / SR 49 EB Ramps				
NB right	---	51	48	<25
NB left	355	87	151	52
WB	90	68	266	78
7. Idaho Maryland Rd / Railroad Ave				
EB	90	136	166	53
8. Main St / Brunswick Rd – W. Olympia Dr				
NB left	110	<25	<25	<25
NB right	125	43	134	70
SB left (2 lanes)	355	66	177	117
WB left (2 lanes)	150	47	106	73
WB right	150	55	155	73
9. Brunswick Rd / SR 49 WB Off-Ramp – Maltman Dr				
NB left	100	<25	70	51
NB right	100	30	128	83
SB left (2 lanes)	260	144	149	140
SB right	260	50	86	52
EB	160	62	205	139
WB left	145	65	107	89

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 27B (continued)
CUMULATIVE PLUS PROJECT QUEUES
TO SR 49 (SCENARIO #2)
PROJECT TRAFFIC HOURS

Location	Length*	Cum + Project 6:30 – 7:30 AM Queue (feet)	Cum + Project 3:30 – 4:30 PM Queue (feet)	Cum + Project 6:30 – 7:30 PM Queue (feet)
10. Brunswick Rd / SR 49 EB Ramps				
NB left	200	153	225	179
NB right	---	94	259	96
11. Brunswick Rd / Sutton Way				
NB left (2 lanes)	280	56	490	139
SB left	190	39	113	54
SB right	180	---	---	---
EB left (2 lanes)	185	60	134	62
EB right	250	50	208	95
WB left	125	47	181	79
12. Brunswick Rd / Idaho Maryland Rd				
NB left	540	108	166	77
SB left	120	<25	188	107
EB left	150	<25	74	39
WB left	175	99	68	44
13. Brunswick Rd / Whispering Pines Ln				
NB left	210	<25	<25	<25
EB left	110	<25	60	<25
14. Brunswick Rd / E. Bennett Rd – Greenhorn Rd				
NB left	225	<25	<25	<25
SB left	260	<25	<25	<25
EB	---	<25	<25	<25
WB	---	<25	<25	<25
15. Brunswick Rd / SR 174				
SB left	90	28	260	48
EB left	130	<25	<25	<25
16. Brunswick Rd / Project Driveway				
NB left	350	<25	<25	<25
EB	---	<25	<25	<25
17. E. Bennett Rd / Millsite Rd				
NB right	---	<25	<25	<25
19. Idaho Maryland Rd / Centennial Dr				
NB	---	29	285	30
WB left	130	<25	<25	<25

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

TABLE 27B (continued)
CUMULATIVE PLUS PROJECT QUEUES
TO SR 49 (SCENARIO #2)
PROJECT TRAFFIC HOURS

Location	Length*	Cum + Project 6:30 – 7:30 AM Queue (feet)	Cum + Project 3:30 – 4:30 PM Queue (feet)	Cum + Project 6:30 – 7:30 PM Queue (feet)
20. Idaho Maryland Rd /Sutton Way				
SB right	90	<25	53	<25
SB left	---	27	119	28
ÈB	---	81	274	65
WB	---	74	168	36
21. Sutton Way / Dorsey Dr				
SB right	120	<25	28	<25
SB thru	---	<25	190	<25
NB	---	30	1340	60
EB	---	25	188	25
22. Dorsey Dr / SR 49 EB Ramps				
NB Left (2 lanes)	215	101	128	52
NB right	215	60	101	63
EB left	180	63	174	75
23. Dorsey Dr / SR 49 EB Ramps				
SB right	400	52	59	49
SB left-thru	400	38	161	69
EB right	155	42	220	49
WB left	180	76	249	114

Highlighted values indicate queue length in excess of available storage
* - longest lane for multiple turn lane approaches
Queuing distances based on stochastic modeling

Cumulative Plus Project Conditions (Scenario #2) Roadway Segment Levels of Service. Table 28 summarizes the Levels of Service based on the Cumulative plus Project traffic volumes on study area roads with the existing roadway configuration. All segments along Brunswick Road and E. Bennett Road will continue to operate at LOS D or better while the SR 174 segment will continue to operate at LOS E. The SR 174 segment exceeds the LOS C threshold in both directions.

TABLE 28
CUMULATIVE PLUS PROJECT
TO SR 49 (SCENARIO #2)
ROADWAY SEGMENT LEVELS OF SERVICE

Roadway	Location	Facility Classification	ATS/PTSF/LOS Cumulative plus Project PM Peak Hour
Brunswick Rd	SR 49 to Whispering Pines Ln	Class I Highway	
	NB		29.5 / 82.5 / D
	SB		29.8 / 83.5 / D
	Whispering Pines Ln to E. Bennett Rd	Class I Highway	
	NB		34.1 / 87.8 / D
	SB		34.5 / 76.1 / D
	E. Bennett Rd to Project Driveway	Class I Highway	
	NB		34.6 / 69.4 / D
	SB		34.5 / 81.1 / D
	Project Driveway to SR 174	Class I Highway	
	NB		33.4 / 68.8 / D
	SB		32.7 / 81.8 / D
E. Bennett Rd	Project Driveway to Brunswick Rd	Class III Highway	
	EB		34.7 / 38.8 / C
	WB		34.7 / 57.8 / C
SR 174	Brunswick Rd to Empire St	Class I Highway	
	EB		**29.7 / 60.8 / E**
	WB		**28.6 / 81.5 / E**

ATS – average travel speed
PTSF – percent time spent following
LOS – level of service
Bold indicates LOS threshold exceeded

VIII. PAVEMENT CONDITION ANALYSIS

The purpose of this analysis is to assess the impact of the project on the roadway pavement where engineered fill haul trucks and other trucks, such as deliveries and concentrate shipments, are expected to travel through NCTC's 2035 cumulative year traffic model.

Truck traffic is the primary factor affecting pavement design life and is therefore used to engineer pavement thickness. Passenger cars and pick-up trucks are considered to have a negligible impact when considering traffic loads. Traffic loads are transmitted to the pavement surface from the vehicle axles, and the loading is determined by using established constants to convert truck data into 18,000-pound Equivalent Single Axle Loads (ESAL). These ESAL's are converted into a Traffic Index (TI) which is then used to calculate the minimum pavement thickness. Pavement impacts were analyzed based on a comparison of the Traffic Index (TI) under 'Plus Project' and 'No Project' conditions. The segments studied include Brunswick Road from the project driveway north to the SR 49 / 20 interchange and along Whispering Pines Lane to the proposed Centennial site driveway.

VIII.1. Project Truck Trip Generation

Pavement analyses consider truck and bus traffic with ESAL constants varying for 2,3,4 and 5+ axle classifications. Pavement conditions were analyzed for an average day over a 20-year study period. Engineered fill will be transported in 4-axle single unit trucks. Other trucks providing materials and fuel were also assumed to be 5-axle trucks / semi-trailers. Truck trip generation for the Idaho-Maryland Mine project was estimated as shown in Table 29. The trip generation is based upon the project description identifying the projected truck traffic at both sites for the length of the project. Haul truck traffic between the Brunswick and Centennial sites is projected to last for five years of the 20-year study period while the engineered fill trucks are projected to access SR 49/20 for 15 of those years. All other trucks will access the site from the SR 49/20 interchange for the entire 20-year period.

TABLE 29
PROJECT TRUCKS (1-WAY)

Trip Type	Centennial Site Scenario #1	SR 49 Scenario #2
Engineered Fill		
Inbound Trucks (average daily)	50	50
Outbound Trucks (average daily)	50	50
Other Trucks (Brunswick Site)*		
Inbound Trucks (average daily)	6	6
Outbound Trucks (average daily)	6	6
Other Trucks† (Centennial Site)		
Inbound Trucks (average daily)	1	0
Outbound Trucks (average daily)	1	0
Total Trucks		
Inbound Trucks (average daily)	**57**	**56**
Outbound Trucks (average daily)	**57**	**56**

* includes fuel trucks, explosives trucks, cement delivery and freight trucks
† includes fuel trucks

VIII.2. Pavement Condition Analysis

The impact of the Idaho-Maryland Mine project on roadway pavement conditions was evaluated for this report. The assessment of pavement is based on Chapters 600, 610, and 630 of the *Highway Design Manual* (California Department of Transportation, 2018). As stated in the *Highway Design Manual*, pavements should be engineered to carry the truck traffic loads expected during the pavement design life. Truck traffic, which includes buses, trucks, and truck-trailers, is the primary factor affecting pavement design life and its serviceability. The methods described in the *Highway Design Manual* for evaluating impacts specify how to estimate traffic loading and pavement performance. Traffic loading is estimated by using established constants to convert truck traffic volumes into 18-kip[1] equivalent single axle loads (ESALs).

Caltrans identifies 20 and 40-year design life periods when constructing or rehabilitating pavement. For this report a 20-year design life was used to calculate the Traffic Index (TI). The ESAL constants, as described in the *Highway Design Manual*, are presented in Table 30. The total projected ESALs during the pavement design life are converted into a TI (Table 31) that is used along with the characteristics of the subgrade soils (R-Value) to determine the required pavement thickness.

[1] 1 kip equals 1,000 pounds

TABLE 30
EQUIVALENT SINGLE AXLE LOAD CONSTANTS

Vehicle Type (By Axle Classification)	10-Year Constants	20-Year Constants	30-Year Constants	40-Year Constants
2-axle Trucks or Buses	690	1,380	2,070	2,760
3-axle Trucks or Buses	1,840	3,680	5,520	7,360
4-axle Trucks or Buses	2,940	5,880	8,820	11,760
5 or more-axle Trucks	6,890	13,780	20,670	27,560

Source: Caltrans Highway Design Manual (California Department of Transportation, 2012)

A fundamental characteristic of pavement condition analysis as described in the *Highway Design Manual* is that the TI value is calculated for a design life. The pavement condition analysis is analyzed over its design life timeframe. The mid-point of the timeline, in this analysis, is 10 years from Existing conditions, and represents the "average" ESAL over the design life. The proposed project will haul engineered fill between the Brunswick site and the Centennial site for five years while engineered fill will be hauled offsite via SR 49/20 for 15 years; therefore, the haul route between the Brunswick and Centennial sites will be used for 25% of the time while the SR 49 route will be used for 75% of the time. Other trucks, materials delivery and concentrate trucks, will access the Brunswick Road / SR 49/20 interchange throughout the duration of the project.

The *Highway Design Manual* indicates that the TI is a measure of the number of ESALs expected in the traffic lane over the pavement design life of the facility. The TI does not vary linearly with the ESAL values, but rather according to the exponential formula below and the values presented below.

$$TI = 9.0 \times ((\ ESAL \times LDF\ ) / 10^{6}\ )^{0.119}$$

Where:

TI = Traffic Index (determined to the nearest 0.5)
ESAL = Total number of cumulative 18-kip Equivalent Single Axle Loads
LDF = Lane Distribution Factor (Table 613.3B of the *Highway Design Manual*)
LDF =1

An increase in the TI as a result of a new project or regional growth creates a corresponding decrease in the expected life of the existing pavement. This is due to a pavement being designed to a particular thickness based on the TI and R values. A higher TI will result in a thicker pavement. If the pavement is not being changed, the result is a shorter lifespan. The actual decrease in the life of the pavement for a given increase in the TI is dependent upon variable

factors such as the existing asphalt concrete thickness, the existing aggregate base thickness, and the strength of the subgrade soils (R-Value). The determination of these factors is beyond the scope of this traffic impact study. Therefore, the actual decrease in pavement life is not identified.

TABLE 31
CONVERSION OF EQUIVALENT SINGLE AXLE LOADS (ESAL)
TO TRAFFIC INDEX (TI)

Equivalent Single Axle Loads (ESAL)	Traffic Index (TI)	Equivalent Single Axle Loads (ESAL)	Traffic Index (TI)
4,710		6,600,000	
	5.0		11.5
10,900		9,490,000	
	5.5		12.0
23,500		13,500,000	
	6.0		12.5
47,300		18,900,000	
	6.5		13.0
89,800		26,100,000	
	7.0		13.5
164,000		35,600,000	
	7.5		14.0
288,000		48,100,000	
	8.0		14.5
487,000		64,300,000	
	8.5		15.0
798,000		84,700,000	
	9.0		15.5
1,270,000		112,000,000	
	9.5		16.0
1,980,000		144,000,000	
	10.0		16.5
3,020,000		186,000,000	
	10.5		17.0
4,500,000		238,000,000	
	11.0		17.5
6,600,000		303,000,000	

Source: Caltrans Highway Design Manual (California Department of Transportation, 2018)
Notes: According to Table 613.3C of the Caltrans Highway Design manual, "the determination of the TI closer than 0.5 is not justified. No interpolation should be made."
For ESAL's less than 5,000 or greater than 300,000,000, use the TI equation to calculate the design TI

VIII.3. Data Collection

Vehicle classification counts were conducted along Brunswick Road, E. Bennett Road and Whispering Pines Lane during the week of September 23, 2019 while school was in session to determine the existing daily truck volumes. The classification count provided a breakdown, by direction and axle, of the types of trucks along each of the roadways and is provided in Appendix 6. For this report, the impact of the Idaho-Maryland Mine project on pavement condition was analyzed for the following roadways, which includes the Centennial Industrial site haul route for five of the 20 years and the SR 49 haul route for 15 of the 20 years:

- Brunswick Rd between the Project Site Access and E. Bennett Rd – Greenhorn Rd,
- Brunswick Rd between E. Bennett Rd – Greenhorn Rd and Whispering Pines Ln,
- Brunswick Rd between Whispering Pines Ln and SR 49/20,
- E. Bennett Rd between Project Site Access and Brunswick Rd,
- Whispering Pines Ln between Brunswick Rd and Crown Point Circle, and
- Whispering Pines Ln between Crown Point Circle and Centennial Industrial Site.

Table 32 presents a breakdown of the existing average daily traffic conditions along the roadway segments including the vehicle classification in each direction along the roadway, and the truck type, by axle.

TABLE 32
AVERAGE DAILY TRAFFIC / TRUCK CLASSIFICATION

Location	Daily Traffic	2-Axle Volume	3-Axle Volume	4-Axle Volume	5+ Axle Volume
Brunswick Road					
102 north of Whispering Pines Lane					
NB	6,185	313	0	28	4
SB	6,109	297	0	24	3
105 Whispering Pines Lane to E. Bennett Rd					
NB	7,752	703	50	31	31
SB	7,614	534	50	26	14
107 E. Bennett Rd to Project Driveway					
NB	4,680	319	13	12	7
SB	4,752	170	13	7	14
E. Bennett Rd					
106 Millsite Rd to Brunswick Rd					
EB	721	50	4	1	2
WB	763	57	4	1	0
Whispering Pines Lane					
104 Brunswick Rd to Crown Point Cir					
EB	1,339	84	12	3	5
WB	1,136	100	12	3	2
103 Crown Point Cir to Centennial Site					
EB	1,608	61	11	2	2
WB	1,744	51	11	4	4

The NCTC travel demand model traffic volume forecasts were used for this report. TI values were calculated for conditions without the proposed project and for conditions with the proposed project with both haul routes. As noted above, an increase in the TI as a result of a new project creates a corresponding decrease in the expected life of the existing pavement. Therefore, if the TI value for conditions with the proposed project is higher than the TI value without the project, this would indicate a project-related decrease in the expected life of the pavement and is considered an adverse impact.

A summary of the pavement condition analysis is presented in Table 33. For each roadway segment analyzed, Table 33 presents TI values for conditions without the Idaho-Maryland Mine project and TI values for conditions with the proposed project under both hauling scenarios. As noted above, the proposed project is considered to have an adverse impact if it would result in an increase in the TI value.

TABLE 33
ROADWAY SEGMENT TRAFFIC INDEX (TI) SUMMARY

Roadway Segment	Direction	20 Year Without Project	20 Year With Project TI (To Centennial Site – Scenario #1)	20 Year With Project TI (To SR 49 – Scenario #2)
Brunswick Road between the Project Site Access and E. Bennett Road – Greenhorn Road	Northbound	8.5	8.5	8.5
	Southbound	8.5	8.5	8.5
Brunswick Road between E. Bennett Road – Greenhorn Road and Whispering Pines Lane	Northbound	9.5	**10.0**	**10.0**
	Southbound	9.5	9.5	9.5
Brunswick Road between Whispering Pines Lane and SR 49/20	Northbound	8.5	8.5	**9.0**
	Southbound	8.5	8.5	8.5
E. Bennett Road between Project Site Access and Brunswick Road	Eastbound	7.0	**8.0**	**8.0**
	Westbound	7.0	7.0	7.0
Whispering Pines Lane between Brunswick Road and Crown Point Circle	Eastbound	8.0	8.0	Not used
	Westbound	8.0	8.0	Not used
Whispering Pines Lane between Crown Point Circle and Centennial Industrial Site	Eastbound	7.5	7.5	Not used
	Westbound	7.5	7.5	Not used

- Notes: ESAL – Equivalent Single Axle Load; TI= Traffic Index
- Calculation of TI Values presented in Technical Appendix
- **Bold** indicates existing TI exceeded

Implementation of the Idaho-Maryland Mine project would result in an increase in the TI value on the following directional roadway segments:

<u>To Centennial Industrial Site</u>

- Brunswick Road northbound between E. Bennett Rd and Whispering Pines Lane,
- E. Bennett Road between Millsite Road (project driveway) and Brunswick Road,

<u>To SR 49/20</u>

- Brunswick Road northbound between E. Bennett Rd and Whispering Pines Lane,
- Brunswick Road northbound between Whispering Pines Lane and SR 49/20, and
- E. Bennett Road between Millsite Road (project driveway) and Brunswick Road.

Because the design pavement thickness for roadway segments depends on the projected TI, the additional project truck traffic would result in a shorter lifespan of the pavement or increased maintenance.

IX. TRUCK TURN ASSESSMENT

This section presents an assessment of the adequacy of routes to and from the Brunswick Industrial site on Brunswick Road. The purpose of this analysis is to determine whether key intersections along each route, as currently configured, can accommodate haul trucks and to identify the approximate level of roadway widening improvements that would likely be necessary to allow haul truck movements. The haul truck to be used is a single unit 4-axle Superior Super Tag SST100 truck.

Study Area. Haul truck traffic to and from the Brunswick Industrial site consists of inbound and outbound routes to both the Centennial Industrial site and to the SR 49/20 / Brunswick Road interchange. Five (5) intersections were analyzed:

Brunswick Industrial Site Driveway. This entrance will be used for haul trucks entering the Brunswick Industrial site from the north. This will include right turning traffic into the site.

Millsite Road / E. Bennett Road Exit. This location will be used only for haul trucks departing the Brunswick Industrial site and heading to either the Centennial Industrial Use site or SR 49/20. This will include right turning traffic departing the site.

Brunswick Road / E. Bennett Road – Greenhorn Road. This location includes southbound through traffic and eastbound to northbound left turning traffic. The AutoTURN analysis only considered the turning movement.

Brunswick Road / Whispering Pines Lane. This location includes northbound to westbound traffic heading to the Centennial Industrial site and eastbound to southbound traffic heading from the Centennial site. Truck traffic will also use this intersection heading to SR 49/20; however, these through movements were not analyzed.

Centennial Industrial Use Site Driveway. This location includes westbound left turn movements into the proposed Centennial Industrial site driveway and northbound right turn movements departing the driveway.

IX.1. Methods of Analysis

AutoTURN. The assessment of truck turning movements was conducted using AutoTURN software prepared by Transoft. This software implements procedures described in the American Association of State and Highway Transportation Officials (AASHTO) document *A Policy on Geometric Design of Highways and Streets*, and the Caltrans *Highway Design Manual*. The software is a CADD based program that simulates turning maneuvers for various vehicles. The program is used to define both vehicle tire tracking and trailer sweep paths in order to test design roadway features to meet minimum design vehicle constraints. A Superior Super Tag SST100 truck vehicle template was created based on information obtained for this vehicle.

The spatial database used in the analysis of all truck turning movements was based on aerial photography acquired from Google Earth, with imagery dated May 17, 2018. At each location the aerial photograph was imported into a CADD file. AutoTURN was then superimposed over each aerial photograph to simulate the projected turning paths for a STAA vehicle. The resulting paths were then reviewed to determine the ability of vehicles to complete the required movements within the identified constraints:

- Drive off of the edge of the pavement or
- Encroach into the opposing lane.

These AutoTURN paths were then used to develop the limits of new pavement and shoulder, if needed, for each turning movement. Subsequent analysis based on new survey information would be needed to finalize design recommendations.

IX.2. Results

Figures 14 through 18 present haul truck turning movements at the five locations studied.

Brunswick Industrial Site Driveway (Figure 14)

Figure 14 presents the truck turning movement for inbound haul trucks. Trucks will approach the project driveway from the north, from either SR 49/20 or the Centennial Industrial Site. The AutoTURN path shows that the truck will be able to enter the wide driveway unimpeded, while allowing any outbound vehicles to queue adjacent to the inbound movements.

E. Bennett Road / Millsite Road Access (Figure 15)

Figure 15 presents the truck turning movement for haul trucks departing the Brunswick site. The AutoTURN assessment considered the existing gravel road as seen in the figure as well as a former road looping around the mine shaft. This road is proposed to be used as it allows departing trucks to approach E. Bennett Road at a 90° angle, maximizing visibility for departing drivers. As shown in the figure the intersection will require new pavement along the Millsite Road approach.

Brunswick Road / E. Bennett Road (Figure 16)

Figure 16 presents the truck turning movement for trucks leaving the Brunswick site and heading north on Brunswick Road to either the Centennial Industrial site or SR 49/20. The AutoTURN assessment illustrates that the design vehicle can complete the left turn without entering the southbound left turn lane. Additionally, the vehicle envelope will remain on the roadway along northbound Brunswick Road.

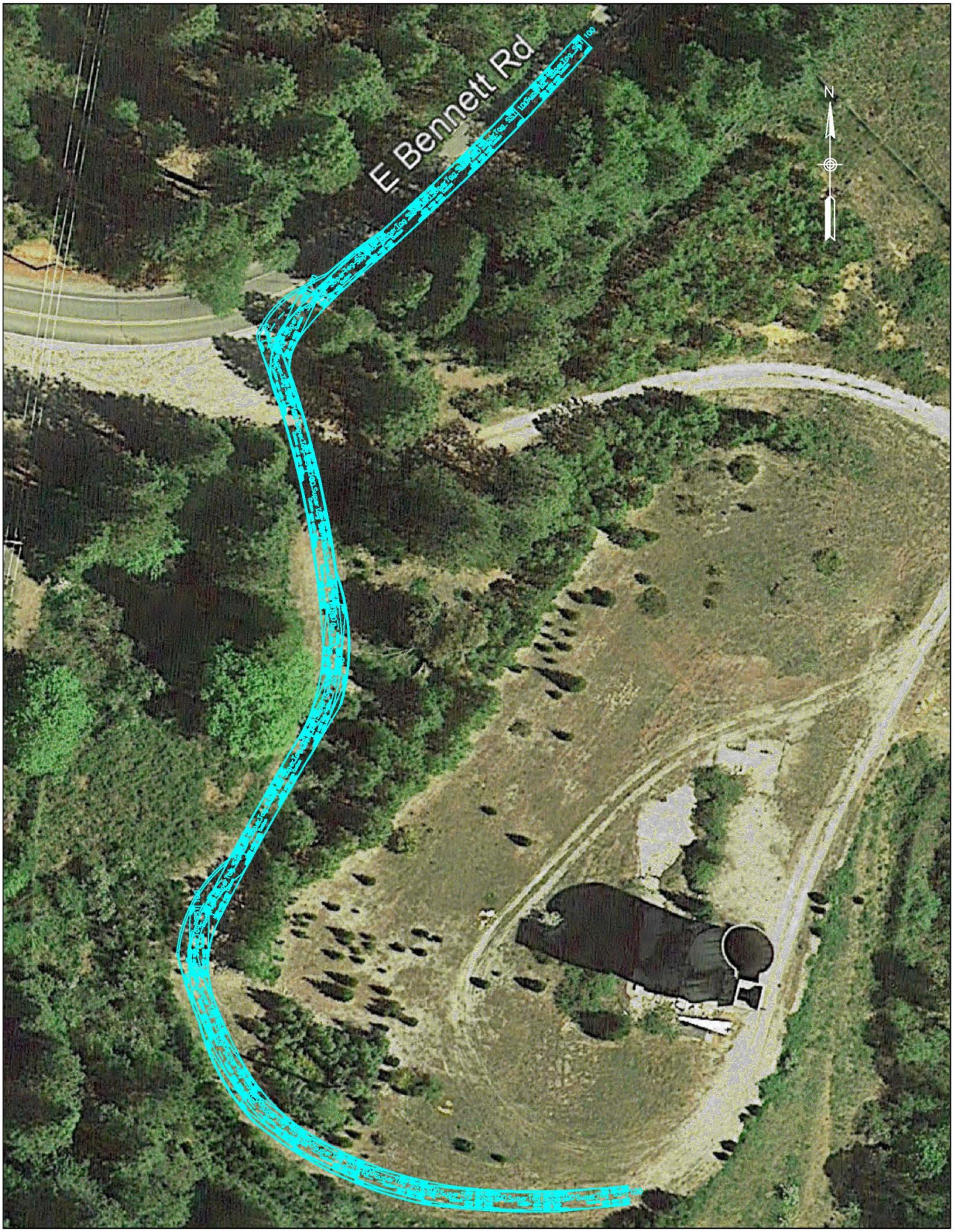
Brunswick Road / Whispering Pines Lane (Figure 17)

Figure 17 presents the truck turning movement for trucks turning to and leaving from the Centennial Industrial site. The AutoTURN assessment shows that northbound to westbound movements can be completed without entering the eastbound left turn lane or the westbound shoulder. AutoTURN indicates that the eastbound to southbound right turn will be completed with trucks able to complete the right turn while staying within the eastbound approach and the outside departure lane along Brunswick Road. The truck wheels should not overtop the curb in the southwest quadrant of the intersection.

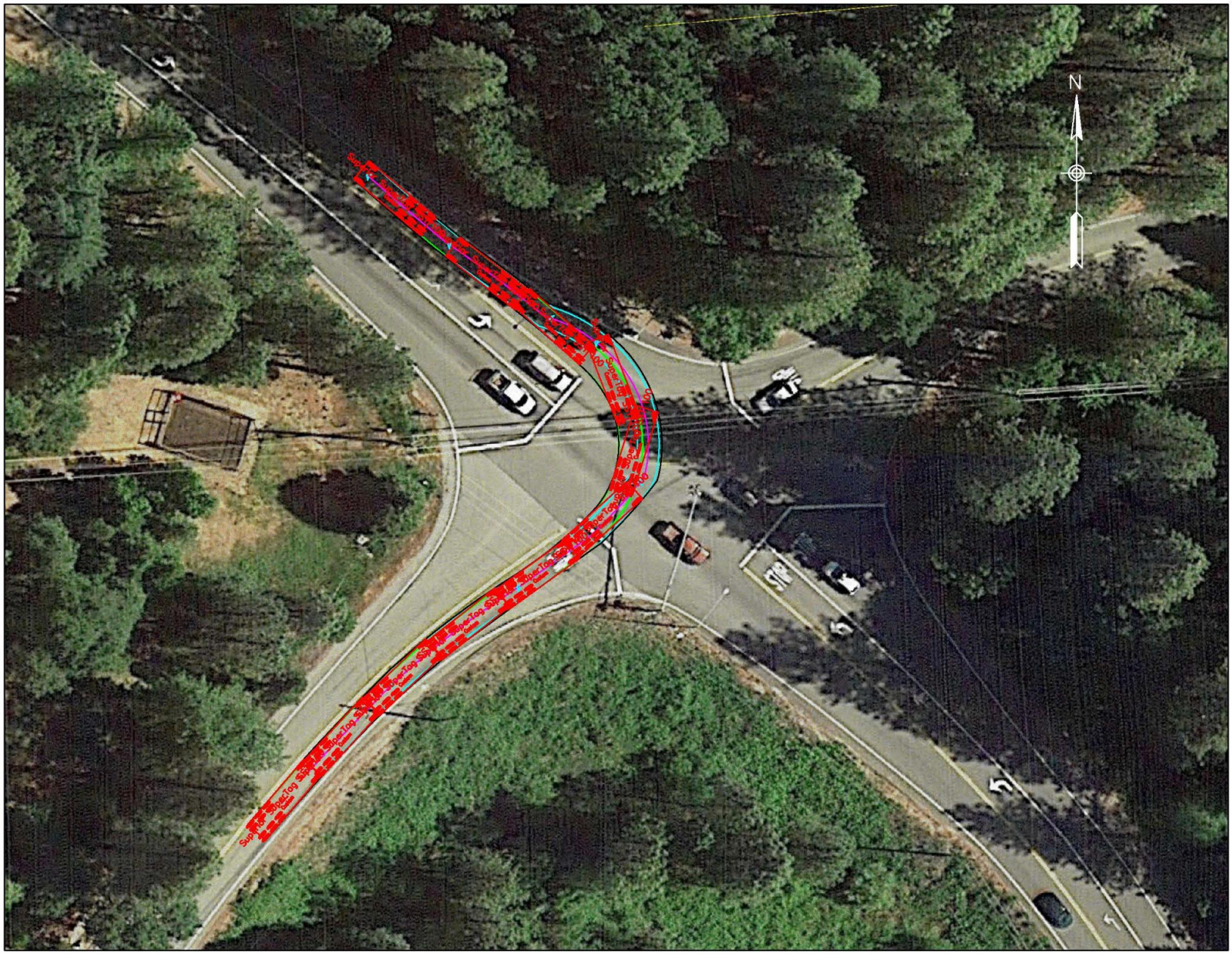
Centennial Industrial Site Driveway (Figure 18)

The existing center median east of the project frontage along Whispering Pines Lane ends about 60' east of the property. The east end of the property is the approximate location where the full width roadway section ends, and a two-way roadway begins and continues to Idaho Maryland Road. To provide access to the Centennial site widening of the south side of Whispering Pines Lane is proposed. Figure 18 shows the proposed conceptual layout of the roadway improvements along the project frontage to allow haul trucks to enter and exit the site. Whispering Pines Lane would be widened to provide a 12' two-way-left-turn-lane (TWLTL), a 12' travel lane and a 6' bicycle lane. This layout will allow haul trucks to queue in the TWLTL while waiting to enter the site. The AutoTURN assessment shows that inbound and outbound trucks can turn simultaneously without interfering with the opposing vehicle.

AUTOTURN ASSESSMENT
BRUNSWICK ROAD DRIVEWAY

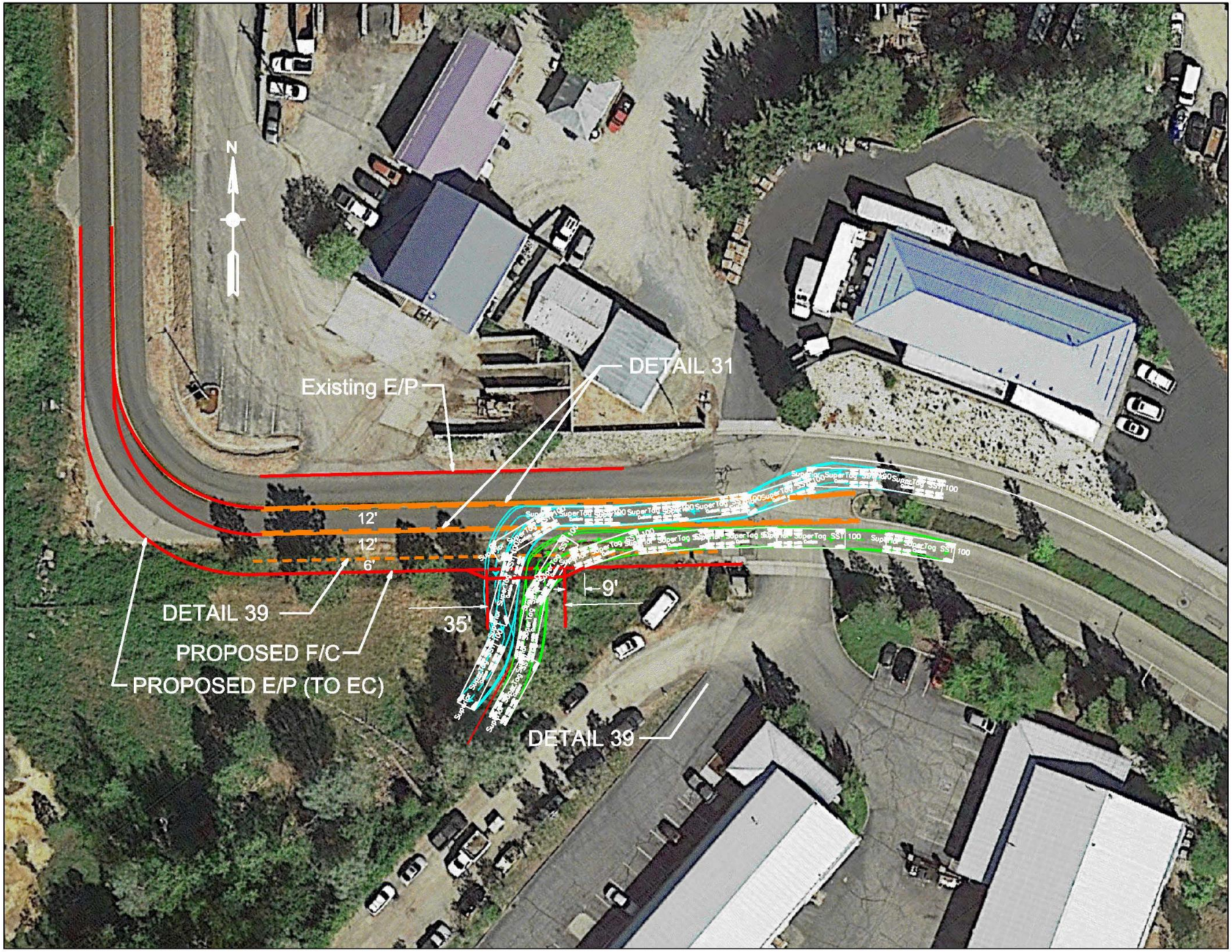


AUTOTURN ASSESSMENT
MILLSITE ROAD AT E BENNETT ROAD



AUTOTURN ASSESSMENT
BRUNSWICK ROAD AT E BENNETT ROAD

AUTOTURN ASSESSMENT
BRUNSWICK ROAD AT WHISPERING PINES LANE



AUTOTURN ASSESSMENT
CENTENNIAL SITE DRIVEWAY

X. SIGHT DISTANCE

A sight distance analysis was completed at several locations along the proposed haul routes. These included the Brunswick Road driveway, the Millsite Road driveway, the Centennial Site driveway and the Brunswick Road / Whispering Pines Lane intersection.

Available sight distance was evaluated using the standards documented in the Caltrans *Highway Design Manual* (HDM). Based on the locations of the driveways "**Minimum Stopping Sight** Distance" (MSSD) and "**Corner Sight Distance**" (CSD) was considered. These criteria are documented in Tables 201.1 and 405.1A of the HDM; the HDM notes that the MSSD criterion is used for CSD evaluation at driveways.

Brunswick Road Driveway. The posted speed limit along Brunswick Road is 50 miles per hour (mph). Considering CSD requirements the corresponding minimum sight distance standard for this speed is 700 feet for left turning vehicles and 775 feet for right running vehicles. Considering MSSD for driveways 430 feet would be needed. Figure 19 illustrates the sight line looking north with a line of sight of 800 feet. Figure 20 provides the sight line looking south with a line of sight of 750 feet. Both directions meet the CSD requirements. Any landscaping material over 2 feet in height inside the sight line should be removed.

Millsite Road. The posted speed limit along E. Bennett Road is 35 mph. Considering CSD requirements the corresponding minimum sight distance standard for this speed is 540 feet. The sight line was reviewed for eastbound traffic as this access will be restricted to right turning movements. Considering MSSD for driveways 250 feet would be needed. Figure 21 presents the sight line looking west of 580 feet. This exceeds the CSD requirement. Any landscaping material over 2 feet in height inside the sight line should be removed.

Whispering Pines Lane. The posted speed limit along Brunswick Road is 45 mph. Considering CSD requirements the corresponding minimum sight distance standard for this speed is 695 feet. The sight line was reviewed for southbound traffic as all truck traffic from the Centennial Site will be turning right heading to the Brunswick Site. Figure 22 presents the sight line looking north of 1,000 feet. This exceeds the CSD requirement.

Centennial Site Driveway. The posted speed limit along Whispering Pines Lane and Centennial Drive is 30 mph. However, traffic heading south on Centennial Drive is required to make a 90° turn to the east onto Brunswick Road. Warning signs along Centennial Road note that truck traffic is present on the road and a left turn sign with a suggested speed of 15 mph is present just prior to the 90° turn. The sight line was reviewed for eastbound traffic as haul trucks leaving the site will head east back to the Brunswick Site.

CSD requirements for vehicles completing the 90° left turn at the suggested 15 mph speed requires a minimum sight distance of 230 feet. Considering MSSD for driveways 100 feet of sight distance would be needed. Figure 23 illustrates the sight line looking west with a line of sight of 225 feet. This meets the MSSD requirement and is 5 feet short of meeting the CSD requirement; this is not considered adverse as this is a driveway location. Any landscaping material over 2 feet in height inside the sight line should be removed.

SIGHT DISTANCE
BRUNSWICK ROAD LOOKING NORTH AT DRIVEWAY
800 FEET

KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

figure 19

SIGHT DISTANCE
BRUNSWICK ROAD LOOKING SOUTH AT DRIVEWAY
750 FEET

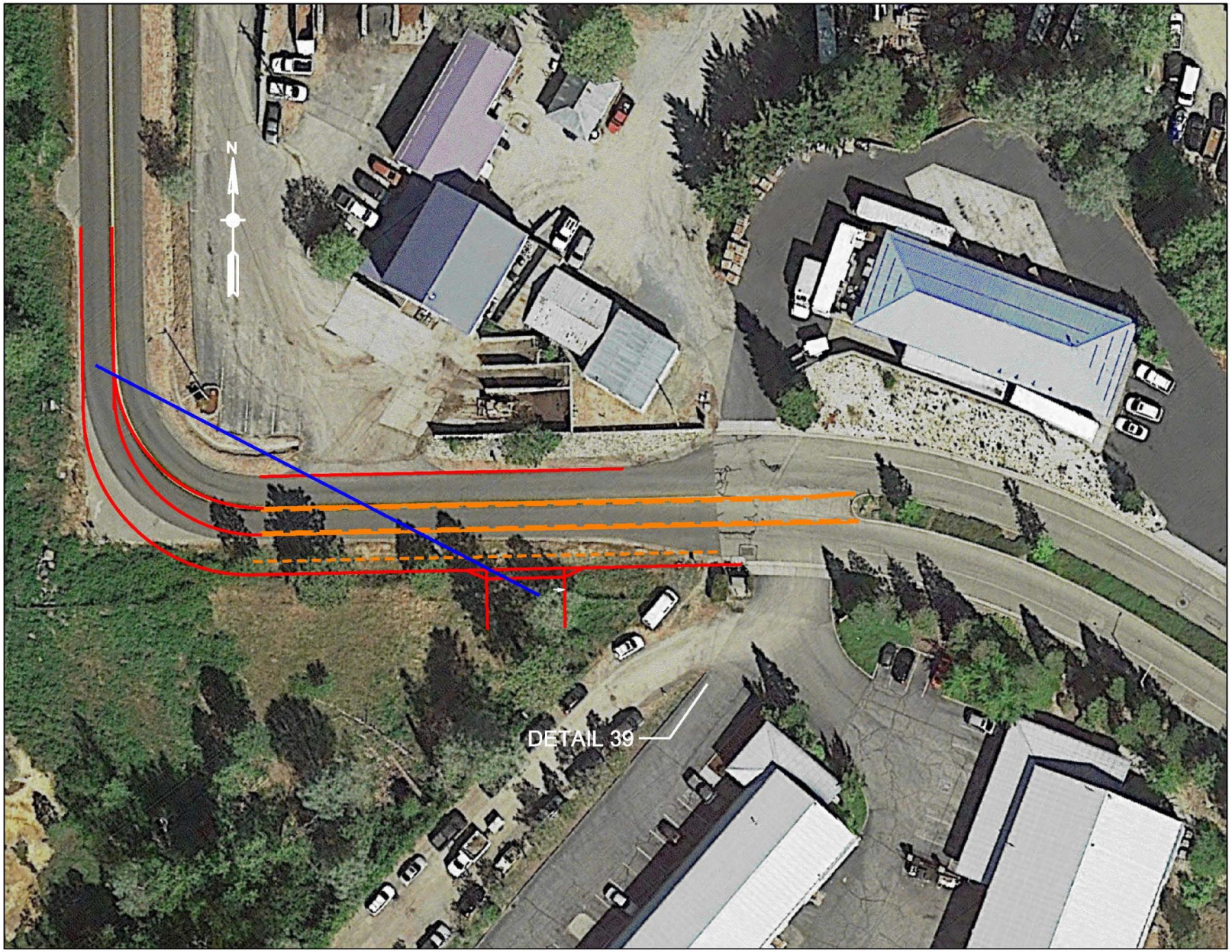
KD Anderson & Associates, Inc.
Transportation Engineers

5875-01 RA 2/17/2020

figure 20

SIGHT DISTANCE
MILLSITE ROAD LOOKING WEST
580 FEET

SIGHT DISTANCE
WHISPERING PINES LANE LOOKING NORTH
1000 FEET



SIGHT DISTANCE
CENTENNIAL SITE DRIVEWAY LOOKING WEST
225 FEET

XI. ACCELERATION ON GRADE

The location of the Brunswick site relative to hauling engineered fill to either the Centennial Industrial site or SR 49/20 requires loaded trucks to travel northbound uphill on Brunswick Road from E. Bennett Road about ¼ mile north until it reaches the crest just west of Loma Rica Drive. The grade departing the E. Bennett Road intersection is about 1% for ~800 feet after which the grade increases to approximately 8% for ~600 feet. From the crest to Whispering Pines Lane the grade declines at approximately 5%. Trucks returning from the Centennial site or SR 49/20 will travel unloaded and will be able to accelerate more quickly, especially when entering southbound Brunswick Road from Whispering Pines Lane. Currently, trucks of 4 axles or more account for about 10% of northbound vehicles and about 8% of southbound vehicles. Trucks also account for about 8% of eastbound traffic along Whispering Pines Lane.

Section 3.4 of AASHTO's Policy of Geometric Design of Highways and Street (i.e., the Green Book) was reviewed to estimate the speeds of trucks on these hills. As trucks depart the E. Bennett Road intersection, the northbound grade is flat and allows trucks to accelerate smoothly. Figure 3-16 of the Green Book suggests that a fully laden "typical truck" can reach about 42 mph prior to arriving at the 8% grade west of Loma Rica Drive. Trucks will then decelerate to about 35 mph as they travel up the grade.

Southbound trucks heading towards the Brunswick site will either be traveling at a higher rate of speed (i.e. 45 mph) as they travel south through the intersection or will be accelerating from a stopped condition as they turn right from Whispering Pines Lane. As noted in the *Sight Distance* section vehicles turning right have 1000 feet of sight distance looking north. While these trucks are accelerating from a stopped condition, they should be able to accelerate faster and to a higher speed as they will be unloaded; the AASHTO figures account for gross vehicle weight. Two southbound lanes are present along Brunswick Road north of Whispering Pines Lane. The outside lane continues for about 325 feet before ending and merging into the inside lane. The uphill 5%± grade continues past Loma Rica Drive for about 1,500 feet before reaching the crest. Under a fully laden condition trucks should be able to reach the merge point with a speed of about 26 mph and reach a speed of about 33 mph by the time they reach the crest. Project trucks will reach higher speeds because they are empty, and the available sight distance will allow drivers to enter Brunswick Road when road conditions permit.

XII. VEHICLE LEVEL OF SERVICE FINDINGS AND RECOMMENDATIONS

The preceding analysis has identified the effect of the project on the local roadway network. Recommendations are identified for facilities that have deficiencies in the roadway network without and with the project.

XII.1. Existing Conditions - Recommendations

Intersections

Three intersections, in the 3:30-4:30 PM period as shown in Table 4B, currently operate below the acceptable LOS D threshold, at LOS E or F. These include Brunswick Road at Idaho Maryland Road, SR 174 at Brunswick Road, and Idaho Maryland Road at Centennial Drive. Installation of traffic signals would result in acceptable levels of service. Brunswick Road at Idaho Maryland Road will operate at LOS C and Idaho Maryland Road at Centennial Drive will operate at LOS B after installation of traffic signals.

The City of Grass Valley has Capital Improvement Projects (CIP) to install traffic signals at the Brunswick Road at Idaho Maryland Road and Idaho Maryland Road at Centennial Drive intersections.

SR 174 at Brunswick Road was previously identified to be signalized in the NCTC Regional Transportation Program (RTP); however, the most recent study, the NCTC 2016 Nexus Study, removed the project from the program as this study showed acceptable intersection levels of service. The Caltrans SR 174 TCR continues to identify this intersection as a planned, but unfunded improvement which could include either a traffic signal or roundabout.

The Nevada County General Plan Policy LU-4.1.6 states "Relative to the State highway system, Nevada County recognizes the major funding limitations that exist within the State system and finds that as a matter of policy, additional growth and development may be allowed within the County, notwithstanding the adverse impacts which may result in the short term by this growth and development."

Roadway Segments

One roadway segment currently operates below the acceptable LOS threshold, at LOS E during the existing peak hour as shown in Table 6. This is the segment of SR 174 between Brunswick Road and Empire Street which is within the rural region of the County. Caltrans has one project programmed in their SR 174 Transportation Concept Report (TCR) in the segment from the Placer County line to the Grass Valley city limit. The project includes widening shoulders and curve improvements from near Bar Ela Ranch Road to You Bet Road. There are five conceptual projects also identified. These include: 1) construction of a left turn lane at Bartlett Drive including Class III bicycle and pedestrian facilities, 2) construction of a Class III bike facility between Rattlesnake Road and the Grass Valley city limit, 3) construction of a Class III bike

facility between the Placer County line (PM 0.00) and post mile 2.74, 4) construction of one turnout in each of the northbound and southbound directions between the Placer County line and Brunswick Road, and 5) construction of a Class III bicycle facility between You Bet Road and Brunswick Road.

The Nevada County General Plan Policy LU-4.1.6 states "Relative to the State highway system, Nevada County recognizes the major funding limitations that exist within the State system and finds that as a matter of policy, additional growth and development may be allowed within the County, notwithstanding the adverse impacts which may result in the short term by this growth and development."

XII.2. Existing Plus Approved Project Conditions - Recommendations

Intersections

Three intersections, in the 3:30-4:30 PM period as shown in Table 7B, will operate below acceptable the LOS D threshold, at LOS E or F. These include Brunswick Road at Idaho Maryland Road, SR 174 at Brunswick Road and Idaho Maryland Road at Centennial Drive. Installation of traffic signals would result in acceptable levels of service. Brunswick Road at Idaho Maryland Road will operate at LOS C and Idaho Maryland Road at Centennial Drive will operate at LOS B after installation of traffic signals.

The City of Grass Valley has Capital Improvement Projects (CIP) to install traffic signals at the Brunswick Road at Idaho Maryland Road and Idaho Maryland Road at Centennial Drive intersections.

SR 174 at Brunswick Road was previously identified to be signalized in the NCTC Regional Transportation Program (RTP); however, the most recent study, the NCTC 2016 Nexus Study, removed the project from the program as this study showed acceptable intersection levels of service. The Caltrans SR 174 TCR continues to identify this intersection as a planned, but unfunded improvement which could include either a traffic signal or roundabout.

The Nevada County General Plan Policy LU-4.1.6 states "Relative to the State highway system, Nevada County recognizes the major funding limitations that exist within the State system and finds that as a matter of policy, additional growth and development may be allowed within the County, notwithstanding the adverse impacts which may result in the short term by this growth and development."

Roadway Segments

One roadway segment will operate below the acceptable LOS threshold, at LOS E in the Existing Plus Approved Projects peak hour as shown in Table 9. This is the segment of SR 174 between Brunswick Road and Empire Street which is within the rural region of the County. Caltrans has one project programmed in their SR 174 Transportation Concept Report (TCR) in the segment

from the Placer County line to the Grass Valley city limit. The project includes widening shoulders and curve improvements from near Bar Ela Ranch Road to You Bet Road. There are five conceptual projects also identified. These include: 1) construction of a left turn lane at Bartlett Drive including Class III bicycle and pedestrian facilities, 2) construction of a Class III bike facility between Rattlesnake Road and the Grass Valley city limit, 3) construction of a Class III bike facility between the Placer County line (PM 0.00) and post mile 2.74, 4) construction of one turnout in each of the northbound and southbound directions between the Placer County line and Brunswick Road, and 5) construction of a Class III bicycle facility between You Bet Road and Brunswick Road.

The Nevada County General Plan Policy LU-4.1.6 states "Relative to the State highway system, Nevada County recognizes the major funding limitations that exist within the State system and finds that as a matter of policy, additional growth and development may be allowed within the County, notwithstanding the adverse impacts which may result in the short term by this growth and development."

XII.3. Existing Plus Approved Projects Plus Project Conditions (Scenario #1 – Centennial Site)

As identified in the project description the project intends to operate under the following work periods:

- 7:00 a.m. – mining shift change and inbound administrative personnel begin day
- 3:30 p.m. – administrative personnel day ends
- 7:00 p.m. – mining shift change

Under the proposed work periods there is negligible traffic to or from the site during the a.m. and p.m. peak hours. The majority of project traffic occurs in the periods surrounding mining shift changes and the end of the administrative personnel work day as identified above; the end of the day for administrative personnel does occur during some peak periods, and this was reflected in the level of service analyses during the 3:30-4:30 p.m. analysis period. Recommendations, therefore, are based on the project traffic hours.

Intersections

During the 3:30-4:30 PM period, as shown in Table 14B, three intersections will operate below the acceptable LOS D threshold, at LOS E or F. These include Brunswick Road at Idaho Maryland Road, SR 174 at Brunswick Road and Idaho Maryland Road at Centennial Drive, all of which already operate below the acceptable LOS D threshold under Existing and EPAP scenarios.

12) Brunswick Road at Idaho Maryland Road - Signalization will improve the intersection to LOS D. This intersection is identified to be signalized in the City of Grass Valley CIP. The project is expected to add 35 additional vehicles through the intersection during the 3:30-4:30 PM time period. As the project will adversely affect the intersection during the 3:30 – 4:30 PM period, a fair share contribution for signalization of this intersection should be negotiated between Rise Grass Valley and Nevada County with participation from the City of Grass Valley.

15) SR 174 at Brunswick Road - Signalization or a roundabout would improve the intersection to acceptable LOS conditions. The project is expected to add10 additional vehicles through the intersection during the 3:30 to 4:30 PM time period. NCTC removed this intersection from their CIP program in their 2016 Nexus Study while Caltrans has the intersection identified as a planned, but unfunded improvement in their SR 174 TCR. Under County Policy LU-4.16, relative to the State highway system, additional growth and development may be allowed within the County, notwithstanding the adverse impacts which may result in the short term by this growth and development.

19) Idaho Maryland Road at Centennial Drive - Signalization will improve the intersection to LOS D. This intersection is identified to be signalized in the City of Grass Valley CIP. The project is expected to add 18 additional vehicles through the intersection during the 3:30 to 4:30 PM time period. As the project will adversely affect the intersection during the 3:30 – 4:30 PM period, a fair share contribution for signalization of this intersection should be negotiated between Rise Grass Valley and Nevada County with participation from the City of Grass Valley.

Roadway Segments

One roadway segment will continue to operate below the acceptable LOS threshold, at LOS E as shown in Table 16. This is the segment of SR 174 between Brunswick Road and Empire Street which is within the rural region of the County. Caltrans has not identified a widening project to improve roadway operational characteristics in this segment. This segment will continue to operate at LOS E during the peak hour. The project has minimal effect on projected conditions with an increase in the percent time following (PTSF) from 76.9% (Table 9) to 78.2% (Table 16) in the westbound direction; the average travel speed (ATS) will decrease by 0.1 mph, from 29.3 mph to 29.2 mph. The PTSF in the eastbound direction will remain unchanged at 59.8% and the ATS will decrease by 0.1 mph, from 30.3 mph to 30.2 mph. Under County Policy LU-4.16, relative to the State highway system, additional growth and development may be allowed within the County, notwithstanding the adverse impacts which may result in the short term by this growth and development.

XII.4. Existing Plus Approved Projects Plus Project Conditions (Scenario #2 – To SR 49)

As identified in the project description the project intends to operate under the following work periods:

- 7:00 a.m. – mining shift change and inbound administrative personnel begin day
- 3:30 p.m. – administrative personnel day ends
- 7:00 p.m. – mining shift change

Under the proposed work periods there is negligible traffic to or from the site during the a.m. and p.m. peak hours. The majority of project traffic occurs in the periods surrounding mining shift changes and the end of the administrative personnel work day as identified above; the end of the day for administrative personnel does occur during some peak periods, and this was reflected in the level of service analyses during the 3:30-4:30 p.m. analysis period. Recommendations, therefore, are based on the project traffic hours.

Intersections

During the 3:30-4:30 PM period, as shown in Table 17B, three intersections will operate below the acceptable LOS D threshold, at LOS E or F. These include Brunswick Road at Idaho Maryland Road, SR 174 at Brunswick Road and Idaho Maryland Road at Centennial Drive, all of which already operate below the acceptable LOS D threshold under Existing and EPAP scenarios.

12) Brunswick Road at Idaho Maryland Road - Signalization will improve the intersection to LOS D. This intersection is identified to be signalized in the City of Grass Valley CIP. The project is expected to add 47 additional vehicles through the intersection during the 3:30-4:30 PM time period. As the project will adversely affect the intersection during the 3:30 – 4:30 PM period a fair share contribution for signalization of this intersection should be negotiated between Rise Grass Valley and Nevada County with participation from the City of Grass Valley.

15) SR 174 at Brunswick Road - Signalization or a roundabout would improve the intersection to acceptable LOS conditions. The project is expected to add 10 additional vehicles through the intersection during the 3:30 to 4:30 PM time period. NCTC removed this intersection from their CIP program in their 2016 Nexus Study while Caltrans has the intersection identified as a planned, but unfunded improvement in their SR 174 TCR. Under County Policy LU-4.16, relative to the State highway system, additional growth and development may be allowed within the County, notwithstanding the adverse impacts which may result in the short term by this growth and development.

19) Idaho Maryland Road at Centennial Drive - Signalization will improve the intersection to LOS D. This intersection is identified to be signalized in the City of Grass Valley CIP. The project is expected to add 15 additional vehicles through the intersection during the 3:30-4:30 PM time period. As the project will adversely affect the intersection during the 3:30 – 4:30 PM period a fair share contribution for signalization of this intersection should be negotiated between Rise Grass Valley and Nevada County with participation from the City of Grass Valley.

Roadway Segments

One roadway segment will continue to operate below the acceptable LOS threshold, at LOS E as shown in Table 19. This is the segment of SR 174 between Brunswick Road and Empire Street which is within the rural region of the County. Caltrans has not identified a widening project to improve roadway operational characteristics in this segment. This segment will continue to operate at LOS E during the peak hour. The project has minimal effect on projected EPAP conditions with modelling showing an increase in the percent time following (PTSF) from 76.9% (Table 9) to 78.2% (Table 19) in the west bound direction; the average travel speed (ATS) will decrease by 0.1 mph. The PTSF in the eastbound direction will remain unchanged at 59.8% and the ATS will decrease by 0.1 mph. Under County Policy LU-4.16, relative to the State highway system, additional growth and development may be allowed within the County, notwithstanding the adverse impacts which may result in the short term by this growth and development.

XII.5. Cumulative (2035) Conditions No Project – Recommendations

Intersections

Two intersections, Sutton Way at Dorsey Drive and SR 174 at Brunswick Road, and shown in Table 20B, will operate below the acceptable the LOS D threshold, at LOS E or F. Both intersections will meet the peak hour signal warrant.

15) SR 174 at Brunswick Road was previously identified to be signalized in the NCTC Regional Transportation Program (RTP); however, the most recent study, the NCTC 2016 Nexus Study, removed the project from the program as this study showed acceptable intersection levels of service. The Caltrans SR 174 TCR continues to identify this intersection as a planned, but unfunded improvement which could include either a traffic signal or roundabout. Under County Policy LU-4.16, relative to the State highway system, additional growth and development may be allowed within the County, notwithstanding the adverse impacts which may result in the short term by this growth and development.

21) Sutton Way at Dorsey Drive - Signalization will improve the intersection to LOS C. As an alternative, a roundabout would operate at LOS C.

Roadway Segments

One roadway segment, as shown in Table 22, will continue to operate below the acceptable LOS threshold, at LOS E. This is the segment of SR 174 between Brunswick Road and Empire Street which is within the rural region of the County. There are no funded projects identified in the NCTC CIP or Caltrans SR 174 TCR to improve motor vehicle operations of this segment. Under County Policy LU-4.16, relative to the State highway system, additional growth and development may be allowed within the County, notwithstanding the adverse impacts which may result in the short term by this growth and development.

XII.6. Cumulative (2035) Plus Project Conditions (Scenario #1 – Centennial Site)

As identified in the project description the project intends to operate under the following work periods:

- 7:00 a.m. – mining shift change and inbound administrative personnel begin day
- 3:30 p.m. – administrative personnel day ends
- 7:00 p.m. – mining shift change

Under the proposed work periods there is negligible traffic to or from the site during the a.m. and p.m. peak hours. The majority of project traffic occurs in the periods surrounding mining shift changes and the end of the administrative personnel work day as identified above; the end of the day for administrative personnel does occur during some peak periods, and this was reflected in the level of service analyses during the 3:30-4:30 PM analysis period. Recommendations, therefore, are based on the project traffic hours.

Intersections

Two intersections shown in Table 23B, Sutton Way at Dorsey Drive and SR 174 at Brunswick Road, will operate below the acceptable LOS D threshold, at LOS E or F. Both intersections will meet the peak hour signal warrant.

15) SR 174 at Brunswick Road - Signalization or a roundabout would improve the intersection to acceptable LOS conditions. The project would add 10 additional trips to the intersection during the 3:30 to 4:30 PM time period. NCTC removed this intersection from their CIP program in their 2016 Nexus Study while Caltrans has the intersection identified as a planned, but unfunded improvement in their SR 174 TCR. Under County Policy LU-4.16, relative to the State highway system, additional growth and development may be allowed within the County, notwithstanding the adverse impacts which may result in the short term by this growth and development.

21) Sutton Way at Dorsey Drive - Signalization will improve the intersection to LOS C; as an alternative, a single lane roundabout would also operate at LOS C. This intersection is identified to be signalized in the City of Grass Valley CIP. The project will generate 2 additional vehicles in a total of 1936 vehicles passing through the intersection during the 3:30 – 4:30 PM period. Although the project contributes a negligible amount of traffic a fair share contribution for signalization of this intersection should be negotiated between Rise Grass Valley and Nevada County with participation from the City of Grass Valley.

Roadway Segments

One roadway segment, as shown in Table 25, will continue to operate below the acceptable LOS threshold, at LOS E. This is the segment of SR 174 between Brunswick Road and Empire Street which is within the rural region of the County. There are no funded projects identified in the NCTC CIP or Caltrans SR 174 TCR to improve motor vehicle operations of this segment. This segment will continue to operate at LOS E during the peak hour. The project has minimal effect on projected conditions with an increase in the PTSF from 80.4% to 81.5% in the westbound direction; the average travel speed (ATS) will remain at 28.6 mph. In the eastbound direction the PTSF will increase from 60.2% to 60.8% while the ATS will decrease by 0.1 mph, from 29.8 mph to 29.7 mph. Under County Policy LU-4.16, relative to the State highway system, additional growth and development may be allowed within the County, notwithstanding the adverse impacts which may result in the short term by this growth and development.

XII.7. Cumulative (2035) Plus Project Conditions (Scenario #2 – To SR 49)

As identified in the project description the project intends to operate under the following work periods:

- 7:00 a.m. – mining shift change and inbound administrative personnel begin day
- 3:30 p.m. – administrative personnel day ends
- 7:00 p.m. – mining shift change

Under the proposed work periods there is negligible traffic to or from the site during the a.m. and p.m. peak hours. The majority of project traffic occurs in the periods surrounding mining shift changes and the end of the administrative personnel work day as identified above; the end of the day for administrative personnel does occur during some peak periods, and this was reflected in the level of service analyses during the 3:30-4:30 PM analysis period. Recommendations, therefore, are based on the project traffic hours.

Intersections

Two intersections, shown in Table 26B, Sutton Way at Dorsey Drive and SR 174 at Brunswick Road, will operate below the acceptable LOS D threshold, at LOS E or F. Both intersections will meet the peak hour signal warrant.

15) SR 174 at Brunswick Road - Signalization or a roundabout would improve the intersection to acceptable LOS conditions. The project would add 10 additional trips to the intersection during the 3:30 to 4:30 PM time period. NCTC removed this intersection from their CIP program in their 2016 Nexus Study while Caltrans has the intersection identified as a planned, but unfunded improvement in their SR 174 TCR. Under County Policy LU-4.16, relative to the State highway system, additional growth and development may be allowed within the County, notwithstanding the adverse impacts which may result in the short term by this growth and development.

21) Sutton Way at Dorsey Drive - Signalization will improve the intersection to LOS C; as an alternative, a single lane roundabout would also operate at LOS C. This intersection is identified to be signalized in the City of Grass Valley CIP. The project will generate 2 vehicles in a total of 1936 vehicles passing through the intersection during the 3:30-4:30 PM period. Although the project contributes a negligible amount of traffic a fair share contribution for signalization of this intersection should be negotiated between Rise Grass Valley and Nevada County with participation from the City of Grass Valley.

Roadway Segments

One roadway segment, as shown in Table 28, will continue to operate below the acceptable LOS threshold, at LOS E. This is the segment of SR 174 between Brunswick Road and Empire Street which is within the rural region of the County. There are no funded projects identified in the NCTC CIP or Caltrans SR 174 TCR to improve motor vehicle operations of this segment. This segment will continue to operate at LOS E during the peak hour. The project has minimal effect on projected conditions with an increase in the PTSF from 80.4% to 81.5% in the westbound direction; the average travel speed (ATS) will remain at 28.6 mph. In the eastbound direction the PTSF will increase from 60.2% to 60.8% while the ATS will decrease by 0.1 mph, from 29.8 mph to 29.7 mph. Under County Policy LU-4.16, relative to the State highway system, additional growth and development may be allowed within the County, notwithstanding the adverse impacts which may result in the short term by this growth and development.

XIII. SUMMARY OF TRAFFIC IMPROVEMENT RECOMMENDATIONS

Intersections

12) Brunswick Road at Idaho Maryland Road - Signalization will improve the intersection to LOS D. This intersection is identified to be signalized in the City of Grass Valley CIP. Up to 47 additional vehicles are projected to pass through the intersection during the 3:30-4:30 PM period. Existing traffic through this intersection is estimated at ~1458 vehicles. As the project will adversely affect the intersection during the 3:30 – 4:30 PM period a fair share contribution for signalization of this intersection should be negotiated between Rise Grass Valley and Nevada County with participation from the City of Grass Valley.

15) SR 174 at Brunswick Road - Signalization or a roundabout would improve the intersection to acceptable LOS conditions. The project would add 10 additional trips to the intersection during the 3:30 to 4:30 PM time period. Existing traffic through this intersection is estimated at ~1172 vehicles. NCTC removed this intersection from their CIP program in their 2016 Nexus Study while Caltrans has the intersection identified as a planned, but unfunded improvement in their SR 174 TCR. Under County Policy LU-4.16, relative to the State highway system, additional growth and development may be allowed within the County, notwithstanding the adverse impacts which may result in the short term by this growth and development.

19) Idaho Maryland Road at Centennial Drive - Signalization will improve the intersection to LOS D. This intersection is identified to be signalized in the City of Grass Valley CIP. Up to 18 additional vehicles are projected to pass through the intersection during the PM peak hour. Existing traffic through this intersection is estimated at ~1015 vehicles. As the project will adversely affect the intersection during the 3:30 – 4:30 PM period a fair share contribution for signalization of this intersection should be negotiated between Rise Grass Valley and Nevada County with participation from the City of Grass Valley.

21) Sutton Way at Dorsey Drive – This intersection is expected to operate at an unacceptable LOS of F in the Cumulative (2035) and Cumulative (2035) Plus Project Conditions Scenarios. Signalization will improve the intersection to LOS C; as an alternative, a single lane roundabout would also operate at LOS C. This intersection is identified to be signalized in the City of Grass Valley CIP. The project is expected to generate 2 additional vehicles in a total of 1936 vehicles passing through the intersection during the 3:30 – 4:30 PM period. The project contributes a negligible amount of traffic through this intersection. Although the project contributes a negligible amount of traffic a fair share contribution for signalization of this intersection should be negotiated between Rise Grass Valley and Nevada County with participation from the City of Grass Valley.

Roadway Segments

One roadway segment, SR 174 between Brunswick Road and Empire Street, will continue to operate below the acceptable LOS threshold, at LOS E. This segment is within the rural region of the County. Caltrans has not identified a widening project to improve roadway operational characteristics in this segment. This segment will continue to operate at LOS E during the peak hour. The project has minimal effect on projected conditions in regards to the percent time following (PTSF) and the average travel speed (ATS). Under County Policy LU-4.16, relative to the State highway system, additional growth and development may be allowed within the County, notwithstanding the adverse impacts which may result in the short term by this growth and development.

Pavement Condition Recommendations

The pavement condition analysis presented in Section VII indicates that pavement in the northbound direction on Brunswick Road from Greenhorn Road to SR 49 and on E. Bennett Road eastbound from the project driveway to Brunswick Road may be impacted by truck traffic generated by the project.

Rise should pay its fair share of road maintenance through the Nevada County's tonnage fee, commensurate with the project's impact. This is similar to the fee currently collected for aggregate mining projects in Nevada County.

Centennial Industrial Site Driveway

To provide access to the Centennial site, widening of the south side of Whispering Pines Lane is proposed. Figure 18 shows the proposed conceptual layout of the roadway improvements along the project frontage to allow haul trucks to enter and exit the site. Whispering Pines Lane would be widened to provide a 12' two-way-left-turn-lane (TWLTL), a 12' travel lane and a 6' bicycle lane. This layout will allow haul trucks to queue in the TWLTL while waiting to enter the site.

Rise should pay 100% of the cost for this improvement to Whispering Pines Lane.

Regional Transportation Mitigation Fee

Western Nevada County Regional Transportation Mitigation Fee (the "RTMF"). The Nevada County Transportation Commission (NCTC), in partnership with Nevada County, Nevada City, and the City of Grass Valley established the RTMF program in 2001. Under this program, development impact fees are collected to help fund construction of the regional system of roads, streets, and highways needed to accommodate growth in western Nevada County. Nevada City and the City of Grass Valley also have adopted their own transportation mitigation fees to fund transportation improvements in each city. All three fee programs were updated in 2008 and again in 2016 to reflect changes in demographic and economic assumptions and associated changes in transportation improvement needs and funding opportunities for these improvements (NCTC 2016).

The purpose of the RTMF is to establish a uniform, cooperative program to mitigate the cumulative indirect regional impacts of future developments on traffic conditions on regional roadways in Nevada County. The fees will help fund improvements needed to maintain the target level of service in the face of the higher traffic volumes brought on by new developments.

The RTMF is based on total thousand square feet of industrial buildings. The Project proposes 126,000 square feet of industrial buildings and should pay the required RTMF.

XIV. REFERENCES

American Association of State Highway and Transportation Officials (AASHTO), Washington, D.C., *A Policy of Geometric Design on Highways and Streets,* 7th Edition, 2018.

California *Manual of Uniform Traffic Control Devices*, 2014.

California *Guide for the Preparation of Traffic Impact Studies*, December 2002.

Caltrans *Highway Design Manual*, 2016.

City of Grass Valley Design Standards, *Section 4 - Traffic Studies*. Revised February 2012.

Dorsey Marketplace Project DEIR / FEIR, City of Grass Valley, October 2019.

Fehr & Peers, *Senate Bill 743 Vehicle Miles Traveled Implementation [DRAFT]* for Nevada County Transportation Commission, September 2019

Fehr & Peers, *Idaho-Maryland Mine Project Vehicle Miles Traveled Analysis*, March 2020.

Institute of Transportation Engineers. Washington, D.C., *Trip Generation Manual*, 10th Edition, 2017.

Institute of Transportation Engineers. Washington, D.C., *Trip Generation Handbook,* 3rd Edition, 2017.

Loma Rica Ranch Specific Plan, City of Grass Valley, May 2011.

Pack, Joshua. *County of Nevada Traffic Impact Study Guidelines.* November 2013.

Telephone and E-mail correspondence, Jessica Hankins, Public Works Project Manager, Nevada County, August 2019 through December 2019.

Telephone and E-mail correspondence, Brian Foss, Planning Director, Nevada County, September 2019.

Telephone and E-mail correspondence, Epifanio Carrasco, Signal Operations, Caltrans District 3, October 2019.

Telephone and E-mail correspondence, Kwasi Donkor, Fehr & Peers, November 2019 through December 2019.

Telephone and E-mail correspondence, Mike Woodman, Deputy Executive Director, Nevada County Transportation Commission, September 2019 through December 2019.

Telephone and E-mail correspondence, Tom Last, Community Development Director, City of Grass Valley, October 2019.

Telephone and E-mail correspondence, Zachary Lake, Senior Civil Engineer, City of Grass Valley, October 2019 through December 2019.

Transportation Concept Report State Route 174, Caltrans District 3, February 2017.

Transportation Concept Report State Route 20, Caltrans District 3, March 2013.

Transportation Research Board, *Highway Capacity Manual*, 2016.

XV. APPENDICES

FEHR PEERS DC

1003 K Street NW, Suite 209
Washington, DC 20001
202.854.2750

MEMORANDUM

Date: March 24, 2020

To: Jonathan Flecker – KD Anderson & Associates

From: Kwasi Donkor – Fehr & Peers DC

Subject: Idaho-Maryland Mine Project Vehicle Miles Traveled Analysis

DC20-0062

This memorandum outlines the vehicles miles traveled (VMT) analysis methodology and results for the Idaho-Maryland Mine project in Nevada County, California. This analysis was prepared for KD Anderson & Associates as part of their ongoing work on the Idaho-Maryland Mine project.

Analysis Scenarios

This VMT analysis includes four scenarios, described as follows.

- Base Year – VMT is analyzed under the 2012 model base year condition, assuming no activity at the Brunswick or Centennial Industrial sites.
- Base Year Plus Project – VMT is analyzed under plus project conditions, assuming operations at the Brunswick site. For the purposes of the modeling, the Centennial Industrial site employees were added to the Brunswick site.
- Cumulative Year – VMT is analyzed under the 2035 future year condition, assuming no activity at the Brunswick or Centennial Industrial sites.
- Cumulative Year Plus Project – VMT is analyzed under future 2035 plus project conditions, assuming operations at the Brunswick site. As with the base year scenario, the Centennial Industrial site employees were added to the Brunswick site.

Methodology

Land Use

Fehr & Peers identified the proposed project location in the NCTC travel model traffic analysis zone (TAZ) structure. The TAZ layer is a geographic representation of area the model uses to inventory land uses. In the travel model, TAZ 446 shown in Figure 1 below best represented the location of the mine.

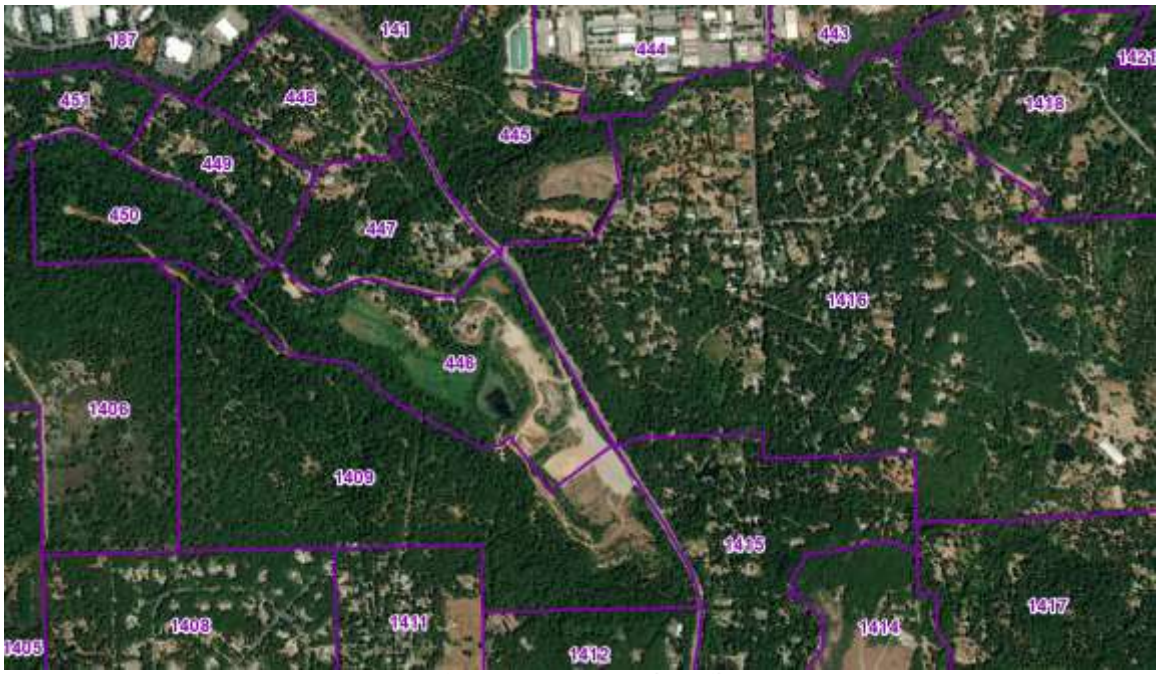


Figure 1 - TAZ Boundary File

The initial travel model land use file listed 2 residential single-family homes in TAZ 446. However, to exclusively represent the project land use in the TAZ, we removed the single-family homes from TAZ 446 and listed them under TAZ 447.

According to Table 1, the total square footage of the buildings on site is 126,300. The NCTC travel model represents non-residential land uses in KSF (1,000 square feet) so we added the project land uses to TAZ 446 accordingly. The Office-General KSF was added to the model's Office land use category and the remaining KSF was added to the Warehouse category.

TABLE 1: IDAHO-MARYLAND MINE PROJECT BUILDING SQUARE FOOTAGE	
Building Use	**Gross Area (Square Feet)**
Office - General	10,100
General Industrial	50,700
Manufacturing	51,000
Warehousing	14,500
Total	**126,300**
Source: *KD Anderson & Associates, 2020*	

Land Use Adjustment

According to the trip generation estimates provided by KD Anderson & Associates, truck trips are not included in this analysis. The total trip generation for the employee traffic only is 178 trips inbound and 178 trips outbound.

Given that the travel model's trip generation rates do not match precisely the project trip generation, we performed an initial run of the model to compare the inbound and outbound volumes at the project site with the expected project trip generation volumes. The model estimated higher volumes than the project trip generation, so we iteratively adjusted the input land use estimates to ultimately produce volumes at the project site that closely matched the expected project trip generation.

Project VMT

Once we completed the project model runs for each scenario year, we performed select zone assignment model runs of the project TAZ to calculate the VMT generated by the project. The purpose of a select zone assignment is to track the trips generated from a predefined TAZ throughout the model network. This procedure allowed us to summarize the project trips on the model network along with the link distances they travelled on and calculate VMT using the following general equation:

$$Project\,VMT = (Model\ link\ distance \times Project\ trips)_{Employees}$$

Figure 2 shows the project trip distribution throughout the model network based on the select zone assignment run.

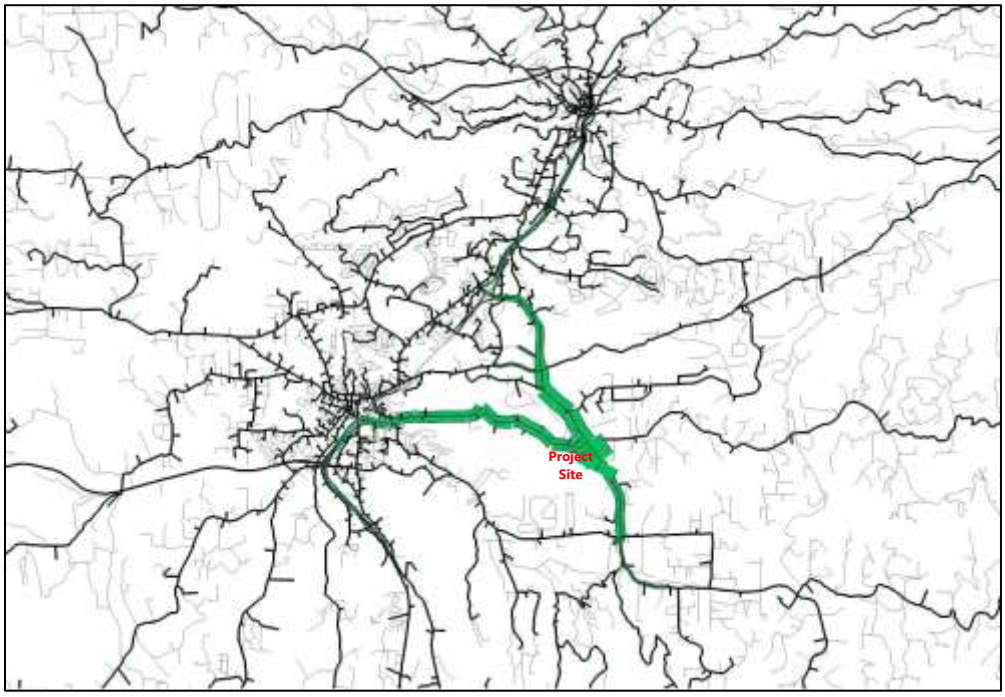


Figure 2 - Project Select Zone Distribution

VMT Effect

To understand the project's VMT effect as noted in the NCTC SB 743 VMT Implementation document, we developed a project influence subarea to compare daily VMT for the no project and plus project scenarios based on a review of the select zone trip distribution on the model network. This VMT was calculated by multiplying the total number of vehicle trips on roadways within the influence subarea by the distances of the roadway segments captured. Figure 3 below shows the influence area of the project.

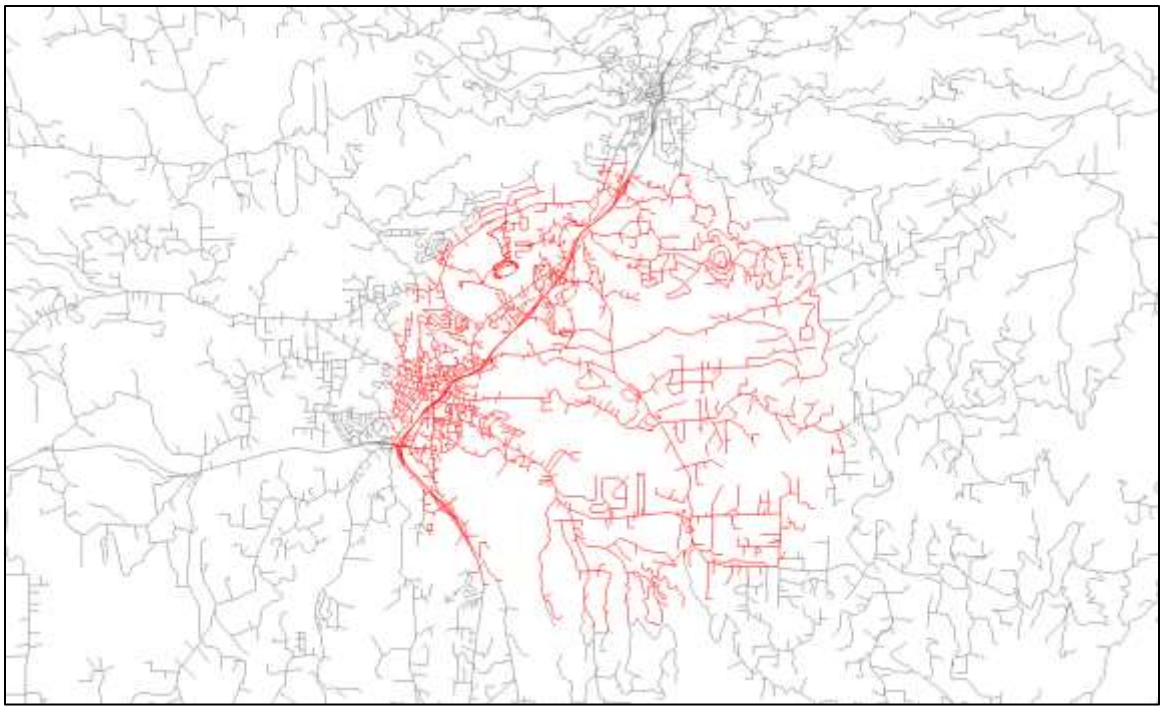


Figure 3 - Project Influence Subarea

Results

Table 2 shows the daily VMT summary for the project. Table 3 shows a summary of the daily VMT effect of the project.

TABLE 2: RISE GRASS VALLEY PROJECT GENERATED VMT SUMMARY

Metric	2012 Base Year	2035 Future Year
Total Daily Project VMT	1,637	1,538
Maximum Employees on Site (Including Centennial employees)	111	111
Daily VMT per Employee	14.7	13.9

Notes: VMT = vehicle miles traveled
Source: *Fehr & Peers, 2020*

TABLE 3: RISE GRASS VALLEY PROJECT VMT EFFECT SUMMARY		
Scenario	**2012 Base Year**	**2035 Future Year**
No Project	438,990	513,575
Plus Project	439,435	513,991
Growth	445	416

Notes: VMT = vehicle miles traveled
Source: *Fehr & Peers, 2020*