Expanded ENVIRONMENTAL CHECKLIST
Evergreen Elementary Modernization and Addition
Bethel School District #403

RCW 197-ll-960 Environmental Checklist

Purpose of Checklist:

The State Environmental Policy Act (SEPA), chapter 43.21C1 RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the agency identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the agency decide whether an EIS is required.

Instructions for Applicants:

This environmental checklist asks you to describe some basic information about your proposal. Governmental agencies use this checklist to determine whether the environmental impacts of your proposal are significant, requiring preparation of an EIS. Answer the questions briefly, with the most precise information known, or give the best description you can.

You must answer each question accurately and carefully, to the best of your knowledge. In most cases, you should be able to answer the questions from your own observations or project plans without the need to hire experts. If you really do not know the answer, or if a question does not apply to your proposal, write "do not know" or "does not apply". Complete answers to the questions now may avoid unnecessary delays later.

Some questions ask about governmental regulations, such as zoning, shoreline, and landmark designations. Answer these questions if you can. If you have problems, the governmental agencies can assist you.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Use of checklist for nonproject proposals:

Complete this checklist for nonproject proposals, even though the questions may be answered "does not apply." IN ADDITION, complete the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D).

For non-project actions, the references in the checklist to the words "project," "applicant," and "property or site" should be read as "proposal," "proposer," and "affected geographic area," respectively.

A. BACKGROUND

l. Name of proposed project, if applicable:

Evergreen Elementary School Modernization and Addition

2. Name of applicant:

Bethel School District #403
516 – 176th Street East
Spanaway, WA. 98387

3. Address and phone number of applicant and contact person:

Jeffrey D. Mann, AICP, Facilities Planner
5410 184th Street East
Puyallup, WA 98375
253.800.6776
jemann@bethelsd.org

4. Date checklist prepared:

November 6, 2023

5. Agency requesting checklist:

Pierce County and Bethel School District.

6. Proposed timing or schedule (including phasing, if applicable):

Planned construction is to begin in Spring 2024 and be completed in Fall 2025.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

Beyond the work that is proposed for this project, no future construction is currently planned to occur on the property.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

- Geotechnical Engineering Report for the Evergreen Elementary Expansion, prepared by Migizi Group, Inc., dated March 6, 2023
- Transportation Technical Report for the Evergreen Elementary School Project, prepared by Heffron Transportation, Inc., dated October 10, 2023
- Noise Assessment Report, prepared by Landau Associates, Inc., dated December 2022
- Topographic Survey, prepared by Sitts and Hill Engineers, dated April 2023

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

Other than the permits associated with this project, there are no other pending applications.

10. List any government approvals or permits that will be needed for your proposal, if known.

Pierce County Building Permit
Pierce County Site Development Permit
Tacoma Pierce County Health Department Permits for School Site & Plan Review
Tacoma Pierce County Health Department Food Establishment Permit (School Kitchen/Servery)
Washington State Department of Health – Approval letter obtained from DOH to continue use of existing LOSS system

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The proposal is to modernize and construct a new 8,929 square foot addition to the existing Evergreen Elementary School. The project includes 8-10 new classrooms, a new kitchen and commons, remodel of existing administrative areas and general building upgrades including but not limited to building systems and finishes. Frontage improvements will be included as required by Pierce County Planning and Public Works. The project will include the removal of (3) existing portables to accommodate the project including a new play shed.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

The site is located 1311 172nd St. E, Spanaway, WA 98387 (Pierce County Tax Parcel 0319273068), Section 73 Township 19 Range 03E. See Attachment B, "Vicinity Map" for location.

TO BE COMPLETED BY APPLICANT

B. ENVIRONMENTAL ELEMENTS

l. EARTH

a. General description of the site (circle one): (Flat), rolling, hilly, steep slopes, mountainous, other _____.

b. What is the steepest slope on the site (approximate percent slope)?

The site in general is relatively flat with an approximate 3 percent slope.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.

The Soils Conservation Survey (SCS) for Pierce County maps soils on the site as 41A, Spanaway gravelly, sandy loam, formed in glacial outwash.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

There are no indications or history of unstable soils identified in the Geotechnical Report.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.

Earthwork on site will include excavation and grading to accommodate the main building, new parking and playgrounds.

Maximum Depth of Excavation (Cut): 8-feet
Maximum Depth of Fill: 5-feet
Total Cut: 850 cubic yards
Total Fill: 210 cubic yards

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Yes, some customary erosion consistent with site development could occur during clearing and construction of the site. Best Management Practices described below in "1.h" will be implemented to minimize any erosion during clearing and construction.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Approximately 55% of the site will be covered with impervious surfaces at project completion.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Best Management Practices as set forth in the current Pierce County Stormwater Management and Site Development Manual will be utilized during construction. These practices may include, but are not limited to: stabilized construction entrance, temporary interceptor ditches and swales, temporary sediment traps/ponds, and silt fencing, as needed. Seasonal limitations of construction activities will

be considered and erosion and sedimentation control will be provided accordingly to allow construction to continue as needed during the wet season. All County and State requirements for wet season work will be adhered to as well as recommendations provided in the Geotechnical Report.

2. AIR

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, and industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.

Temporary increase of construction vehicle emissions and dust during construction. No industrial wood smoke or additional odors are to be generated from the work proposed on site. Emissions will be localized and dissipate within the site. There are no significant adverse impacts to air quality expected, as a result of the proposed project.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

There are no known off-site emissions or odors that would affect the project.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

No significant adverse impacts have been identified. Best Management Practices will be utilized during construction to reduce and control emissions. District vehicles and buses will meet vehicle air pollution control standards.

3. WATER
a. Surface:

l. Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

No, there are no known surface water bodies on or immediately adjacent to the site.

2. Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

No work will occur within 200 ft. of a water body.

3. Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

No fill or dredge is proposed.

4. Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

No surface water withdrawals or diversions are proposed.

5. Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

No, this proposal does not lie within a 100-year floodplain.

6. Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

No, the proposal will not discharge waste materials to surface waters. Any greases and oils from vehicular traffic in parking areas will be conducted to onsite biofiltration stormwater management systems for filtration and containment.

b. Ground:

l. Will ground water be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities, if known.

No groundwater will be withdrawn. Stormwater runoff will be discharged to the storm water quality/quantity systems in accordance with current Pierce County Stormwater Management and Site Development Manual requirements.

2. Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals; agricultural; etc.) Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

The proposed expansion and remodel of the existing Evergreen Elementary School will be served by the existing septic tank and drainfield system for the current school building. The system is a Large Operating Septic System or LOSS and was sized with sufficient capacity to accommodate both the new addition and existing school. A new collection and pump system will connect to the existing system. The new collection system and certification of capacity of the existing septic tank and drainfield system has been approved by the Washington State Department of Health.

c. Water Runoff (including stormwater):

l. Describe the source of runoff (including stormwater) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

Stormwater runoff will be generated by the new roof areas of the proposed addition. Stormwater from the site will not flow into another water body.

The soils of the site support infiltration as the primary method of stormwater management. The infiltration systems will all be designed in accordance with the Pierce County Stormwater and Site Development Manual which provides for management of water quantities as well as quality.

2. Could waste materials enter ground or surface waters? If so, generally describe.

Minimal waste materials would enter the groundwater. Bio-filtration from plant material and filtration by the upper soil levels will protect ground water.

3. Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.

No, this proposal does not/will not affect drainage patterns.

d. Proposed measures to reduce or control surface, ground, and runoff water and drainage pattern impacts, if any:

The project will employ Best Management Practices and will comply with current Pierce County Stormwater Management and Site Development Manual requirements. Measures to reduce control surface, ground and runoff water and drainage impacts are identified in Item 1 above.

4. PLANTS

a. Check or circle types of vegetation found on the site:

X_deciduous tree: alder, maple, aspen, other
X_evergreen tree: fir, cedar, pine, other
X_shrubs
X_grass
____ pasture
____ crop or grain
____ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, others
____ water plants: water lily, eelgrass, milfoil, other
____ other types of vegetation

b. What kind and amount of vegetation will be removed or altered?

The site is currently sparsely treed with mature coniferous trees along the South, West and Eastern property boundaries. Site development plans include retaining as many of the existing trees as possible. Any vegetation removal anticipated to occur will be limited to the new building addition and new parking spaces.

c. List threatened or endangered species known to be on or near the site.

There are no known threatened or endangered species on or near the site.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

The proposed project will comply with Pierce County's Tree Conservation requirements and the site will be landscaped to meet Pierce County requirements.

e. List all noxious weeds and invasive species known to be on or near the site.

There are no known noxious weeds or invasive species known to be on or near the site.

5. ANIMALS

a. Circle any birds and animals that have been observed on or near the site or are known to be on or near the site:

birds: hawk, heron, eagle, songbirds, other: Robins, Sparrows, Crows, Songbirds
mammals: deer, bear, elk, beaver, other: Rabbits, Moles
fish: bass, salmon, trout, herring, shellfish, other: None

b. List any threatened or endangered species known to be on or near the site.

There are no known threatened or endangered species on or near the site.

c. Is the site part of a migration route? If so, explain.

Yes, this site is part of the Pacific Flyway migration route.

d. Proposed measures to preserve or enhance wildlife, if any:

The landscaping plan will include plantings that incorporate native plant species such as Oregon Grape, Salal, and other flora native to the Pacific Northwest. The plantings will enhance habitat and food resources for wildlife and pollinating insects utilizing the site. Native trees are to be preserved which will enhance and provide habitat for wildlife. Best management practices to protect the retained trees and care will be taken to protect root systems.

e. List any invasive animal species known to be on or near the site.

European starling, House sparrow

6. ENERGY AND NATURAL RESOURCES

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc

Electricity is provided by Tacoma Power and is used for heating the buildings and water heating. Electrical power is used for lighting and mechanical systems. No gas is proposed.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

No, the project would not affect potential use of solar energy by adjacent properties.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

The project will comply with State Energy Code regulations.

7. ENVIRONMENTAL HEALTH

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste that could occur as a result of this proposal? If so, describe.

There are no environmental health hazards that would occur as a result of the proposed expansion and remodel of the elementary school.

1. Describe any known possible contamination at the site from present or past uses.

There is no known contamination of the site from present or past uses.

2. Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.

There are no known hazardous chemicals or conditions that might affect project development and design. There are no known hazardous liquid or gas transmission pipelines located within the project area or vicinity.

3. Describe any toxic or hazardous chemicals that might be stored, used or produced during the project's development or construction, or any time during the operating life of the project.

The project will not include any toxic or hazardous chemicals. The District's elementary school science programs do not include the use of hazardous chemicals.

4. Describe special emergency services that might be required.

There are no known special emergency services required as a result of this proposal.

5. Proposed measures to reduce or control environmental health hazards, if any.

Best Management Practices will be employed during site work and construction activities.

b. Noise

1. What types of noise exist in the area which may affect your Project (for example: traffic, equipment, operation, other)?

There is some existing noise from vehicular traffic from the adjacent streets however the school building location itself is setback from surrounding streets. The exiting noise levels have evaluated under the Tacoma-Pierce County Health Department school site plan review process and meet State Noise requirements for school siting.

2. What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

Short-term: Construction, 7:00 am to 7:00pm
Long-term: Vehicle traffic 7:00 AM to 5:30 PM & scheduled evening events such as open houses, sports events and student concerts consistent with the current use of the existing elementary school.

3. Proposed measures to reduce or control noise impacts, if any:

No proposed mitigation measures. Measures to reduce or control construction noises will be met through the application of requirements found in Pierce County, Chapter 8.76, Noise Pollution Control as applicable. There are no school operations that are expected to exceed County noise thresholds.

8. LAND AND SHORELINE USE

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.

The current use of the site that contains the existing Evergreen Elementary school is for delivering public education and instruction to the student population in the surrounding community. The site includes parking areas for student and staff as well as a bus drop-off area.

The current use of adjacent properties includes:
North - Single Family residential homes South - Single Family residential homes
East - Single Family residential homes
West - Single family residential homes
The proposed project will not affect current land uses on nearby or adjacent properties.

b. Has the project site been used as a working farmland or working forest lands? If so, describe. How much agricultural or forestland of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forestland tax status will be converted to nonfarm or nonforest use?

No, the site has not been used as working farmlands or working forestlands.

c.Will the proposal affect or be affected by surrounding working farm or forestland normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how?

This proposal will not affect, or be affected by surrounding working farm or forestland normal business operations.

c. Describe any structures on the site.

The existing Evergreen Elementary School resides on the property utilizing one main structure, six portable classroom structures, one covered play structure, emergency storage container, playgrounds and fields and a storage shed are currently on the site.

d. Will any structures be demolished? If so, what?

The existing covered play structure will be demolished and a new covered play structure will be constructed in a different location on site. The new structure will be sized similarly. Some portions of the existing building planned for improvements will require demolition for the expansion. Three existing portable classroom buildings will also be demolished or removed to accommodate the proposed project.

e. What is the current zoning classification of the site?

Moderate Density Single Family (MSF) is the current zoning classification.

f. What is the current comprehensive plan designation of the site?

The current comprehensive plan designation for the project site includes Moderate Density Single Family and the Parkland-Spanaway-Midland Communities Plan.

g. If applicable, what is the current shoreline master program designation of the site?

The project site is not located in an area with a body of water that falls within the shoreline master program jurisdiction.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify.

The Pierce County Critical Areas Checklist classifies the site as Aquifer Recharge Area as defined by the Pierce County Code Title 18E.50.

i. Approximately how many people would reside or work in the completed project?

At full utilization of the site, approximately 575 students and staff would attend and or work at the elementary school; none will reside on school campus.

j. Approximately how many people would the completed project displace?

No people will be displaced by the project.

k. Proposed measures to avoid or reduce displacement impacts, if any:

No adverse impacts have been identified, therefore, no measures are proposed.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

The project will comply with the regulations of Chapter 18J.15 Countywide Design Standards and Guidelines, and 18A.28 Parkland-Spanaway-Midland Community Plan Area Design Standards and Guidelines.

m. Proposed measures to reduce or control impacts to agricultural and forestlands of long-term commercial significance, if any:

There are no proposed measures to reduce or control impacts to agricultural or forestlands of long-term commercial significance as there are no known impacts.

9. HOUSING

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

No housing units will be provided.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

No housing units will be eliminated with this project.

c. Proposed measures to reduce or control housing impacts, if any:

No adverse impacts have been identified therefore, no measures are proposed.

10. AESTHETICS

a. What is the tallest height of any proposed structure(s), not including Antennas. What is the principal exterior building material(s) proposed?

The tallest building height of the proposed structure will not exceed the 35-foot maximum height requirements for this zone.

b. What views in the immediate vicinity would be altered or obstructed?

The project will not alter or obstruct existing views.

c. Proposed measures to reduce or control aesthetic impacts, if any:

The building will be designed in compliance with Title 18J.15 Pierce County Countywide Design Standard and the Parkland-Spanaway-Midland Communities Plan Design Standards found in Title 18J.30. Proposed landscaping will meet the applicable standards of Chapter 18.J.15 and will be compatible with and enhance the existing neighborhood. The existing trees and vegetation along the southern and eastern property lines will be maintained and provide a visual landscape barrier to surrounding residential areas.

ll. LIGHT AND GLARE

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

Parking lot lighting: immediately before and after normal school hours and during evening/weekend events. Building security lighting will be provided along the perimeter of the building.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

No, light or glare will not be a safety hazard or interfere with views.

c. What existing off-site sources of light or glare may affect your proposal?

There are no existing off-site sources of light or glare that would affect the proposal.

d. Proposed measures to reduce or control light and glare impacts, if any:

New lighting will be limited to areas of the building where expansion work is to occur. Lighting will be directional with cut off features so as to minimize spillage onto neighboring properties. Light standards will meet the 35-foot height limitation of the Countywide exterior lighting standards.

12. RECREATION

a. What designated and informal recreational opportunities are in the immediate vicinity?

The existing school provides an open field and playground facilities. Spanaway Park is located approximately 1.5 miles to the Northwest. Located adjacent to the park is Lake Spanaway Golf course. Spanaway Lake High School is located in closer proximity to the North of the site and that high school campus contains tennis courts, and running track as well as baseball and football athletic fields. The Washington State Horseman Association has a facility for equestrian related recreation, located to the South of the property.

b. Would the proposed project displace any existing recreational uses? If so, describe.

No, the project will not displace any existing recreational uses.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

No impacts have been identified therefore, no measures are proposed.

13. HISTORIC AND CULTURAL PRESERVATION

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state or local preservation registers? If so, specifically describe.

There are no known buildings or structures located on or near the site that are over forty-five years old listed in, or eligible for listing in, national, state or local preservations registers.

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources. Generally, describe any landmarks or evidence of historic, archaeological, scientific or cultural importance known to be on or next to the site.

There are no known landmarks, features or evidence of indigenous presence or historic use or occupation of this property. There are no known evidences of artifacts, or areas of cultural importance on or near the site. Finally, there are no known landmarks, evidence of historic, archaeological, scientific or cultural importance known to be on or near the site.

c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the Department of Archeology and Historic Preservation, archaeological surveys, historic maps, GIS data, etc.

The Pierce County GIS database and the Historic Register were reviewed as the methods used to assess potential impacts to cultural historic resources.

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.

No impacts have been identified, therefore, no measures are proposed.

14. TRANSPORTATION

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.

The existing Evergreen Elementary School is located at 1311 172nd St. E Pierce County. The existing school has three site access driveways. The entire building will be accessible by emergency vehicles.

b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?

The project site vicinity is not served by public transit. Pierce Transit does provide bus service within larger Pierce County; however, the closest transit stops are located 2.3 miles or more from the project site. Stops serving Pierce Transit's Route 1 are located 2.3 miles to the west on SR 7 at Military Road S; stops serving Route 4 are located 2.9 miles to the north on 112th Street E at Waller Road E.

The Bethel School District provides bus service to eligible students. Under normal operating conditions, the school is served by six full-size school buses and four SPED buses.

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?

The renovated Evergreen Elementary facility will provide an additional 20 parking spaces for staff and visitors for a total of 87 parking spaces. The proposal will not eliminate any parking stalls.
d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicated whether public or private).

The proposed project does not create traffic impacts that warrant intersection or two-way left turn improvements however other improvements may be required as determined by Pierce County Planning and Public Works.

e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

The project will not use or occur in the immediate vicinity of water, rail or air transportation.

e. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and non-passenger vehicles). What data or transportation models were used to make these estimates?

The following summarizes the analysis and conclusions of the Transportation Technical Report for the Evergreen Elementary School:

- The proposed project would renovate and expand the existing school, removing three double portables (containing six classrooms), constructing an eight-classroom addition (approximately 8,930 square feet), and making interior renovations to the existing building that would eliminate one permanent classroom.

- With the project, the school would have 30 permanent classrooms (a net increase of seven permanent classrooms) and would retain four portable classrooms (in two double portable buildings). When complete, the elementary school would have a future capacity of 714 students, which is a net permanent capacity increase of 147 students compared to the existing school's permanent capacity.

- Based on staffing at other elementary schools, the District estimates the renovated Evergreen Elementary could have up to 87 employees if the school were enrolled to its proposed capacity.

- The existing site access driveways and internal vehicular site circulation patterns would be retained.

- The main parking lot (54 stalls) and school-bus load/unload area would remain unchanged and unconnected internally to the other on-site parking and vehicular load/unload loop. The 13-stall parking area east of the school would be expanded (adding 20 stalls); the combined site would have 87 parking stalls with the project.

- Early elements of the construction effort are planned to begin in spring 2024 while students are still on campus. Students and staff would then occupy the old Naches Trail Elementary School for one school year (2024-25) while construction is completed. The renovated Evergreen Elementary School is planned to reopen in fall 2025.

- The added enrollment capacity provided by the renovation could increase volumes by 111 trips in the morning arrival peak hour, 88 trips during the afternoon dismissal peak hour, and 23 trips during the PM peak hour. See Table 2 from the Transportation Report.

Table 2. Vehicle Trip Estimates – Renovated Evergreen Elementary School

Land Use	Enrollment Capacity (students)	Daily Trips	Morning Peak Hour (7:45 – 8:45 A.M.)			Afternoon Peak Hour (2:45 – 3:45 P.M.)			PM Peak Hour		
			In	Out	Total	In	Out	Total	In	Out	Total
Elementary School Trip Rates[1]		*2.27 trips / student*	*0.75 trips / student (54% in, 46% out)*			*0.45 trips / student (46% in, 54% out)*			*0.16 trips / student (46% in, 54% out)*		
Renovated School	714	1,621	289	247	536	148	173	321	53	61	114
Existing School[2]	567	1,287	230	195	425	117	138	255	42	49	91
Net Change	**147**	**334**	**59**	**52**	**111**	**31**	**35**	**66**	**11**	**12**	**23**

Source: Heffron Transportation Inc., July 2023.

1. *ITE. Trip Generation Manual, LU 520. 11th Edition, September 2021.*
2. *Reflects enrollment capacity provided in the school's current permanent classrooms plus the four portable classrooms that would remain after the project is complete (excludes six portable classrooms that would be removed with the project).*

- One arterial intersection—172nd Street E / 22nd Avenue E—is forecast to experience net increases of 25 or more peak hour trips during the morning and afternoon peak hours.

- The forecast volumes at the school access on 172nd Street and 14th Avenue E would not meet the HRR 211 warrants for left-turn storage during either morning or afternoon peak hours—even when assuming all volumes and turns are consolidated to one location on 172nd Street E. Therefore, no left-turn storage pocket would be warranted.

- All three study intersections are forecast to remain operating at LOS A overall during both peak hour analysis periods with all movements operating at LOS D or better. Traffic generated by the proposed increase in permanent school capacity would add some delay—ranging from 0.1 to 2.8 seconds per vehicles. The proposed Evergreen Elementary School Renovation project is not expected to cause significant adverse impacts to the intersection operations.

- The estimated morning arrival queues (average of 10 vehicles and 95th-percentile of 26 vehicles) can be accommodated on site. The existing vehicle load/unload loop and queuing area provides a total of about 1,760 linear feet of queue / waiting area, which his more than published planning guidance for elementary schools (855 to 1,430 feet for a school with 714 students).

- The existing access driveway on 172nd Street E does not meet minimum County spacing requirements and it would not be possible to locate a school driveway that would meet the County's minimum spacing requirements. As a result, and because it is a long-established existing driveway, it should be permitted to remain.

- The existing access on the short dead-end segment of 14th Avenue E is also a long-established existing driveway and should be permitted to remain.

- Entering and stopping sight distances at the existing access driveways would continue to meet minimum County standards.

- County code would require a minimum of 87 parking spaces and allow a maximum of 174 parking spaces. The proposed parking supply would meet the minimum County Code requirement.

- Parking demand observations in September 2023 found a total of 62 parked vehicles resulting in a rate of 0.795-vehicles-per employee. ITE's Parking Generation rate for Elementary Schools (Land Use Code 520) is 0.95-vehicles-per-employee. At these rates, and assuming full enrollment to 714 students and 87 employees, school-day parking demand is estimated to range from 69 to 83 vehicles. With the project, the site would have 87 on-site parking spaces, which would meet the estimated demand range using the rates described.

Since the existing school would remain occupied during part of the construction effort, the following operational measure is recommended to minimize the short-term construction-related transportation impacts of the project.

Construction Transportation Management Plan (CTMP) – The District will require the selected contractor to develop a CTMP that addresses traffic and pedestrian control during construction. It would define truck routes, lane closures, walkway closures, and parking disruptions, as necessary. The CTMP may also include measures to keep adjacent streets clean on a daily basis at the truck exit points (such as street sweeping or on-site truck wheel cleaning) to reduce tracking dirt offsite. The CTMP would identify parking locations for the construction staff.

h. Proposed measures to reduce or control transportation impacts, if any:
The project would not result in significant adverse impacts to transportation facilities or operations.

15. PUBLIC SERVICES

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.

The project will not create additional need for public services. The school will serve the existing student and staff population, so no new public services will be necessary.

b. Proposed measures to reduce or control direct impacts on public services, if any.

No impacts have been identified; therefore, no measures are proposed.

16. UTILITIES

a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity that might be needed.

Utilities serving this project include: Spanaway Water Service, onsite sanitary septic system, Tacoma Power, Lemay provide waste and recycle services and there is no gas to the site.

C. Signature

The above answers are true and complete to the best of my knowledge. I understand the lead agency is relying on them to make its decision.

Signature: _____

Jeffrey D. Mann, Facilities Planner
Bethel School District

Date Signed: November 9, 2023

Attachments

A. Site Plan

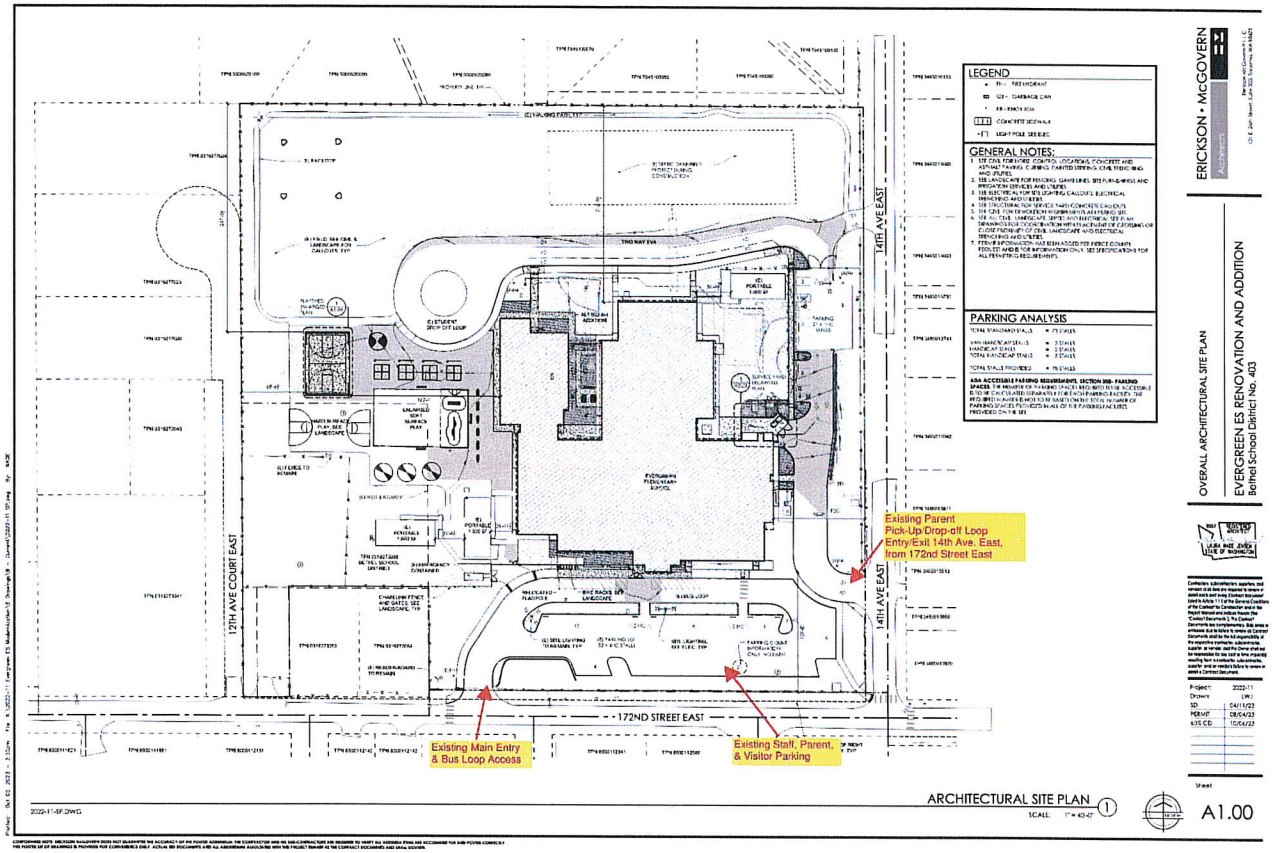
B. Vicinity Map

C. Geotechnical Engineering Report

D. Transportation Technical Report for the Bethel School District, prepared by Heffron Transportation, Inc., dated October 10, 2023

Attachments

A. Site Plan



Vicinity Map

B. Geotechnical Engineering Report

C. Transportation Technical Report

MIGIZI GROUP, INC.

PO Box 44840
Tacoma, Washington 98448

PHONE (253) 537-9400
FAX (253) 537-9401

March 6, 2023

Bethel School District
516 176th Street East
Spanaway, WA 98387
cell: (360) 584-2929
office: (253) 800-6777
camcintyr@bethelsd.org

Attention: Caitlin McIntyre, Planning and Project Coordinator

Subject: **Geotechnical Engineering Report**
Evergreen Elementary School Improvements
1311 172nd St E
Spanaway, WA
Parcel No. 0319273068

MGI Project Z0443

Dear Mr. McIntyre:

Migizi Group, Inc. (MGI) is pleased to submit this report describing the results of our geotechnical engineering evaluation of improvements proposed to the existing Evergreen Elementary School campus situated at 1311 172nd St E in Spanaway, Washington.

This report has been prepared for the exclusive use of Bethel School District, and their consultants, for specific application to this project, in accordance with generally accepted geotechnical engineering practice.

1.0 SITE AND PROJECT DESCRIPTION

The project site consists of the Evergreen Elementary School campus, which occupies 9.36 acres immediately northeast of the intersection between 12th Ave Ct E and 172nd St E towards the central portion of the political boundaries of the census-designated-place of Spanaway, Washington, as shown on the enclosed Topographic and Location Map (Figure 1). The central portion of the site is occupied by the primary 34,875 sf school building and 11,625 sf gymnasium, originally constructed in 1978. A series of portable classroom structures and a storage garage occupy regions immediately west and northeast of the school building, with the north end of the site being retained as an athletic field. The bus loop and primary parking facilities occupy the south-central portion of the site, with a secondary entrance coming from the east off 14th Ave E.

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APPENDIX A

APPENDIX B

Improvement plans involve the construction of a new 12,470 sf addition along the west of the school building, which will include commons space, a reconfigured administrative area, classrooms, and an ancillary entry. Additionally, a new student drop off / bus loop is proposed along the northeast corner of the site and expanded hard-scaped areas are proposed northwest of the school building. Site produced stormwater will be retained onsite if feasible.

2.0 EXPLORATORY METHODS

We explored surface and subsurface conditions at the project site on December 28, 2022, with a second mobilization being conducted on January 16, 2023. Our exploration and evaluation program comprised the following elements:

- Surface reconnaissance of the site,
- Four test pit explorations (designated TP-1 thru TP-4), advanced on December 28, 2022,
- Two EPA Falling Head Percolation Tests, performed towards the southwest corner and north-central portion of the site, in the vicinity of INF-1 & INF-2,
- Three monitoring well installations (designated MW-1 thru MW-3), advanced on January 16, 2023,
- Three groundwater measurements conducted on January 21, 2023, February 4, 2023 & February 17, 2023 (further bi-monthly measurements proposed through the end of April of 2023),
- One grain-size analysis conducted on a soil sample collected from our subsurface explorations, and
- A review of published geologic and seismologic maps and literature.

Table 1 summarizes the approximate functional locations and termination depths of our subsurface explorations, and Figure 2 depicts their approximate relative locations. The following sections describe the procedures used for excavation of test pits.

TABLE 1
APPROXIMATE LOCATIONS AND DEPTHS OF EXPLORATIONS

Exploration	Functional Location	Termination Depth (feet)
TP-1	Immediately west of the primary parking area	10
TP-2	Immediately south of the west endo of the existing athletic field	10
TP-3	South-central portion of the existing athletic field	10
TP-4	Northwest corner of the school campus	10
MW-1	Landscaping area towards the south-central portion of the site	25 ½
MW-2	Landscaping area towards the east-central portion of the site	26
MW-3	Northwest corner of the school campus	25 ½

The specific numbers and locations of our explorations were selected in relation to the existing site features, under the constraints of surface access, underground utility conflicts, and budget considerations.

It should be realized that the explorations performed and utilized for this evaluation reveal subsurface conditions only at discrete locations across the project site and that actual conditions in other areas could vary. Furthermore, the nature and extent of any such variations would not become evident until additional explorations are performed or until construction activities have begun. If significant variations are observed at that time, we may need to modify our conclusions and recommendations contained in this report to reflect the actual site conditions.

2.1 Test Pit Procedures

Our exploratory test pits were excavated with a rubber-tracked mini-excavator, operated by an excavation contractor under subcontract to Migizi Group, Inc. An engineering geologist from our firm observed the test pit excavations, collected soil samples, and logged the subsurface conditions.

The enclosed test pit logs indicate the vertical sequence of soils and materials encountered in each test pit, based on our field classifications. Where a soil contact was observed to be gradational or undulating, our logs indicate the average contact depth. We estimated the relative density and consistency of the in-situ soils by means of the excavation characteristics and the stability of the test pit sidewalls. Our logs also indicate the approximate depths of any sidewall caving or groundwater seepage observed in the test pits. The soils were classified visually in general accordance with the system described in Figure A-1, which includes a key to the exploration logs. Summary logs of the explorations are included as Figures A-2 through A-5.

2.2 Auger Boring Procedures

Our auger boring explorations were advanced through the soil with a hollow-stem auger, using a smaller track-mounted drill rig operated by an independent drilling firm working under subcontract to MGI. A geologist from our firm continuously observed the borings, logged the subsurface conditions, and collected representative soil samples. All samples were stored in watertight containers and later transported to a laboratory for further visual examination. After the borings were completed, the boreholes were backfilled with bentonite chips.

Throughout the drilling operation, soil samples were obtained at intervals of 2.5 to 5 feet by means of the Standard Penetration Test (SPT) per American Society for Testing and Materials (ASTM:D-1586). This testing and sampling procedure consists of driving a standard 2-inch-diameter steel split-spoon sampler 18 inches into the soil with a 140-pound hammer free-falling 30 inches. The number of blows required to drive the sampler through each 6-inch interval is counted, and the total number of blows struck during the final 12 inches is recorded as the Standard Penetration Resistance, or "SPT blow count." If a total of 50 blows are struck within any 6-inch interval, the driving is stopped, and the blow count is recorded as 50 blows for the actual penetration distance. The resulting Standard Penetration Resistance values indicate the relative density of granular soils and the relative consistency of cohesive soils.

The enclosed boring logs (Appendix A) describe the vertical sequence of soils and materials encountered in our explorations, based primarily on our field classifications, and supported by our subsequent laboratory examination and testing. Where a soil contact was observed to be gradational, our logs indicate the average contact depth. Where a soil type changed between sample intervals, we inferred the contact depth. Our logs also graphically indicate the blow count, sample type, sample number, and approximate depth of each soil sample obtained from each boring, as well as any laboratory tests performed on these soil samples. If any groundwater was encountered in the borehole, the approximate groundwater depth is depicted on the boring logs. Groundwater depth estimates are typically based on the moisture content of soil samples, the wetted height on the drilling rods, and the water level measured in the borehole after the auger has been extracted. The soils were classified visually in general accordance with the system described in Figure A-1, which includes a key to the exploration logs. Summary logs of our explorations are included as Figures A-6 and A-8.

2.3 Infiltration Test Procedures

In-situ field infiltration tests were performed for determination of a design infiltration rate in general accordance with the EPA Falling Head Percolation Test Method (as modified by Pierce County) described in the *2015 Stormwater Management & Site Development Manual* as adopted by Pierce County.

A 6-inch-diameter PVC pipe was tamped into the soil of the upper part of the infiltration layer, or as near to the upper level of the infiltration layer as safety permitted. Soil was placed and tamped outside the pipe for stabilization and to prevent upwelling of test water around the pipe. The pipe was then filled with the equivalent of at least 12 inches of water to pre-saturate the tested soils. This was performed twice, and the infiltration testing proceeded.

The pipe was then filled with an additional 12 inches of water, with measurements being taken at regular intervals to determine the field infiltration rate.

3.0 SITE CONDITIONS

The following sections present our observations, measurements, findings, and interpretations regarding surface, soil, groundwater, seismic and infiltration conditions, and liquefaction potential.

3.1 Surface Conditions

As previously indicated, the project site consists of the Evergreen Elementary School campus, which occupies 9.36 acres immediately northeast of the intersection between 12th Ave Ct E and 172nd St E towards the central portion of the political boundaries of the census-designated-place of Spanaway, Washington. The central portion of the site is occupied by the primary 34,875 sf school building and 11,625 sf gymnasium, originally constructed in 1978. A series of portable classroom structures and a storage garage occupy regions immediately west and northeast of the school building, with the north end of the site being retained as an athletic field. The bus loop and primary parking facilities occupy the south-central portion of the site, with a secondary

entrance coming from the east off 14th Ave E.
Topographically, the project area is relatively level with minimal grade change being observed over its full extent. Vegetation onsite is limited to grass fields and maintained landscaping strips along the perimeter of the site and separating drive lanes from parking facilities. Landscaping strips along the perimeter of the site contain a mature growth of fir and cedar trees, with minimal understory vegetation.

No evidence of surface hydrology was present onsite during the time of our reconnaissance, such as seeps, springs, ponds, or streams.

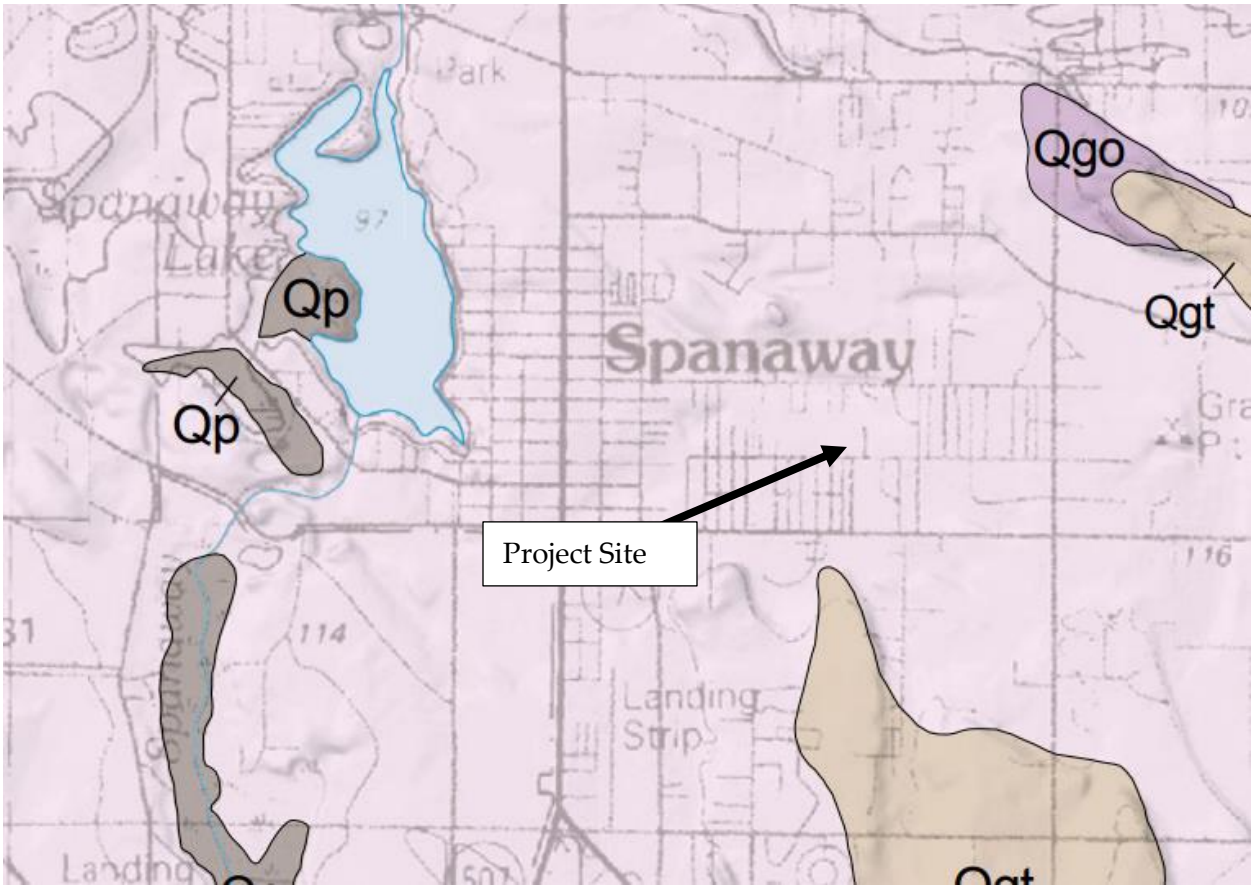
3.2 Soil Conditions

Our test pit and/or auger boring explorations revealed relatively consistent subgrade conditions across the project area, generally consisting of a surface mantle of sod and topsoil, underlain by native recessional outwash deposits.

Spanaway, and the larger Puget Sound area in general, has been glaciated a number of times over the last 2.4 million years. The most recent of these glacial events, the Vashon Stade of the Fraser Glaciation, receded from this region approximately 13,500 years ago. The majority of near surface soils encountered within the Spanaway area are either directly associated with or have been physically altered by the Vashon glacial event. Outwash soils generally consist of variably consolidated sands and gravels deposited along meltwater streams/rivers during the latter end of a glacial event, during an extended period ablation, and regression of glacial ice.

The typical soil sequence encountered in our test pit explorations contains an 18 to 24-inch black, volcanic ash-rich zone between the topsoil horizon and cleaner outwash deposits. Cleaner outwash soils generally comprised medium dense gravel with sand and some to trace silt. With depth, scattered cobbles and boulder-sized clasts were also encountered. Gravelly outwash soils were encountered through the termination of all of our test pit explorations, and through a depth of ±20 feet in the monitoring well explorations. From 20 feet below existing grade, through the termination of our monitoring well explorations (25 ½ to 26 feet), we encountered Vashon-aged glacial till soils. This soil group was comprised of very dense silty sand with gravel and is generally considered an impermeable surface in most stormwater design manuals.

In *the Geologic Map of the Tacoma 1:100,000-scale Quadrangle, Washington*, as prepared by the Washington State Department of Natural Resources (WSDNR) (2015), the project site is largely mapped as containing Qgo_{sg}, or recessional outwash, Steilacoom gravel. This soil group reportedly contains pebbles with boulders, local crossbedding; kettles and other ice-contact depressions. An excerpt from this publication is presented below:



Excerpt from the Geologic Map of the Tacoma 1:100,000-scale Quadrangle, Washington (WSDNR) (2015)

The National Cooperative Soils Survey (NCSS) for Pierce County classifies much of the site as 41A – Spanaway gravelly sandy loam, which corresponds with gravelly outwash soils. Our subsurface observations generally conform with the classifications prepared by the WSDNR and NCSS.

The enclosed exploration logs (Appendix A) provide a detailed description of the soil strata encountered in our subsurface explorations.

3.3 Groundwater Conditions

At the time of our reconnaissance and subsurface explorations (December 28, 2022 & January 16, 2023), we did not encounter groundwater seepage in any of our subsurface explorations. However, at the time of report preparation, we have conducted three series of measurements within the aforementioned monitoring wells after installation (January 21, 2023, February 4, 2023 and February 17, 2023), with waters being observed between 14.95 and 21.9 feet below existing grade, with shallowest waters being observed in the vicinity of MW-1, and the deepest waters being encountered in the vicinity of MW-3. Given the geologic setting of the project area, highly permeable gravelly outwash over relatively impermeable glacial till soils, the localized water table represents where waters are collected directly above the contact between these respective geologic units. Groundwater levels will fluctuate with localized geology and precipitation.

3.4 Seismic Conditions

The site is in the Puget Sound basin which has experienced several earthquakes. A detailed description of the regional seismicity is beyond the scope of this report; however, previous regional earthquakes can be split into two general categories: 1.) large earthquakes with a moment magnitude greater than 8.0 ($M_W > 8.0$), and 2.) modest size earthquakes with a moment magnitude generally less than 7.25 ($M_W < 7.25$). In all cases, the thickness of the soil between the bedrock and the ground surface can change (usually amplify) the seismically induced ground motions and therefore the inertial loads acting on surface structures.

"Site Class" is a classification system used by the IBC and ASCE 7 to provide some insight to the potential for ground motion amplification. The site class is based on the properties of the upper 100 feet of the soil and rock materials at the site. MGI used a combination of onsite explorations and our review of the geologic mapping of the site to derive a site class for the site. Based on evaluation and the definitions of Site Class as provided in Table 20.3-1 of ASCE 7-16 (as required by the 2018 International Building Code), the soil conditions on this site satisfy the definition of Site Class D – Stiff Soils. Our evaluation assumes the soil conditions encountered in the bottom of our explorations, and those from nearby properties, are similar to or increasing in density/consistency down to 100 feet below ground surface.

The 2018 IBC considers earthquake shaking to have a 2 percent probability of exceedance in 50 years (i.e. a 2475-year return period), as the code-based design requirement. Using the third-party graphical user interface tools made available by the USGS at https://seismicmaps.org, MGI derived the design ground motions to be used for design of the structures. Our evaluation used ASCE 7-16 as the code reference, Risk Category I/II/III, and Site Class D (Stiff Soils). The results of our evaluation are provided in Table 2 (below).

TABLE 2
SEISMIC DESIGN PARAMETERS

Parameter	Value	Basis
Site Class	D	Table 20.3-1 of ASCE 7-16
S_S	1.296	seismicmaps.org
F_a	1.0[A]	seismicmaps.org
S_{MS}	1.296	= $F_a \cdot S_S$, 2018 IBC Eqn. 16-36
S_{DS}	0.864	= $^2/_3$ S_{MS}, 2018 IBC Eqn. 16-38
S_1	0.452	seismicmaps.org
F_V	1.85 [B, C]	2018 IBC
S_{M1}	0.836 [B, C]	= $F_V \cdot S_1$, 2018 IBC Eqn. 16-37
S_{D1}	0.557 [B, C]	= $^2/_3$ S_{M1}, 2018 IBC Eqn. 16-39
PGA	0.5g	seismicmaps.org
PGA_M	0.55g	seismicmaps.org
T_0	-- [C]	Not applicable

T_S	-- [C]	Not applicable
T_L	6 sec.	seismicmaps.org

Notes:
A. Use the value provided unless the simplified design procedure of ASCE 7 Section 12.14 is used. If this occurs, please contact our office for more information.
B. Based on Table 1613.2.3(2) of the 2018 IBC – An ASCE 7-16 Chapter 21 analysis has not been performed.
C. More detailed seismic design criteria are available upon request. Please contact MGI's office for more information.

3.5 Liquefaction Potential

Liquefaction is a sudden increase in pore water pressure and a sudden loss of soil shear strength caused by shear strains, as could result from an earthquake. Research has shown that saturated, loose, fine to medium sands with a fines (silt and clay) content less than about 20 percent are most susceptible to liquefaction. Subsurface explorations performed within the confines of the project area did not encounter any saturated, loosely consolidated sandy soils, and we interpret the potential for seismically induced liquefaction to be low within the subject property.

3.6 Infiltration Conditions

As indicated in the *Soil Conditions* section of this report, the project area is overlain by mixed volcanic ash and glacial outwash that is poorly permeable. Underlying this horizon, we encountered very rapidly permeable, gravelly recessional glacial outwash that contains few fines. This soil group, we found, is substantial enough, and contains adequate separation from both impermeable surfaces and groundwater to support retention of site produced stormwater.

On December 28, 2022, an engineering geologist from MGI performed field infiltration testing using the procedures noted at the onset of this report. The field tests (INF-1 & INF-2) were performed towards the southwest corner and north-central portion of the site, adjacent to test pit explorations TP-1 and TP-3, as indicated in the attached Figure 2. As described in the *Infiltration Test Procedures* section of this report, given the rapidly permeable nature of site soils, during tests INF-1 & INF-2, we were unable to develop water head in our field infiltration testing. As such, after the requisite saturation period, we recorded the amount of time it took to infiltrate a 12-inch water column at each test location. Three trials were performed at each location, with the average results of our testing being displayed in Table 3 (below):

TABLE 3
FIELD INFILTRATION TEST RESULTS

Test Number	Location	Depth of Test (feet)	Average Time to Infiltrate 12-inch Water Column (min)
INF-1	Southwest corner of the project area, adjacent to TP-1	3	2.65
INF-2	North-central portion of the site, adjacent to TP-3	3	2.51

The rates listed above correspond with a field infiltration rate of 287 inches per hour and 272 inches per hour, respectively, for INF-1 and INF-2. These values are further modified to produce a long-term infiltration rate through the application of a number of safety factors. The design rate

is determined by the formula $I_{design} = I_{measured} \times F_{testing} \times F_{geometry} \times F_{plugging}$. I_{design} is the maximum Design Infiltration Rate and $I_{measured}$ is the field infiltration rate. $F_{testing}$ is a safety factor that accounts for uncertainties in the testing method and is accepted as $F_{testing}$ =0.50. $F_{geometry}$ is a safety factor that accounts for the influence of facility geometry and depth to the water table or impervious strata on the actual infiltration rate and is determined by the following equation: $F_{geometry} = 4\ D/W + 0.05$ where D = depth from the bottom of the proposed facility to the maximum wet season water table or nearest impervious layer, whichever is less and W = width of facility. $F_{plugging}$ is a safety factor that accounts for reductions in infiltration rates over the long term due to plugging of soils. This factor is:

- 0.7 for loams and sandy loams
- 0.8 for fine sands and loamy sands
- 0.9 for medium sands
- 1.0 for coarse sands or cobbles.

Given the high field infiltration rates we received while conducting our infiltration testing, we would default to the maximum Design Infiltration Rate allowable by Pierce County, which is **30 inches per hour**. This value corresponds with the native, gravelly, recessional outwash deposits.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Improvement plans involve the construction of a new 12,470 sf addition along the west of the school building, which will include commons space, a reconfigured administrative area, classrooms, and an ancillary entry. Additionally, a new student drop off / bus loop is proposed along the northeast corner of the site and expanded hard-scaped areas are proposed northwest of the school building. Site produced stormwater will be retained onsite if feasible.

The 2021 edition of the *Pierce County Stormwater Management and Site Development Manual* should be used for design of onsite infiltration facilities. Pierce County has adopted the 2018 IBC with local amendments for building design.

We offer the following recommendations:

- Feasibility: Based on our field explorations, research and evaluations, the proposed structures and pavements appear feasible from a geotechnical standpoint.
- Foundation Options: Foundation elements should be constructed on medium dense or denser undisturbed native soils, or on structural fill bearing pads that extend down to medium dense or denser native soils. We anticipate that adequate bearing soils will be encountered at relatively shallow depths (less than 2 feet) across much of the proposed building area. We do not foresee the need for any localized over-excavations. Recommendations for spread footings are provided in Section 4.2.
- Floor Options: Floor sections should bear on medium dense or denser native soils or on properly compacted structural fill that extends down to medium dense or denser native soils. We anticipate that adequate bearing soils will be encountered at relatively shallow depths (less than 2 feet) at the proposed building area, and we do not foresee the need for

a granular fill subbase. Recommendations for slab-on-grade floors are included in Section 4.3. Fill underlying floor slabs should be compacted to 95 percent (ASTM:D-1557).

- Pavement Sections: Native, in-situ soil conditions are amenable to the use of soil-supported pavements. We recommend a conventional pavement section comprised of an asphalt concrete pavement over a crushed rock base course over a properly prepared (compacted) subgrade or a granular subbase, depending on subgrade conditions during pavement subgrade preparation.

  All soil subgrades should be thoroughly compacted, then proof-rolled with a loaded dump truck or heavy compactor. Any localized zones of yielding subgrade disclosed during this proof-rolling operation should be over-excavated to a depth of 12 inches and replaced with a suitable structural fill material.

- Infiltration Conditions: The entirety of the site is underlain by rapidly permeable gravelly outwash soils. Additionally, groundwater is encountered at a sufficient depth below the proposed improvement areas so as to not adversely impact the retention of site produced stormwater. We recommend that retention facilities utilizing native gravelly outwash soils be designed using a long-term infiltration rate of **30 inches per hour** based upon field infiltration testing.

- Geologic Hazards: During our site reconnaissance, advancement of subsurface explorations, and general evaluation of the proposed development, we did not observe any erosional, landslide, seismic, settlement, or other forms of geologic hazards within the subject property. Given this fact, we recommend that no buffers, setbacks, or other forms of site restraints be implemented to address these potential hazards.

The following sections of this report present our specific geotechnical conclusions and recommendations concerning site preparation, spread footings, slab-on-grade floors, retaining walls, pavement, and structural fill. The Washington State Department of Transportation (WSDOT) Standard Specifications and Standard Plans cited herein refer to WSDOT publications M41-10, Standard Specifications for Road, Bridge, and Municipal Construction, and M21-01, Standard Plans for Road, Bridge, and Municipal Construction, respectively.

4.1 Site Preparation

Preparation of the project site should involve erosion control, temporary drainage, clearing, stripping, excavations, cutting, subgrade compaction, and filling.

Erosion Control: Before new construction begins, an appropriate erosion control system should be installed. This system should collect and filter all surface water runoff through silt fencing. We anticipate a system of berms and drainage ditches around construction areas will provide an adequate collection system. Silt fencing fabric should meet the requirements of WSDOT Standard Specification 9-33.2 Table 3. In addition, silt fencing should embed a minimum of 6 inches below existing grade. An erosion control system requires occasional observation and maintenance. Specifically, holes in the filter and areas where the filter has shifted above ground surface should be replaced or repaired as soon as they are identified.

Temporary Drainage: We recommend intercepting and diverting any potential sources of surface or near-surface water within the construction zones before stripping begins. Because the selection of an appropriate drainage system will depend on the water quantity, season, weather conditions, construction sequence, and contractor's methods, final decisions regarding drainage systems are best made in the field at the time of construction. Based on our current understanding of the construction plans, surface and subsurface conditions, we anticipate that curbs, berms, or ditches placed around the work areas will adequately intercept surface water runoff.

Clearing and Stripping: After surface and near-surface water sources have been controlled, sod, topsoil, and root-rich soil should be stripped from the site. Our explorations and field observations indicate that the organic horizon can reach thicknesses upwards of 5 inches thick across the project area.

Site Excavations: Based on our explorations, we expect that excavations will encounter medium dense to dense gravelly soils which can be easily excavated using standard excavation equipment.

Dewatering: At the time of report preparation, we have conducted three series of measurements within the aforementioned monitoring wells after installation (January 21, 2023, February 4, 2023, and February 17, 2023), with waters being observed between 14.95 and 21.9 feet below existing grade, with shallowest waters being observed in the vicinity of MW-1, and the deepest waters being encountered in the vicinity of MW-3. Given such, we do not believe that groundwater will be encountered in most project excavations, nor be a limiting factor in the proposed development. If groundwater is encountered, we anticipate that an internal system of ditches, sumpholes, and pumps will be adequate to temporarily dewater shallow excavations.

Temporary Cut Slopes: At this time, final designs and construction sequencing have not been completed. To facilitate project planning, we provide the following general comments regarding temporary slopes:

- All temporary soil slopes associated with site cutting or excavations should be adequately inclined to prevent sloughing and collapse,
- Temporary cut slopes in site soils should be no steeper than 1½H:1V, and
- Temporary slopes should conform to Washington Industrial Safety and Health Act (WISHA) regulations.

These general guidelines are necessarily somewhat conservative (steeper temporary slopes may be possible). As the project progresses, temporary grading plans are developed, final site features are better defined, and a contractor is engaged, MGI may modify these general guidelines to allow steeper slopes.

Subgrade Compaction: Exposed subgrades for the foundations of the planned structures should be compacted to a firm, unyielding state before new concrete or fill soils are placed. Any localized zones of looser granular soils observed within a subgrade should be compacted to a density

commensurate with the surrounding soils. In contrast, any organic, soft, or pumping soils observed within a subgrade should be over-excavated and replaced with a suitable structural fill material.

Site Filling: Our conclusions regarding the reuse of onsite soils and our comments regarding wet-weather filling are presented subsequently. Regardless of soil type, all fill should be placed and compacted according to our recommendations presented in the Structural Fill section of this report. Specifically, building pad fill soil should be compacted to a uniform density of at least 95 percent (based on ASTM:D-1557).

Onsite Soils: We offer the following evaluation of these onsite soils in relation to potential use as structural fill:

- *Surficial Organic Soil and Organic-Rich Topsoil:* Where encountered, surficial organic soils, like duff, topsoil, root-rich soil, and organic-rich fill soils, are *not* suitable for use as structural fill under any circumstances, due to high organic content. Consequently, this material can be used only for non-structural purposes, such as in landscaping areas.
- *Volcanic Ash/Glacial Outwash Mix*: The black mix of volcanic ash and glacial outwash that overlies the site can be reused as structural fill during dry weather conditions. It will be difficult to reuse as structural fill during wet weather due to moisture sensitivity. In our opinion, these soils have a CBR classification of 5.
- *Gravelly Glacial Outwash:* The gravelly volcanic-ash free glacial outwash which underlies the black mix of volcanic ash and glacial outwash is relatively insensitive to moisture content variations and can be reused year-round, provided particles larger than 6 inches are removed. In our opinion, these soils have a CBR classification of 15.

Permanent Slopes: All permanent cut slopes and fill slopes should be adequately inclined to reduce long-term raveling, sloughing, and erosion. We generally recommend that no permanent slopes be steeper than 2H:1V. For all soil types, the use of flatter slopes (such as 2½H:1V) would further reduce long-term erosion and facilitate revegetation.

Slope Protection: We recommend that a permanent berm, swale, or curb be constructed along the top edge of all permanent slopes to intercept surface flow. Also, a hardy vegetative groundcover should be established as soon as feasible, to further protect the slopes from runoff water erosion. Alternatively, permanent slopes could be armored with quarry spalls or a geosynthetic erosion mat.

4.2 Spread Footings

In our opinion, conventional spread footings will provide adequate support for the proposed school buildings if the subgrades are properly prepared. We offer the following comments and recommendations for spread footing design.

Footing Depths and Widths: For frost and erosion protection, the bases of all exterior footings should bear at least 18 inches below adjacent outside grades, whereas the bases of interior

footings need bear only 12 inches below the surrounding slab surface level. To reduce post-construction settlements, continuous (wall) and isolated (column) footings should be at least 18 and 24 inches wide, respectively.

Bearing Subgrades: Footings should bear on dense or denser, undisturbed native soils which have been stripped of surficial organic soils and vigorously surface compacted, or on properly compacted structural fill which bears on the soils just described.

In general, before footing concrete is placed, any localized zones of loose soils exposed across the footing subgrades should be compacted to a firm, unyielding condition, and any localized zones of soft, organic, or debris-laden soils should be over excavated and replaced with suitable structural fill.

Lateral Over excavations: Because foundation stresses are transferred outward as well as downward into the bearing soils, all structural fill placed under footings, should extend horizontally outward from the edge of each footing. This horizontal distance should be equal to the depth of placed fill. Therefore, placed fill that extends 24 inches below the footing base should also extend 24 inches outward from the footing edges.

Subgrade Observation: All footing subgrades should consist of firm, unyielding, native soils, the existing medium dense or denser gravelly fill, or structural fill materials that have been compacted to a density of at least 95 percent (based on ASTM:D-1557). Footings should never be cast atop loose, soft, or frozen soil, slough, debris, existing uncontrolled fill, or surfaces covered by standing water.

Bearing Pressures: In our opinion, for static loading, footings that bear on dense properly prepared subgrades can be designed for a maximum allowable soil bearing pressure of 3,000 psf. A one-third increase in allowable soil bearing capacity may be used for short-term loads created by seismic or wind related activities.

Footing Settlements: Assuming that structural fill soils are compacted to a dense or denser state, we estimate that total post-construction settlements of properly designed footings bearing on properly prepared subgrades will not exceed 1 inch. Differential settlements for comparably loaded elements may approach one-half of the actual total settlement over horizontal distances of approximately 50 feet.

Footing Backfill: To provide erosion protection and lateral load resistance, we recommend that all footing excavations be backfilled on both sides of the footings and stem walls after the concrete has cured. Either imported structural fill or non-organic onsite soils can be used for this purpose, contingent on suitable moisture content at the time of placement. Regardless of soil type, all footing backfill soil should be compacted to a density of at least 90 percent (based on ASTM:D-1557).

Lateral Resistance: Footings that have been properly backfilled as recommended above will resist lateral movements by means of passive earth pressure and base friction. We recommend using an allowable passive earth pressure of 250 psf for both the glacial outwash and fill on site and an allowable base friction coefficient of 0.35 for both soil types.

4.3 Slab-On-Grade Floors

In our opinion, soil-supported slab-on-grade floors can be used in structures if the subgrades are properly prepared. We offer the following comments and recommendations concerning slab-on-grade floors.

Floor Subbase: Generally, structural fill subbases do not appear to be needed under soil-supported slab-on-grade floors. Surface compaction of slab subgrades is recommended. If a subbase is required, it should be compacted to a density of at least 95 percent (based on ASTM:D-1557).

Capillary Break: To retard the upward wicking of moisture beneath the floor slab, we recommend that a capillary break be placed over the subgrade. Ideally, this capillary break would consist of a 4-inch-thick layer of pea gravel or other clean, uniform, well-rounded gravel, such as "Gravel Backfill for Drains" per WSDOT Standard Specification 9-03.12(4). Alternatively, angular gravel or crushed rock can be used if it is sufficiently clean and uniform to prevent capillary wicking.

Vapor Barrier: We recommend that a layer of durable plastic sheeting (such as Crosstuff, Moistop, or Visqueen) be placed directly between the capillary break and the floor slab to prevent ground moisture vapors from migrating upward through the slab. During subsequent casting of the concrete slab, the contractor should exercise care to avoid puncturing this vapor barrier.

4.4 Asphalt Pavement

Since asphalt pavements will be utilized along the proposed bus loops and automobile parking regions adjacent to the proposed school campus, we offer the following comments and recommendations for pavement design and construction.

Subgrade Preparation: All soil subgrades should be thoroughly compacted, then proof-rolled with a loaded dump truck or heavy compactor. Any localized zones of yielding subgrade disclosed during this proof-rolling operation should be over excavated to a maximum depth of 12 inches and replaced with a suitable structural fill material. All structural fill should be compacted according to our recommendations given in the Structural Fill section. Specifically, the upper 2 feet of soils underlying pavement section should be compacted to at least 95 percent (based on ASTM D-1557), and all soils below 2 feet should be compacted to at least 90 percent.

Pavement Materials: For the base course, we recommend using imported washed crushed rock, such as "Crushed Surfacing Base Course" per WSDOT Standard Specification 9-03.9(3) but with a fines content of less than 5 percent passing the No. 200 Sieve. Although our explorations do not indicate a need for a pavement subbase, if a subbase course is needed, we recommend using imported, clean, well-graded sand and gravel such as "Ballast" or "Gravel Borrow" per WSDOT Standard Specifications 9-03.9(1) and 9-03.14, respectively.

Conventional Asphalt Sections: A conventional pavement section typically comprises an asphalt concrete pavement over a crushed rock base course. We recommend using the following conventional pavement sections:

	Minimum Thickness		
Pavement Course	**Automobile Parking Area**	**Driveways**	**Areas Subject to Frequent Truck/Bus Traffic**
Asphalt Concrete Pavement	2 inches	3 inches	4 inches
Crushed Rock Base	4 inches	6 inches	8 inches
Granular Fill Subbase (if needed)	6 inches	12 inches	12 inches

Compaction and Observation: All subbase and base course material should be compacted to at least 95 percent of the Modified Proctor maximum dry density (ASTM D-1557), and all asphalt concrete should be compacted to at least 92 percent of the Rice value (ASTM D-2041). We recommend that an MGI representative be retained to observe the compaction of each course before any overlying layer is placed. For the subbase and pavement course, compaction is best observed by means of frequent density testing. For the base course, methodology observations and hand-probing are more appropriate than density testing.

Pavement Life and Maintenance: No asphalt pavement is maintenance-free. The above-described pavement sections present our minimum recommendations for an average level of performance during a 20-year design life; therefore, an average level of maintenance will likely be required. Furthermore, a 20-year pavement life typically assumes that an overlay will be placed after about 10 years. Thicker asphalt and/or thicker base and subbase courses would offer better long-term performance but would cost more initially; thinner courses would be more susceptible to "alligator" cracking and other failure modes. As such, pavement design can be considered a compromise between a high initial cost and low maintenance costs versus a low initial cost and higher maintenance costs.

4.5 Structural Fill

The term "structural fill" refers to any material placed under foundations, retaining walls, slab-on-grade floors, sidewalks, pavements, and other structures. Our comments, conclusions, and recommendations concerning structural fill are presented in the following paragraphs.

Materials: Typical structural fill materials include clean sand, gravel, pea gravel, washed rock, crushed rock, well-graded mixtures of sand and gravel (commonly called "gravel borrow" or "pit-run"), and miscellaneous mixtures of silt, sand, and gravel. Recycled asphalt, concrete, and glass, which are derived from pulverizing the parent materials, are also potentially useful as structural fill in certain applications. Utilizing recycled content may require approval from the Tacoma Pierce County Health Department for placement in an aquifer recharge area. Soils used for structural fill should not contain any organic matter or debris, nor any individual particles greater than about 6 inches in diameter.

Fill Placement: Clean sand, gravel, crushed rock, soil mixtures, and recycled materials should be placed in horizontal lifts not exceeding 8 inches in loose thickness, and each lift should be thoroughly compacted with a mechanical compactor.

Compaction Criteria: Using the Modified Proctor test (ASTM:D-1557) as a standard, we recommend that structural fill used for various onsite applications be compacted to the following minimum densities:

Fill Application	Minimum Compaction
Footing subgrade and bearing pad	95 percent
Foundation backfill	90 percent
Slab-on-grade floor subgrade and subbase	95 percent
Asphalt pavement base and subbase	95 percent
Asphalt pavement subgrade (upper 2 feet)	95 percent
Asphalt pavement subgrade (below 2 feet)	90 percent

Subgrade Observation and Compaction Testing: Regardless of material or location, all structural fill should be placed over firm, unyielding subgrades prepared in accordance with the *Site Preparation* section of this report. The condition of all subgrades should be observed by geotechnical personnel before filling or construction begins. Also, fill soil compaction should be verified by means of in-place density tests performed during fill placement so that adequacy of soil compaction efforts may be evaluated as earthwork progresses.

Soil Moisture Considerations: The suitability of soils used for structural fill depends primarily on their grain-size distribution and moisture content when they are placed. As the "fines" content (that soil fraction passing the U.S. No. 200 Sieve) increases, soils become more sensitive to small changes in moisture content. Soils containing more than about 5 percent fines (by weight) cannot be consistently compacted to a firm, unyielding condition when the moisture content is more than 2 percentage points above or below optimum. For fill placement during wet-weather site work, we recommend using "clean" fill, which refers to soils that have a fines content of 5 percent or less (by weight) based on the soil fraction passing the U.S. No. 4 Sieve.

5.0 RECOMMENDED ADDITIONAL SERVICES

Because the future performance and integrity of the structural elements will depend largely on proper site preparation, drainage, fill placement, and construction procedures, monitoring and testing by experienced geotechnical personnel should be considered an integral part of the construction process. Subsequently, we recommend that MGI be retained to provide the following post-report services:

- Review all construction plans and specifications to verify that our design criteria presented in this report have been properly integrated into the design,
- Prepare a letter summarizing all review comments (if required),
- Check all completed subgrades for footings and slab-on-grade floors before concrete is poured, in order to verify their bearing capacity, and

- Prepare a post-construction letter summarizing all field observations, inspections, and test results (if required).

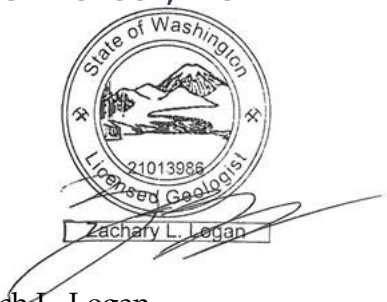
6.0 CLOSURE

The conclusions and recommendations presented in this report are based, in part, on the explorations that we observed for this study; therefore, if variations in the subgrade conditions are observed at a later time, we may need to modify this report to reflect those changes. Also, because the future performance and integrity of the project elements depend largely on proper initial site preparation, drainage, and construction procedures, monitoring and testing by experienced geotechnical personnel should be considered an integral part of the construction process. MGI is available to provide geotechnical monitoring of soils throughout construction.

We appreciate the opportunity to be of service on this project. If you have any questions regarding this report or any aspects of the project, please feel free to contact our office.

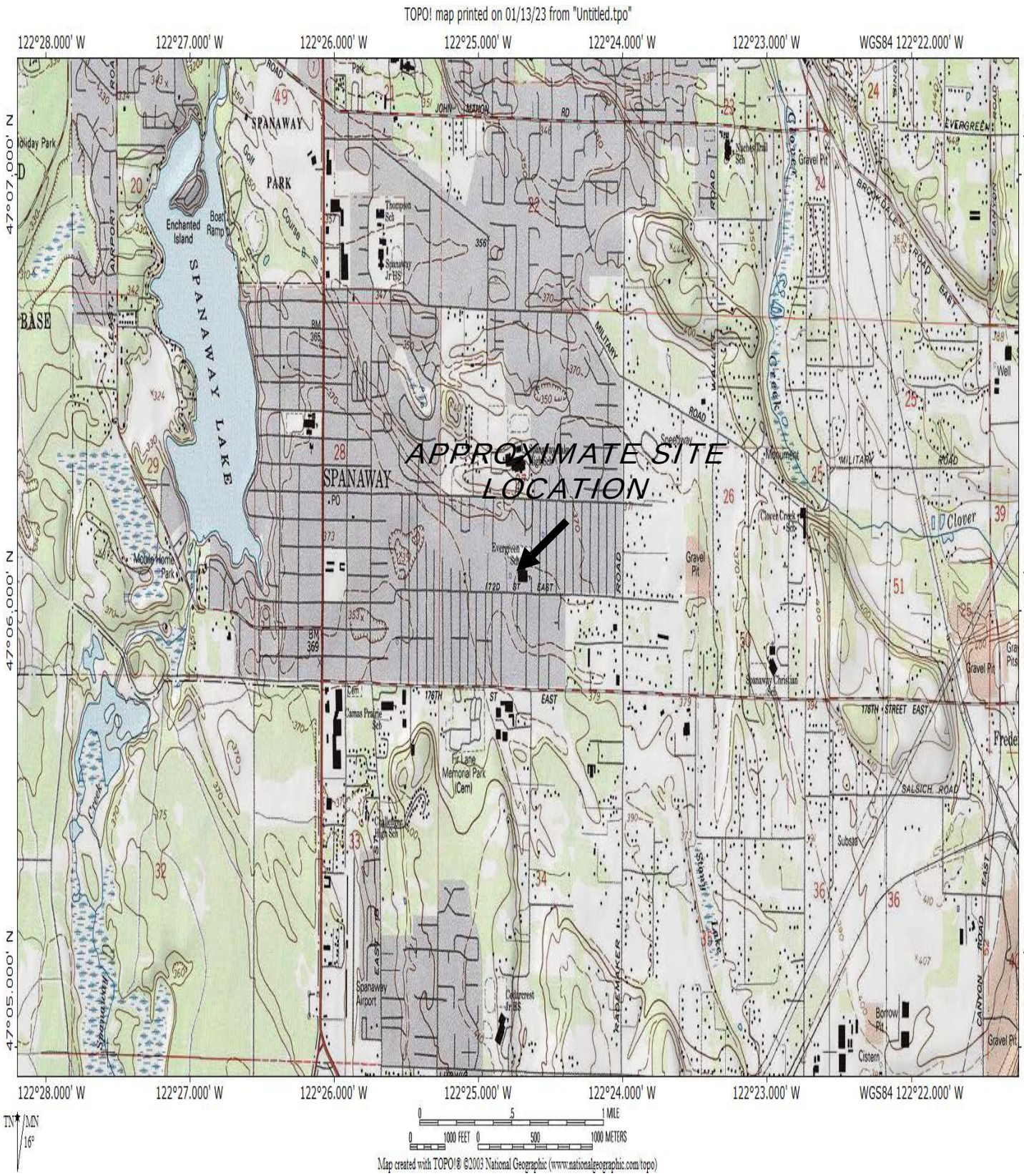
Respectfully submitted,

MIGIZI GROUP, INC.



Zach L. Logan
Senior Staff Geologist

James E. Brigham, P.E.
Senior Principal Engineer



MIGIZI GROUP	Location **1311 172nd St E** **Spanaway, WA 98387**	Job Number **Z0443**	Figure **1**
P.O. Box 44840 **Tacoma, WA 98448**	Title **Topographic and Location Map**		Date **01/13/23**

TEST PIT LOCATION
TP-1

INFILTRATION TEST LOCATION
INF-1

BORING LOCATION
MW-1

NOTE:
BOUNDARY AND TOPOGRAPHY ARE BASED ON MAPPING PROVIDED TO MIGIZI OBSERVATIONS MADE IN THE FIELD. THE INFORMATION SHOWN DOES NOT CONSTITUTE A FIELD SURVEY BY MIGIZI.

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PROJECT:	1311 172nd Street East Spanaway, Washington 98387
SHEET TITLE:	Site and Exploration Plan
DESIGNER: JRB	JOB NO. Z0443
DRAWN BY: JRB	SCALE: NTS
CHECKED BY: JEB	FIGURE: 2
DATE: Jan. 23, 2023	FILE: Fig2.dwg

APPENDIX A
SOIL CLASSIFICATION CHART AND KEY TO TEST DATA

LOG OF TEST PITS
&
LOG OF AUGER BORINGS

MAJOR DIVISIONS				TYPICAL NAMES
COARSE GRAINED SOILS More than Half > #200 sieve	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH OVER 15% FINES	GM	SILTY GRAVELS, POORLY GRADED GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 15% FINES	SM	SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE GRAINED SOILS More than Half < #200 sieve	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

	Modified California	RV	R-Value
	Split Spoon	SA	Sieve Analysis
	Pushed Shelby Tube	SW	Swell Test
	Auger Cuttings	TC	Cyclic Triaxial
	Grab Sample	TX	Unconsolidated Undrained Triaxial
	Sample Attempt with No Recovery	TV	Torvane Shear
CA	Chemical Analysis	UC	Unconfined Compression
CN	Consolidation	(1.2)	(Shear Strength, ksf)
CP	Compaction	WA	Wash Analysis
DS	Direct Shear	(20)	(with % Passing No. 200 Sieve)
PM	Permeability		Water Level at Time of Drilling
PP	Pocket Penetrometer		Water Level after Drilling(with date measured)

SOIL CLASSIFICATION CHART AND KEY TO TEST DATA

Figure A-1

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TEST PIT NUMBER TP-1

Figure A-2

CLIENT Bethel School District
PROJECT NAME Evergreen Elementary School Improvements
PROJECT NUMBER Z0443
PROJECT LOCATION 1311 172nd St E, Spanaway, WA 98387
DATE STARTED 12/28/22 **COMPLETED** 12/28/22
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR Paulman
GROUND WATER LEVELS:
EXCAVATION METHOD Rubber Tracked Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY RVCB **CHECKED BY** JEB
AT END OF EXCAVATION ---
NOTES
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				
			0.3	Topsoil and sod
		SP		(SP) Black gravelly sand (loose, damp)
			1.2	
		GP		(GP) Orange/brown sandy gravel (loose, damp)
			2.0	
2.5	GB S-1			(GP) Tan sandy gravel (loose to medium dense, damp to moist)
5.0		GP		
7.5				
10.0			10.0	

No caving observed
No groundwater observed

The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

Bottom of test pit at 10.0 feet.

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TEST PIT NUMBER TP-2

Figure A-3

CLIENT Bethel School District
PROJECT NAME Evergreen Elementary School Improvements
PROJECT NUMBER Z0443
PROJECT LOCATION 1311 172nd St E, Spanaway, WA 98387
DATE STARTED 12/28/22 **COMPLETED** 12/28/22
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR Paulman
GROUND WATER LEVELS:
EXCAVATION METHOD Rubber Tracked Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY RVCB **CHECKED BY** JEB
AT END OF EXCAVATION ---
NOTES
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				
			0.3	Black gravelly topsoil
		GP		(GP) Black sandy gravel with some large roots and organics (medium dense, damp)
			2.0	
2.5				(GP) Tan sandy gravel (loose to medium dense, damp to moist)
				Large cobbles observed with depth
5.0		GP		
7.5				
10.0			10.0	

No caving observed
No groundwater observed

The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

Bottom of test pit at 10.0 feet.

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TEST PIT NUMBER TP-3

Figure A-4

CLIENT Bethel School District
PROJECT NAME Evergreen Elementary School Improvements
PROJECT NUMBER Z0443
PROJECT LOCATION 1311 172nd St E, Spanaway, WA 98387
DATE STARTED 12/28/22 **COMPLETED** 12/28/22
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR Paulman
GROUND WATER LEVELS:
EXCAVATION METHOD Rubber Tracked Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY RVCB **CHECKED BY** JEB
AT END OF EXCAVATION ---
NOTES
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				
			0.3	Sod and topsoil
		GP		(GP) Black gravel with sand (medium dense, damp) Large cobbles observed below 1 foot
			1.5	
2.5	GB S-1	GP		(GP) Tan sandy gravel (medium dense, damp)
5.0				
			6.0	
		GP		(GP) Tan gravel with sand (loose, damp to moist)
7.5				
10.0			10.0	

Minor caving observed below 6 feet
No groundwater observed

The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

Bottom of test pit at 10.0 feet.

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TEST PIT NUMBER TP-4

Figure A-5

CLIENT Bethel School District
PROJECT NAME Evergreen Elementary School Improvements
PROJECT NUMBER Z0443
PROJECT LOCATION 1311 172nd St E, Spanaway, WA 98387
DATE STARTED 12/28/22 **COMPLETED** 12/28/22
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR Paulman
GROUND WATER LEVELS:
EXCAVATION METHOD Rubber Tracked Mini Excavator
AT TIME OF EXCAVATION ---
LOGGED BY RVCB **CHECKED BY** JEB
AT END OF EXCAVATION ---
NOTES _____
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0				
			0.3	Sod and topsoil
		GP		(GP) Black gravel with sand (medium dense, damp)
2.5			2.5	Large cobbles observed below 2 feet
		GP		(GP) Tan sandy gravel (medium dense, damp)
5.0			5.5	Grades to loose
		GP		(GP) Tan fine to coarse gravel with sand (loose, damp)
7.5				
10.0			10.0	

Minor caving observed below 5 feet
No groundwater observed

The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

Bottom of test pit at 10.0 feet.

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BORING NUMBER MW-1

Figure A-6

CLIENT Bethel School District
PROJECT NAME Evergreen Elementary School Improvements
PROJECT NUMBER Z0443
PROJECT LOCATION 1311 172nd St E, Spanaway, WA 98387
DATE STARTED 1/16/23 **COMPLETED** 1/16/23
GROUND ELEVATION _____ **HOLE SIZE** 4.25" HSA
DRILLING CONTRACTOR Holocene Drilling
GROUND WATER LEVELS:
DRILLING METHOD Track Drill Rig
AT TIME OF DRILLING ---
LOGGED BY RVCB **CHECKED BY** JEB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD)	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0						0.3 Surface crushed rock
				GP		(GP) Brown sandy gravel
						2.5
	SS S-1	7	12-21-30 (51)	GP		(GP) Brown gravel with sand (dense, damp)
5						5.0
	SS S-2	6	8-20-24 (44)	GP		(GP) Gray gravel with sand (dense, damp)
						7.5
	SS S-3	1	23-34-45 (79)	GP		(GP) Gravel (rock chips from drilling through rock) (very dense, damp)
10						10.0
	SS S-4	7	31-32-37 (69)	GP		(GP) Gray large gravel with sand (very dense, damp)
15						15.0
	SS S-5	11	22-37 (50/5")	GP		(GP) Gray sandy gravel (very dense, damp)
20						20.0
	SS S-6	10	44 (50/5")	SM		(SM) Gray silty sand with gravel (very dense, wet)
25						25.4
	SS S-7	3	(50/5")			Bottom of borehole at 25.4 feet.

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BORING NUMBER MW-2

Figure A-7

CLIENT Bethel School District
PROJECT NAME Evergreen Elementary School Improvements
PROJECT NUMBER Z0443
PROJECT LOCATION 1311 172nd St E, Spanaway, WA 98387
DATE STARTED 1/16/23 **COMPLETED** 1/16/23
GROUND ELEVATION _____ **HOLE SIZE** 4.25" HSA
DRILLING CONTRACTOR Holocene Drilling
GROUND WATER LEVELS:
DRILLING METHOD Track Drill Rig
AT TIME OF DRILLING ---
LOGGED BY RVCB **CHECKED BY** JEB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD)	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0						0.3 Sod over gravel
				GP		(GP) Dark brown gravel with sand (loose, damp)
	SS S-1	3	4-7-4 (11)			
5						5.0
	SS S-2	3	4-3-3 (6)	GP		(GP) Tan medium gravel with sand (loose, damp)
						7.5
	SS S-3	8	36-14-23 (37)	GP		(GP) Gray/tan sandy gravel (dense, damp)
10						10.0
	SS S-4	8	13-21-16 (37)	GP		(GP) Gray sandy gravel (dense, damp)
15						
	SS S-5	8	32 (50/6")			
20						20.0
	SS S-6	14	14-36 (50/5.5")	SM		(SM) Gray silty sand with gravel (very dense, wet)
25						25.0
	SS S-7	12	16 (50/6")	SM		(SM) Brown/gray silty sand with gravel (very dense, wet)
						26.0

Bottom of borehole at 26.0 feet.

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BORING NUMBER MW-3

Figure A-8

CLIENT Bethel School District
PROJECT NAME Evergreen Elementary School Improvements
PROJECT NUMBER Z0443
PROJECT LOCATION 1311 172nd St E, Spanaway, WA 98387
DATE STARTED 1/16/23 **COMPLETED** 1/16/23
GROUND ELEVATION _____ **HOLE SIZE** 4.25" HSA
DRILLING CONTRACTOR Holocene Drilling
GROUND WATER LEVELS:
DRILLING METHOD Track Drill Rig
AT TIME OF DRILLING ---
LOGGED BY RVCB **CHECKED BY** JEB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY (in) (RQD)	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					0.3	Sod over gravel
						(GP) Tan sandy gravel (medium dense, damp)
	SS S-1	10	9-13-15 (28)	GP		
5					5.0	
	SS S-2	7	6-9-8 (17)	GP		(GP) Tan gravel with sand (medium dense, damp)
					7.5	
	SS S-3	6	16-18-29 (47)	GP		(GP) Tan sandy gravel (dense, damp)
10					10.0	
	SS S-4	1	22-21-24 (45)	GP		(GP) Gravel (only rock chips) (dense, damp)
15						
	SS S-5	0	11-16-12 (28)			No recovery
20					20.0	
	SS S-6	10	26 (50/4")	SM		(SM) Gray silty sand with gravel (very dense, damp)
25					25.3	
	SS S-7	1	(50/3")			Bottom of borehole at 25.3 feet.

TRANSPORTATION TECHNICAL REPORT

for the

Evergreen Elementary School Renovation

PREPARED FOR:

Bethel School District

PREPARED BY:

heffron transportation inc

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October 10, 2023

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1. INTRODUCTION

This transportation technical report presents the traffic impact analysis for the Bethel School District's (District) proposed improvements at Evergreen Elementary School. This report describes the existing and proposed conditions in the site vicinity, projected trip generation and distribution patterns, and operational analysis at County-defined study-area intersections, including the site access driveways.

The Bethel School District retained Heffron Transportation, Inc. to prepare the required traffic and transportation analyses for the project. Heffron Transportation, Inc. is a professional traffic and transportation engineering consulting firm located and incorporated in the State of Washington. The analysis and report documentation were prepared by:

Tod S. McBryan, P.E., Principal & Vice President
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Mr. McBryan is a Principal Transportation Engineer and Professional Civil Engineer licensed in the State of Washington with 32 years of experience preparing traffic impact analyses. He is also a member of the Institute of Transportation Engineers (ITE) and the Transportation Research Board (TRB).

The scope of the analysis, study area, and key assumptions were coordinated with the Pierce County (County) Traffic Section staff, including through submittal of *Transportation Analysis Scoping*[1] information and the County's revised scoping response memorandum issued by Traffic Section staff.[2] Further input about scope and methodology was received in a follow-up correspondence.[3]

2. PROJECT IDENTIFICATION

2.1. Existing Evergreen Elementary School

Evergreen Elementary School is located at 1311 - 172nd Street E in the Spanaway area of unincorporated Pierce County. The existing school was constructed in 1979 with 23 classrooms, which provided capacity of 25 students per classroom for a total of 575 students at that time. Based on data in the District's *2023-2028 Capital Facilities Plan (CFP)*,[4] Evergreen Elementary School still has 23 permanent classrooms; however, due to new state requirements for smaller class sizes and all-day kindergarten, the District updated its standards to be consistent with current state requirements. As a result, the school currently has capacity for 483 students in the 23 permanent building classrooms (assuming 21 students per classroom), plus capacity for another 210 students in 10 portable classrooms (five double portable buildings). In total, the elementary school currently has total student capacity of 693 students. In addition, there is one portable building that houses an Early Head Start home-based program for children between birth and three years olds. This existing portable hosts playgroups and group stabilization for home play a few times per month and does not accommodate daily activity. Since it does not belong to the district and is not used daily, it does not factor into the capacity of the elementary school. For the 2022-23 school year,

1 Heffron Transportation, Inc., June 21, 2022.
2 *Bethel SD - Evergreen ES Site Renovation Traffic Assessment (TA) Revised Scoping Request*, B. Churchill, P.E., Assoc. County Traffic Engr., March 8, 2023.
3 Email communication, K. Leingang, Traffic Section, Pierce County Planning & Public Works, March 27, 2023.
4 Bethel School District, October 2023.

there were 539 students enrolled at the school; since 2009, enrollment has averaged about 530 students.[5] The school has 78 employees (including 3 part-time)[6] and school hours for the 2022-23 school year were 8:35 A.M. to 3:05 P.M. District Transportation staff indicated that in spring 2023, the school was served by 5 (full-size 40-foot) general education school buses and 3 (smaller 25-foot) special education (SPED) school buses.[7]

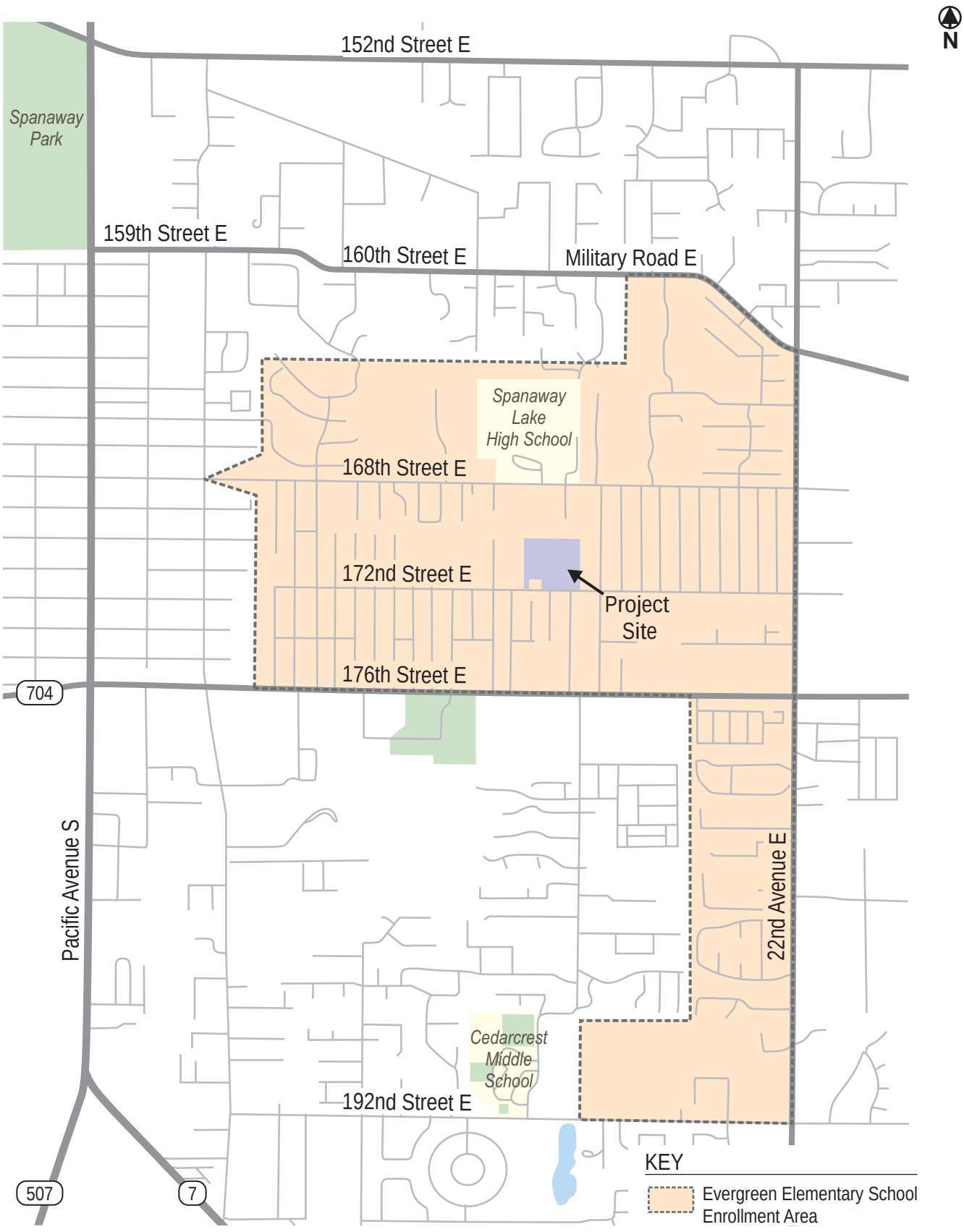
The existing school site has one driveway on 172nd Street E (offset just to the west of 13th Avenue E) and two driveways on 14th Avenue E. The access on 172nd Street E is the primary driveway serving staff and visitor parking as well as school-bus access and egress. School buses currently enter the site through the parking lot, and then loop to the load/unload curb adjacent to the south side of the school building. Parent drop-off-and pick-up occurs on the east side of the building, and is accessed via a long internal driveway along the east and north sides of the school. There is a circular turn-around at the end of this driveway. Parents currently enter this internal access drive from the segment of 14th Avenue E that connects to 172nd Street E (this segment of 14th Avenue E dead-ends about 230 feet north of 172nd Street). While there is another driveway (northeast driveway) that connects this internal drive to the north segment of 14th Avenue E (that ends about 850 feet south of 168th Street E), this driveway is gated and remains closed to vehicle traffic on school days. Figure 1 shows the site location and vicinity of the existing school.

2.2. Proposed Evergreen Elementary School Renovations

The proposed project would renovate and expand the existing school. It would remove three double portables (containing six classrooms), construct an eight-classroom addition (approximately 8,930 square feet), and make interior renovations to the existing building that would eliminate one permanent classroom. With the project, the school would have 30 permanent classrooms (a net increase of seven permanent classrooms) and would retain four portable classrooms (in two double portable buildings). The ECEAP program would also be retained within its existing portable. When complete, the elementary school would have a future capacity of 714 students. This reflects a net permanent capacity increase of 147 students and a reduction in portable classroom capacity of 126 students. For the purposes of this transportation analysis, the net increase in permanent capacity is 147 students. Based on staffing at other elementary schools, the District estimates the renovated Evergreen Elementary could have up to 87 employees if the school were enrolled to its proposed capacity, a net increase of nine employees compared to current conditions.[8] School hours (8:35 A.M. to 3:05 P.M.) are not expected to change with the project.

District Transportation staff indicated that, due to ongoing bus-driver shortages, the walk boundary for the school was modified for the 2023-24 school year and transportation services have been re-optimized for the site. Based on these changes and in the short-term, District Transportation staff indicated the site would be served by three full-size, 40-foot general education school buses and two smaller 25-foot, special-education (SPED) school buses if enrolled to its proposed capacity of 714 students.[9] However, for the purposes of this longer-term analysis and to reflect worst-case conditions, the higher number of buses that had served the site in spring 2023 (5 general education and 3 SPED) was assumed for future conditions.

5 Washington Office of Superintendent of Public Instruction (OSPI), Washington State Report Card, 2009 to 2023.
6 Email communication, C. McIntyre, Bethel School District, July 28, 2023.
7 Email communication, C. McIntyre, Bethel School District, July 27, 2023.
8 Ibid.
9 Ibid.



BETHEL SCHOOL DISTRICT
Evergreen Elementary School Renovation

Figure 1

Site Location and Vicinity

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The existing site access driveways and internal vehicular site circulation patterns would be retained. Family-vehicle drop-off/pick-up would continue to occur using the driveway on the short dead-end segment of 14th Avenue E that extends north from 172nd Street E. All other vehicular access (school buses and staff and visitor parking) would continue from the main driveway on 172nd Street E (just west of 13th Avenue E). The northeast emergency-maintenance access-only driveway on 14th Avenue E would remain, but continue to be gated. The main parking lot (54 stalls) and school-bus load/unload area would remain unchanged and unconnected internally to the other on-site parking and vehicular load/unload loop. The parking area east of the school would be expanded to provide 33 staff parking stalls (an addition of 20 stalls); the combined site would have 87 parking stalls with the project. Figure 2 shows the proposed site plan with the building and parking additions.

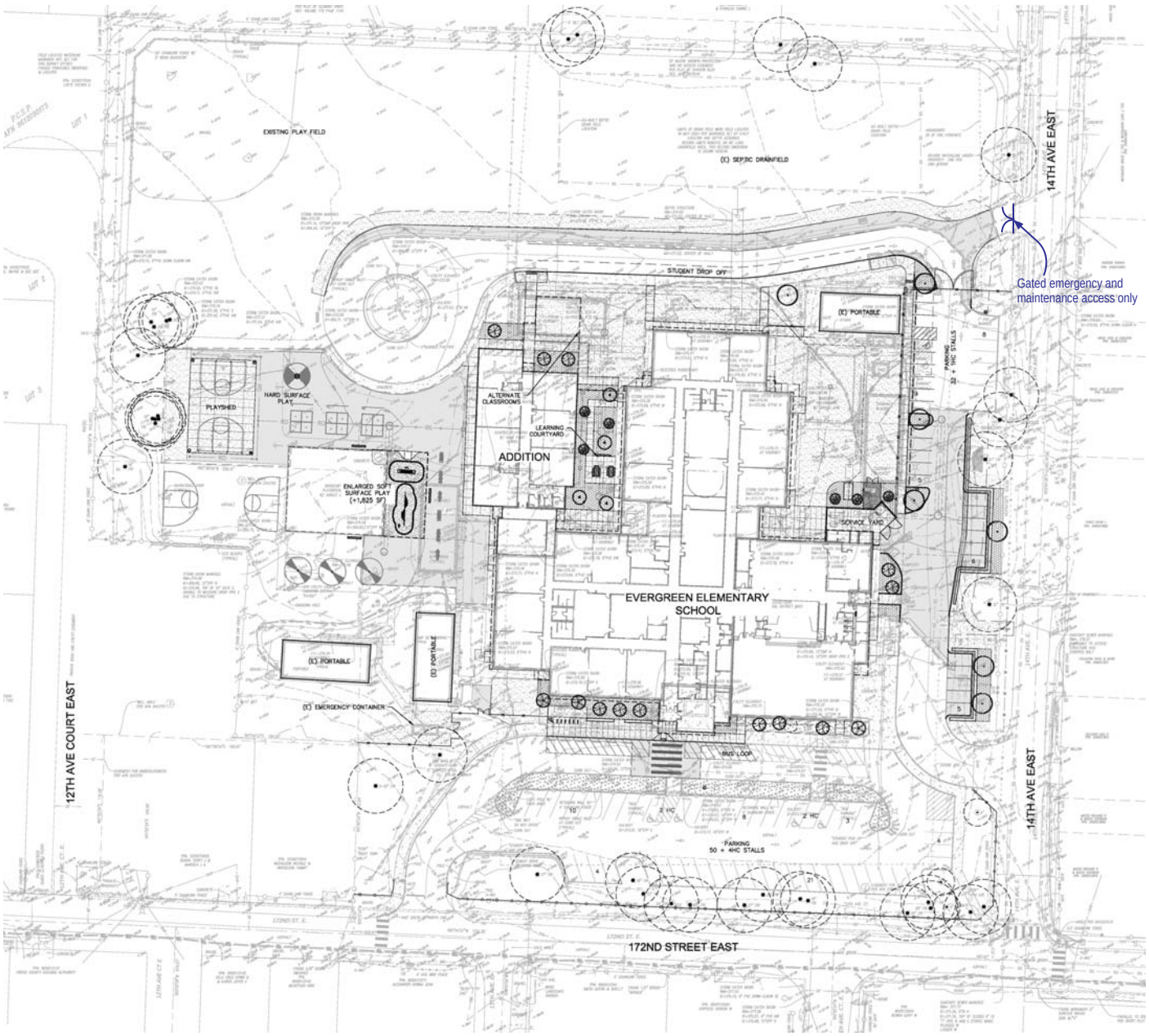
Early elements of the construction effort are planned to begin in spring 2024 while students are still on campus. Students and staff would then occupy the old Naches Trail Elementary School for one school year (2024-25) while construction is completed. The renovated Evergreen Elementary School is planned to reopen in fall 2025.

2.3. Analysis Study Area and Time Periods

County staff requested operational analysis at the 172nd Street E / 22nd Avenue E intersection as well as the site access driveways and "*all arterial intersections through which at least 500 trips of development traffic pass during the peak hour (AM or PM).*" The operational analysis of site access includes the main school access on 172nd Street E as well as the 172nd Street E / 14th Avenue E intersection, which serves as the primary access for family-vehicle pick-up and drop-off trips. There are no arterial intersections through which at least 500 trips of development traffic would pass. The operational analysis is provided in Section 6 of this report.

Although the school renovation project is expected to be complete and occupied by fall 2025, Pierce County requires the transportation analysis horizon year to be at least five years from the date of the traffic study. Therefore, year 2028 was selected as the horizon year for all analyses completed for the morning (arrival) and afternoon (dismissal) peak hours.

At the time of data collection for this analysis (May 2023), Evergreen Elementary School hours were 8:35 A.M. to 3:05 P.M. and traffic counts conducted at the school found the peak hours to be 7:45 to 8:45 A.M. for morning arrival and 2:45 to 3:45 P.M. for afternoon dismissal. These times were used for the analysis. It is noted that for the 2023-24 school year, the District shifted school hours for Evergreen Elementary by 10 minutes to 8:45 A.M. to 3:15 P.M.



Source: Erickson McGovern Architects and Fora Landscape Architects, October 2023. Annotation at north access on 14th Ave E by Heffron Transportation, Inc., October 2023.

BETHEL SCHOOL DISTRICT
Evergreen Elementary
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Figure 2

Proposed Site Plan

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3. SITE INVENTORY

The school site is bounded by 172nd Street E on the south, 14th Avenue E on the east, and by private residential parcels on the west and north. This section describes the existing roadway network, traffic volumes, traffic operations (in terms of levels of service), transit facilities, and non-motorized facilities.

3.1. Existing Roadway Network

The County has four primary roadway classifications—Major Arterials, Secondary Arterials, Collector Arterials, and Local Roads depending upon the street's function in the roadway network.[10] The key roadways in the vicinity of the project site and the analysis study area are described below.

172nd Street E is an east-west oriented Urban Collector Arterial that connects between 5th Avenue E on the west and 22nd Avenue E on the east. Near the site, it has two travel lanes (one in each direction) and gravel shoulders of varying widths on both sides. The posted speed limit is 25 mph; however, there is a school zone (20 mph) speed limit east and west of the school in effect when children are present. Its approaches to 22nd Avenue E are stop-sign controlled.

14th Avenue E is a Local Road that provides for discontinuous north-south access. Near the site there are two segments of the roadway separated by an unimproved segment about 180-feet long and planted with a number of tall evergreen trees. The south segment extends north about 130 feet from 172nd Street E and provides access to a school driveway on the west and three homes on the east. Its approach to 172nd Street E is stop-controlled. The north segment extends south about 850 feet from 168th Street E. Both segments have dead-ends with no outlet at the unimproved segment.

22nd Avenue E is a north-south oriented Urban Secondary Arterial that connects between State Route (SR) 7 on the south and 152nd Street E on the north. In the vicinity of the site, it has two travel lanes (one in each direction) and intermittent segments of asphalt and gravel shoulders of varying widths on both sides. The posted speed limit is 35 mph.

3.2. Future Roadway Network

Pierce County's *Adopted 2023-2028 Transportation Improvement Program (TIP)*[11] was reviewed to determine if there are any planned transportation improvements that would affect the study area intersection. No projects were identified that would change the existing roadway operations or capacity of the study area intersections along 172nd Street E. Therefore, the existing geometry and traffic control were assumed to be in place for future-without-project conditions described.

3.3. Transit Facilities and Service

The project site vicinity is not directly served by public transit. Pierce Transit provides bus service within larger Pierce County; however, the closest transit stops are located about 1.5 miles to the west of the school site on Pacific Avenue S at 168th Street E. School bus service was previously described in Section 2.

3.4. Non-Motorized Transportation Facilities

As described above, the study area roadways near the school site have gravel and/or intermittent paved shoulders of variable widths, but no sidewalks or bicycle facilities. There are marked crosswalks at the 172nd Street E / 14th Avenue E intersections (across the north and east legs).

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[10] Pierce County website (www.co.pierce.wa.us/2731/Arterial-Classifications), *Exhibit "A" of Ordinance No. 2015-23*, last updated 2017, accessed November 2020.

[11] Exhibit "A" to Ordinance No. 2022-65s, Effective December 11, 2022.

4. EXISTING AND HORIZON YEAR TRAFFIC

4.1. Existing Traffic Volumes

New video turning movement counts were conducted at key intersections near the project site for use in the project traffic distribution, assignments, and operational analysis. The counts were conducted on Thursday, May 4 and Tuesday, May 9, 2023[12] from 7:00 to 9:00 A.M. and 2:30 to 4:30 P.M. to capture data during the morning arrival and afternoon dismissal peak hours. Table 1 lists the study-area traffic data compiled and used for this analysis to evaluate the school's morning and afternoon peak hours (as described above). Traffic count data sheets used for this project are provided in Appendix A.

Table 1. Traffic Count Data

Location	Day, Date	Count Periods	Source
172nd Street E / Evergreen Elementary Main Access	Thursday, May 4, 2023 Tuesday, May 9, 2023	7:00 to 9:00 A.M. 2:30 to 4:30 P.M.	Heffron Transportation, Inc. / Idax Data Solutions
172nd Street E / 14th Avenue E	Thursday., May 4, 2023	7:00 to 9:00 A.M. 2:30 to 4:30 P.M.	Heffron Transportation, Inc. / Idax Data Solutions
172nd Street E / 15th Avenue E	Thursday., May 4, 2023	7:00 to 9:00 A.M. 2:30 to 4:30 P.M.	Heffron Transportation, Inc. / Idax Data Solutions
172nd Street E / 22nd Avenue E	Tuesday, May 9, 2023	7:00 to 9:00 A.M. 2:30 to 4:30 P.M.	Heffron Transportation, Inc. / Idax Data Solutions

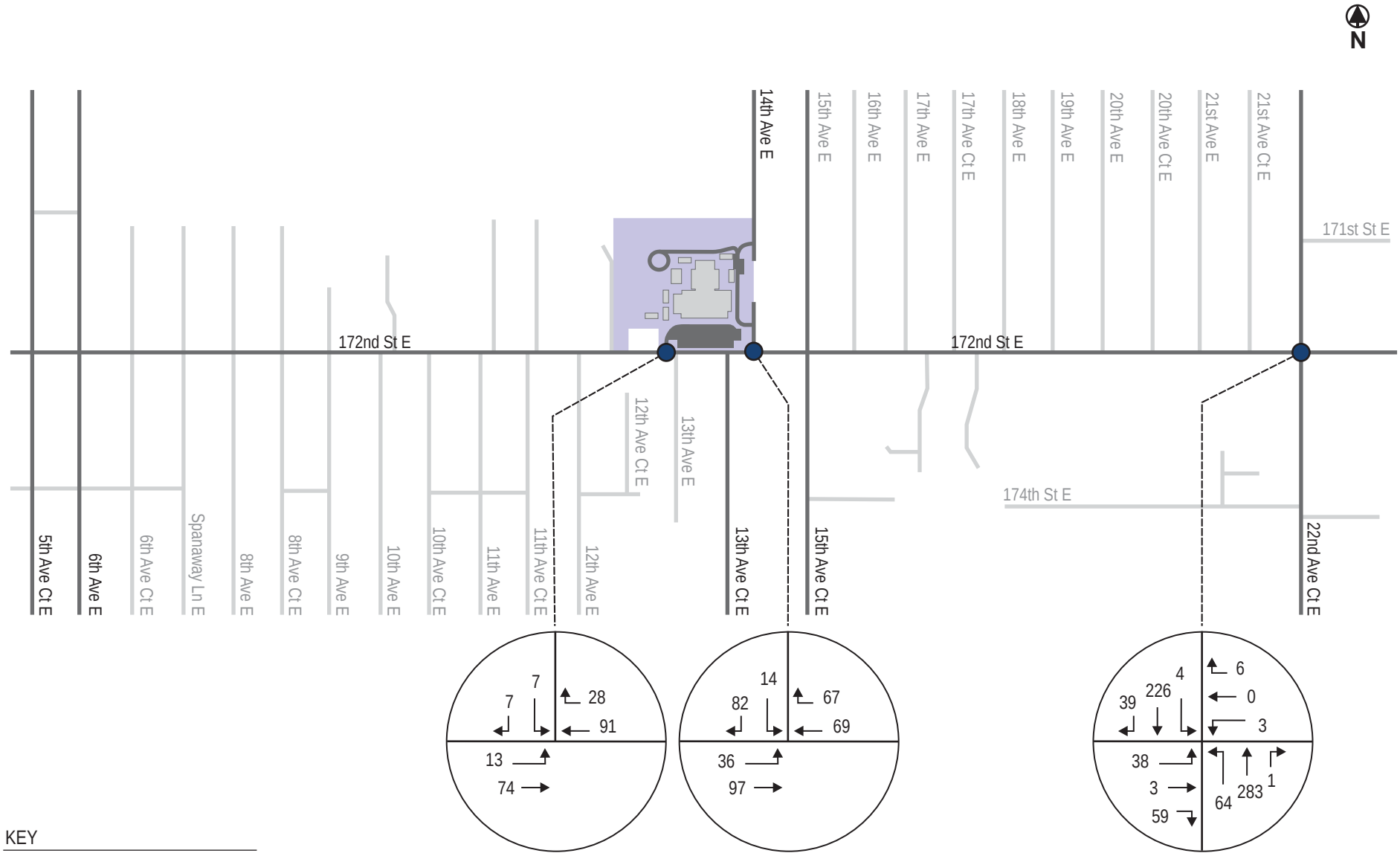
The school's morning peak hour was observed to occur from 7:45 to 8:45 A.M.; the school's afternoon peak hour occurred from 2:45 to 3:45 P.M. Figure 3 and Figure 4 show the existing (2023) traffic volumes in the project study area for the morning and afternoon peak hours, respectively.

4.2. Forecast Without-Project Traffic Volumes

The proposed Evergreen Elementary School Renovation is planned to be complete by fall 2025. However, Pierce County requires the transportation analysis horizon year to be five years from the date of the traffic study. Therefore, year 2028 was selected as the horizon year. For comparison, and to provide an analysis of potential new traffic impacts associated with the proposal, year 2028 without-project conditions assume the existing Evergreen Elementary School would be occupied and enrolled to a capacity of 567 students (the capacity of the existing 23 permanent classrooms plus the 4 portables that are planned to remain on site and 28 more students than were enrolled at the time of the traffic counts in May 2023).

Traffic forecasts were developed for future 2028-without-project conditions based on guidance provided by the County during analysis scoping. As directed by County staff, a 2.5% compound annual growth rate was applied to the existing 2023 non-school volumes at the study-area intersection to reflect 2028-without-project traffic estimates for each analysis period. School traffic was increased separately to reflect conditions with the school operating at its current permanent capacity plus the four portable classrooms that would remain—a total existing capacity of 567 students using published ITE trip generation rates described in the following section. No pipeline development traffic was identified by the County for inclusion in the forecasts. Figure 5 and Figure 6 show the forecast 2028 without-project peak hour traffic volumes at the study-area intersections for the morning and afternoon peak hours, respectively.

[12] Due to a counter equipment malfunction at the 172nd St E / 22nd Ave E intersection during the May 4 counts, it was re-counted on May 9 along with the 172nd St E / Main School access intersection.



BETHEL SCHOOL DISTRICT
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School Renovation

Figure 3
Existing (2023) Traffic Volumes
Morning Peak Hour

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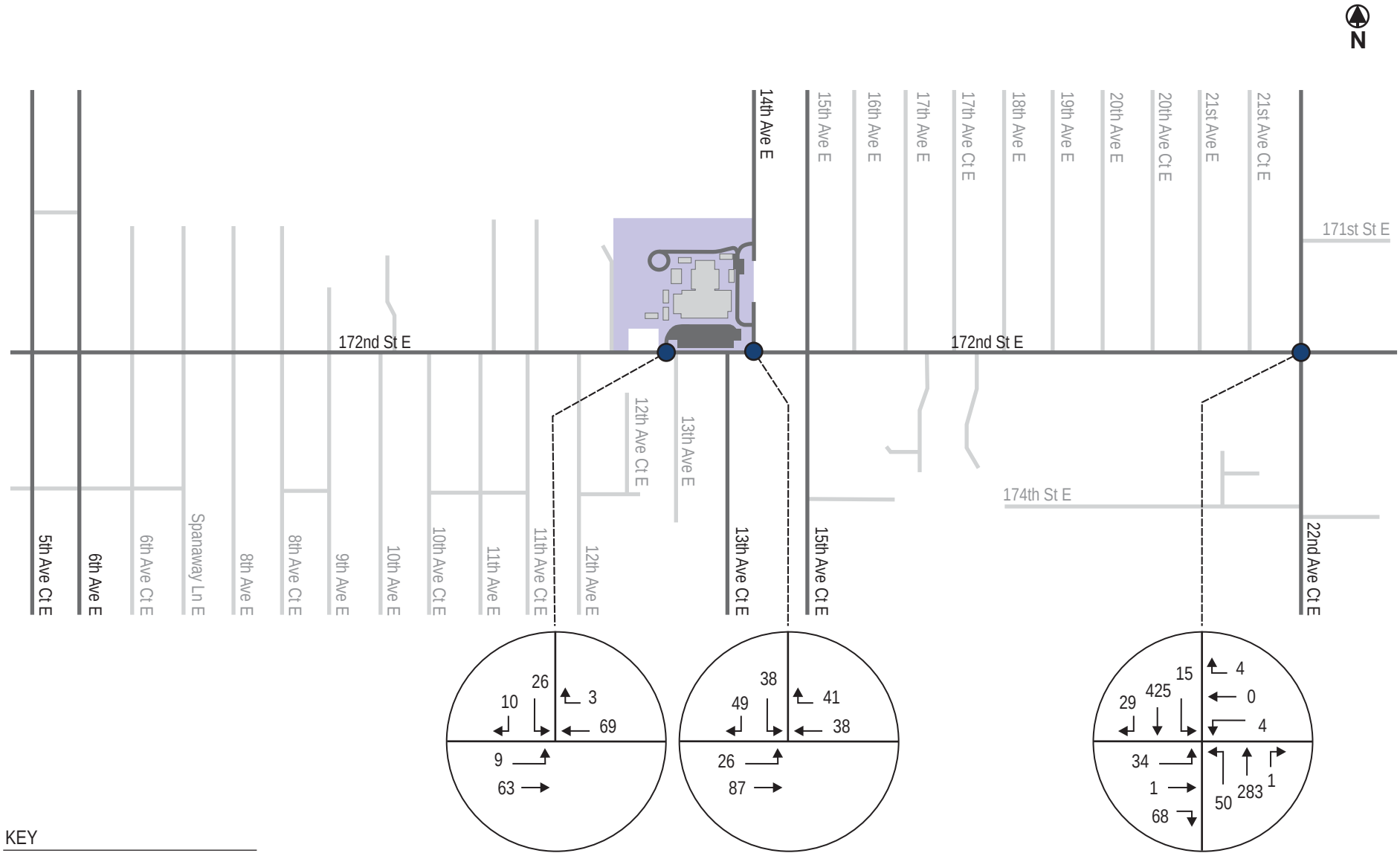

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Figure 4
Existing (2023) Traffic Volumes
Afternoon Peak Hour

heffron transportation inc

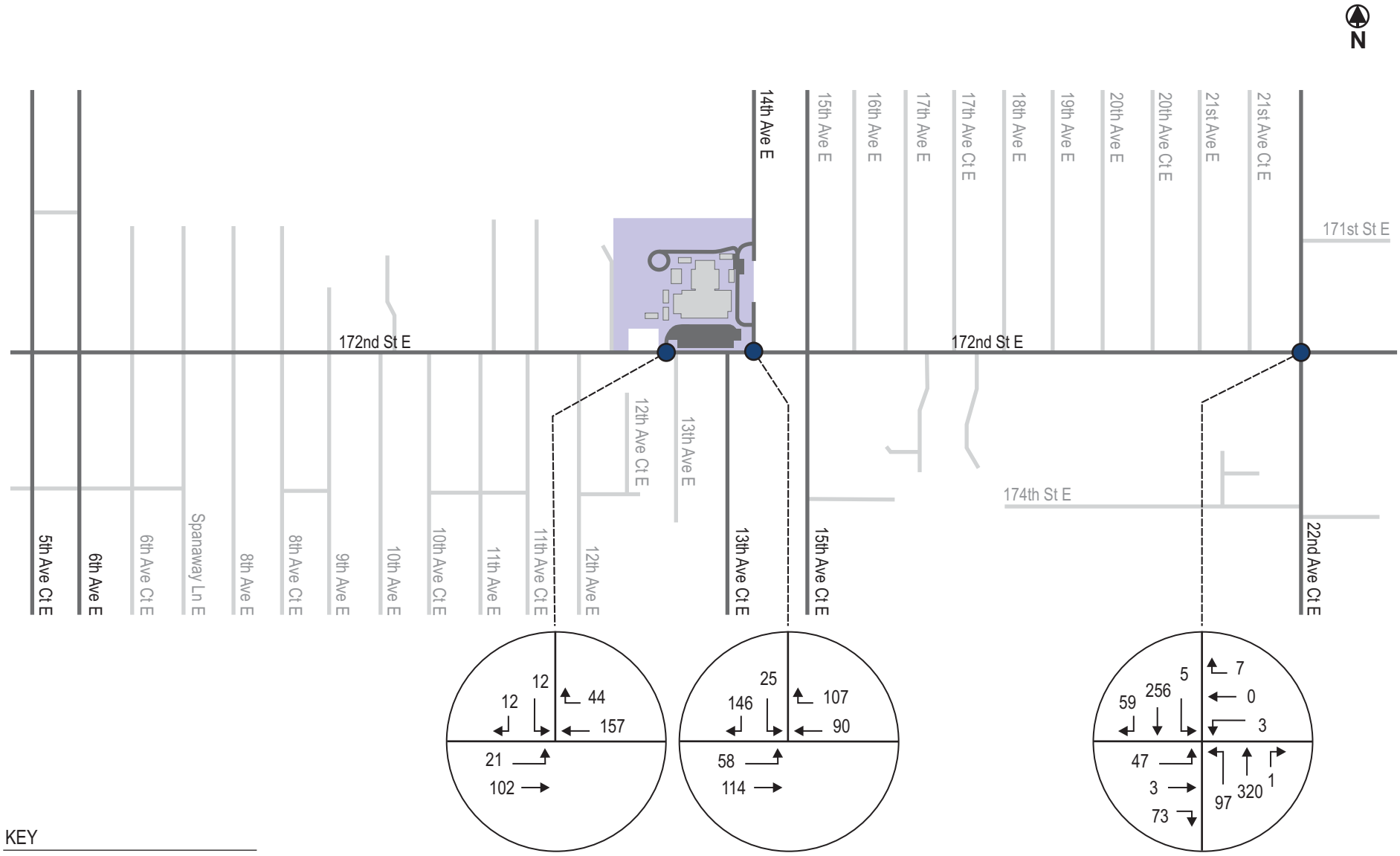

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Figure 5
Forecast-2028-Without-Project Traffic Volumes
Morning Peak Hour

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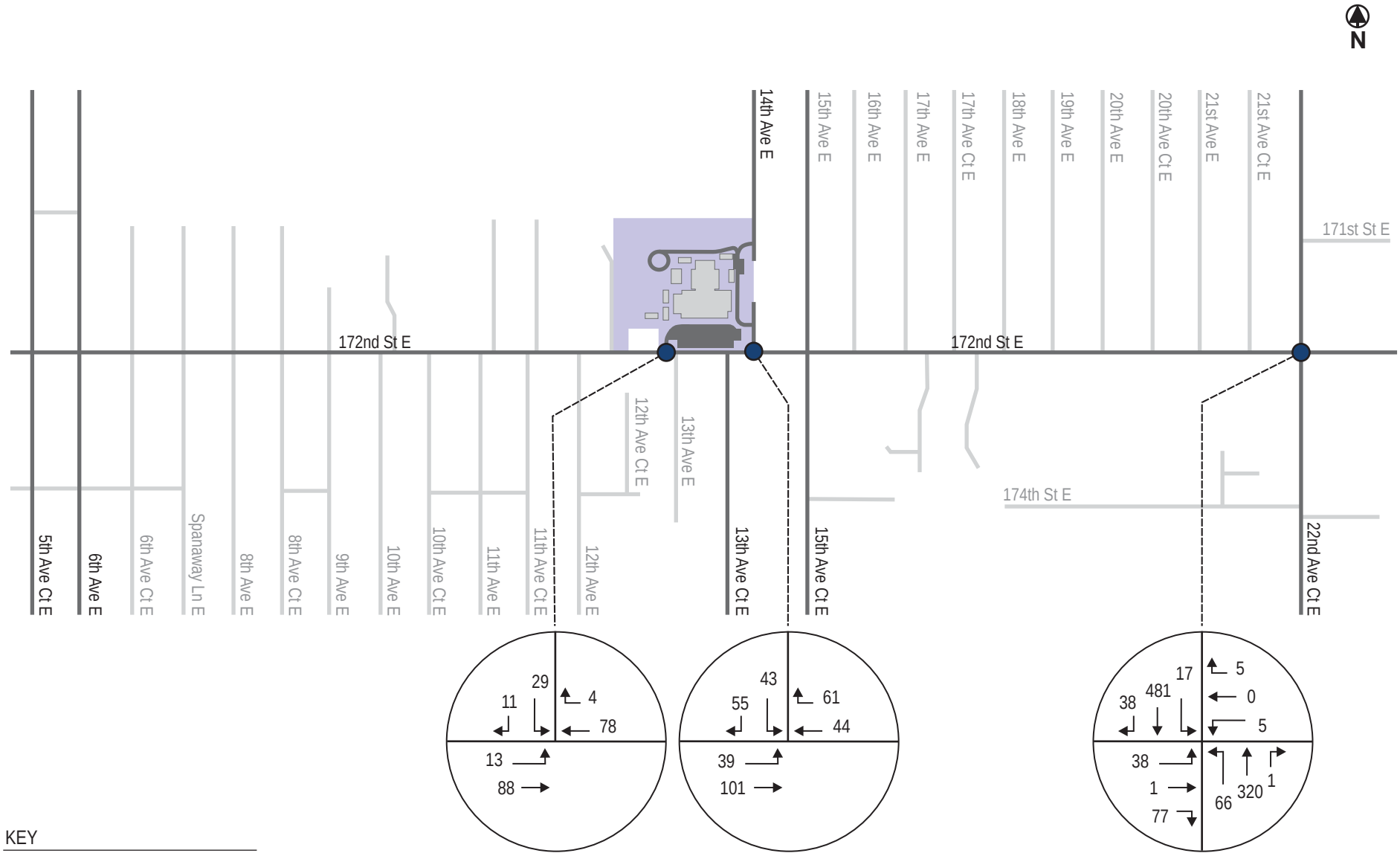

BETHEL SCHOOL DISTRICT
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Figure 6
Forecast-2028-Without-Project Traffic Volumes
Afternoon Peak Hour

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5. TRIP GENERATION AND DISTRIBUTION

This section presents the forecast 2028-with-project traffic volumes. It describes the methodology used to estimate school traffic generation, distribute and assign school trips to the local roadway network, and derive with-project volume forecasts during the key analysis periods.

5.1. Trip Generation of Renovated School at Proposed Capacity

The renovated school would retain the existing access locations and internal circulation patterns. With a larger enrollment capacity, it is expected to generate increases in traffic during each of the analysis periods. Pierce County requires that trip generation estimates for school projects be developed using published rates and equations in the Institute of Transportation Engineers (ITE) *Trip Generation Manual*.[13] The potential increase in traffic is based on the increase in enrollment capacity from the school's current permanent capacity plus the four portable classrooms that would remain—a total existing capacity of 567 students to the new proposed capacity of 714 students (a net increase of 147 students excluding the six portables that would be removed). Table 2 presents the published ITE daily and morning, afternoon, and PM peak hour trip generation rates and the resulting trips estimates for the existing and proposed renovated Evergreen Elementary School.

As shown, the added enrollment capacity provided by the renovation could result in a net increase of 111 trips during the morning arrival peak hour, 88 trips during the afternoon dismissal peak hour, and 23 trips during the PM peak hour. It is noted that these estimates reflect all trips generated by the school including student pick-up/drop-offs, school-bus trips, family-vehicle and visitor trips, teacher/staff trips, deliveries, and typical after-hours use of fields or other on-site facilities.

Table 2. Vehicle Trip Estimates – Renovated Evergreen Elementary School

Land Use	Enrollment Capacity (students)	Daily Trips	Morning Peak Hour (7:45 – 8:45 A.M.)			Afternoon Peak Hour (2:45 – 3:45 P.M.)			PM Peak Hour		
			In	Out	Total	In	Out	Total	In	Out	Total
Elementary School Trip Rates[1]		*2.27 trips / student*	*0.75 trips / student (54% in, 46% out)*			*0.45 trips / student (46% in, 54% out)*			*0.16 trips / student (46% in, 54% out)*		
Renovated School	714	1,621	289	247	536	148	173	321	53	61	114
Existing School[2]	567	1,287	230	195	425	117	138	255	42	49	91
Net Change	147	334	59	52	111	31	35	66	11	12	23

Source: Heffron Transportation Inc., July 2023.

1. *ITE, Trip Generation Manual, LU 520, 11th Edition, September 2021.*
2. *Reflects enrollment capacity provided in the school's current permanent classrooms plus the four portable classrooms that would remain after the project is complete (excludes six portable classrooms that would be removed with the project).*

Pierce County requested analysis for morning arrival (7:45 to 8:45 A.M.) and afternoon dismissal (2:45 to 3:45 P.M.) peak hours. Due to the relatively small increase in traffic expected during the PM peak hour, Pierce County did not require analysis of that time period.

[13] ITE, 11th Edition, 2021.

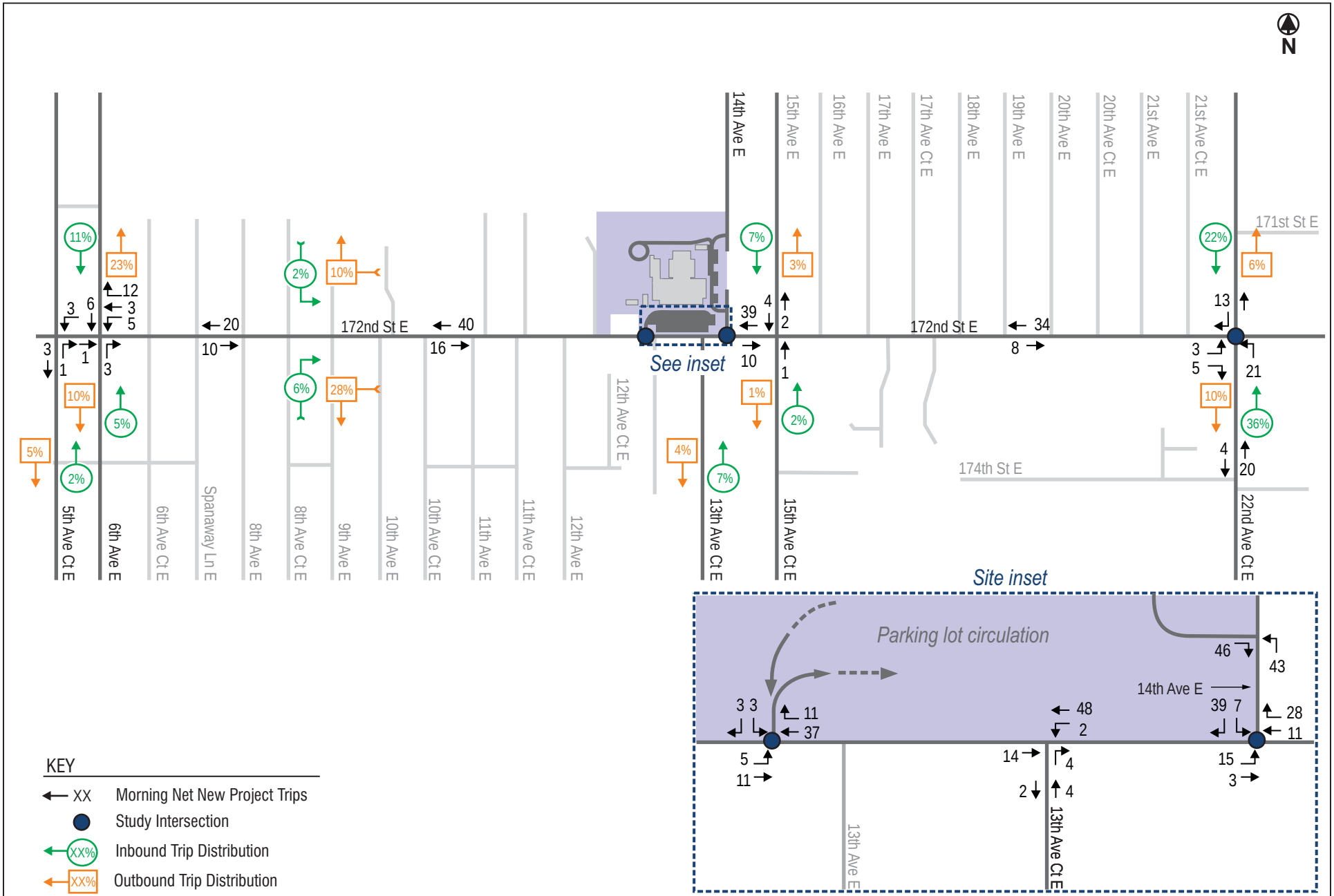
5.2. Project Trip Distribution and Assignment

Trip distribution patterns were derived using a combination of resources including: 1) the overall school enrollment boundary; 2) patterns observed from the May 2023 traffic counts at intersections listed previously; 3) school-bus volumes and travel route information from the District; and 4) Google Maps predictive travel route and travel time mapping resource. The resulting trip patterns also reflect habits of some family drivers linking morning student drop-off and afternoon pick-up trips with work trips.

As required by Pierce County Code §17B.20.060.D.c, the net increases in project trips were assigned to the roadway system and carried to all arterial intersections through which 25 or more new development trips are expected to pass during the school peak hours (morning and afternoon). Figure 7 and Figure 8 show the overall trip distribution percentages and the resulting net changes in peak hour trips for the morning and afternoon peak hours, respectively. As shown, only one arterial intersection—172nd Street E / 22nd Avenue E—is forecast to experience net increases of 25 or more peak hour trips during the morning and afternoon peak hours.

5.3. Forecast With-Project Traffic Volumes

The net changes in peak hour trips were combined with the forecast-2028-without-project traffic forecasts presented previously to develop forecast-2028-with-project traffic volumes. Figure 9 and Figure 10 show the forecast 2028 with-project peak hour traffic volumes at the study-area intersections for the morning and afternoon peak hours, respectively.



BETHEL SCHOOL DISTRICT
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Figure 7
Net New Trip Distribution and Assignment
Morning Peak Hour

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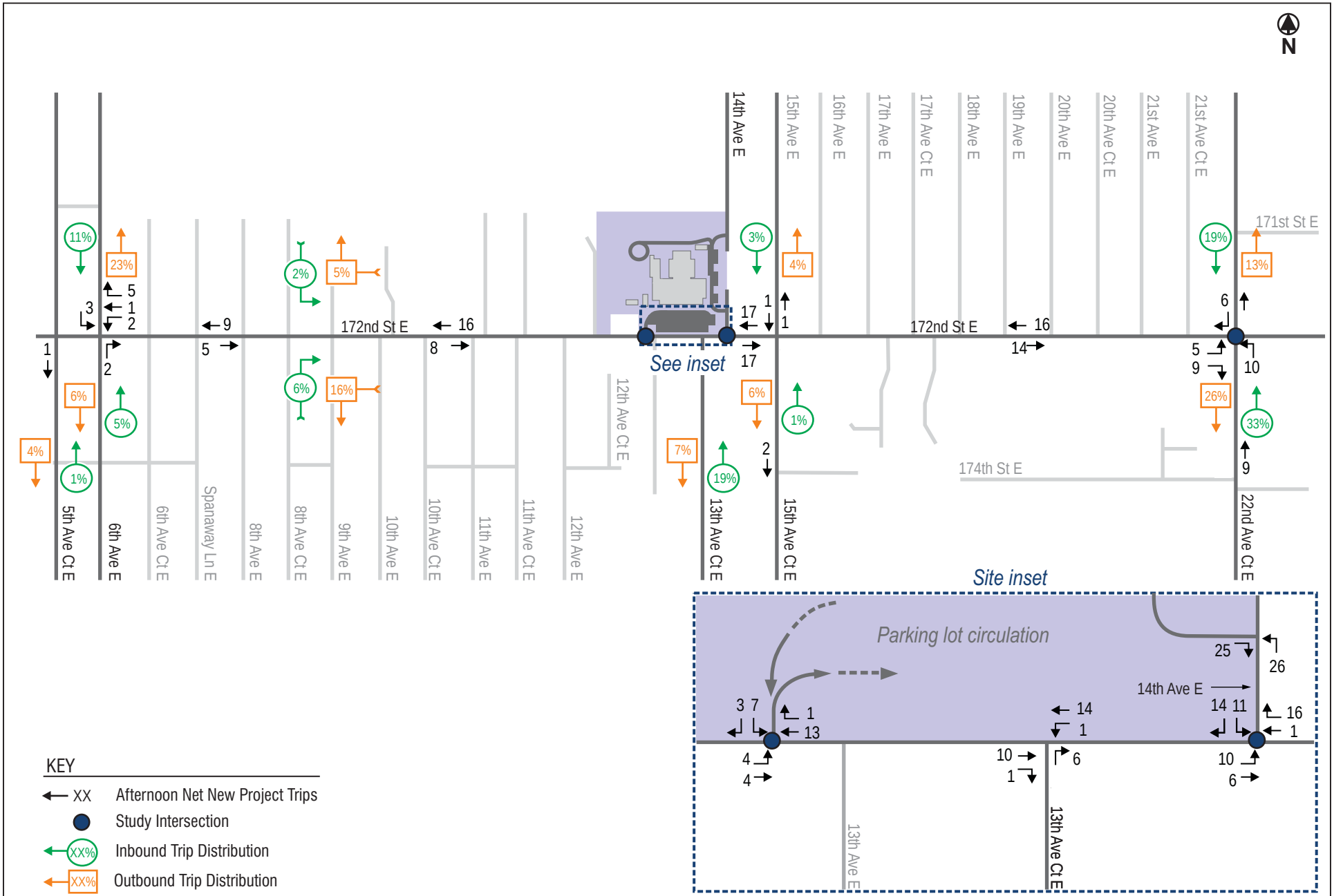

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Evergreen Elementary
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Figure 8
Net New Trip Distribution and Assignment
Afternoon Peak Hour

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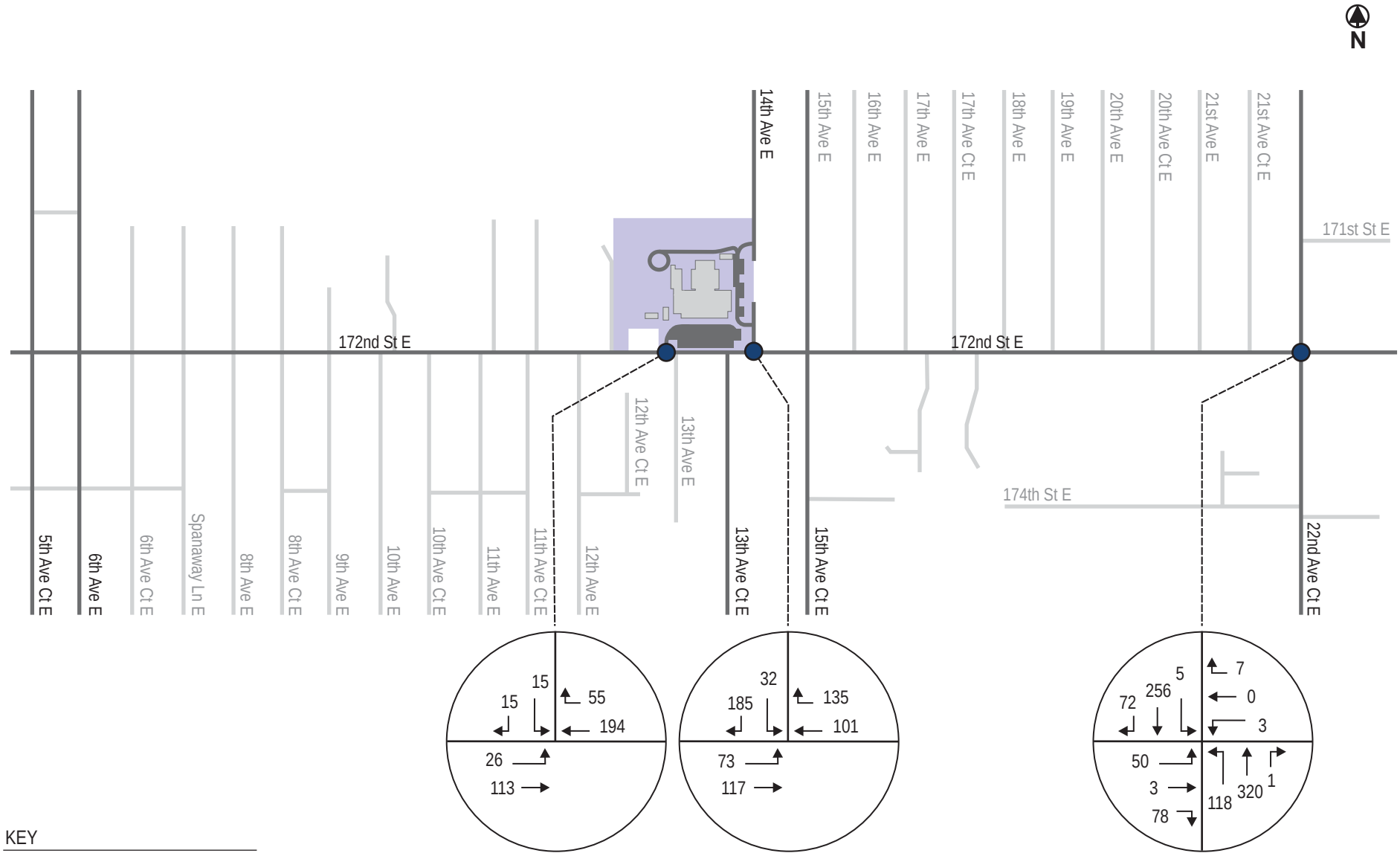

BETHEL SCHOOL DISTRICT
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Figure 9
Forecast-2028-With-Project Traffic Volumes
Morning Peak Hour

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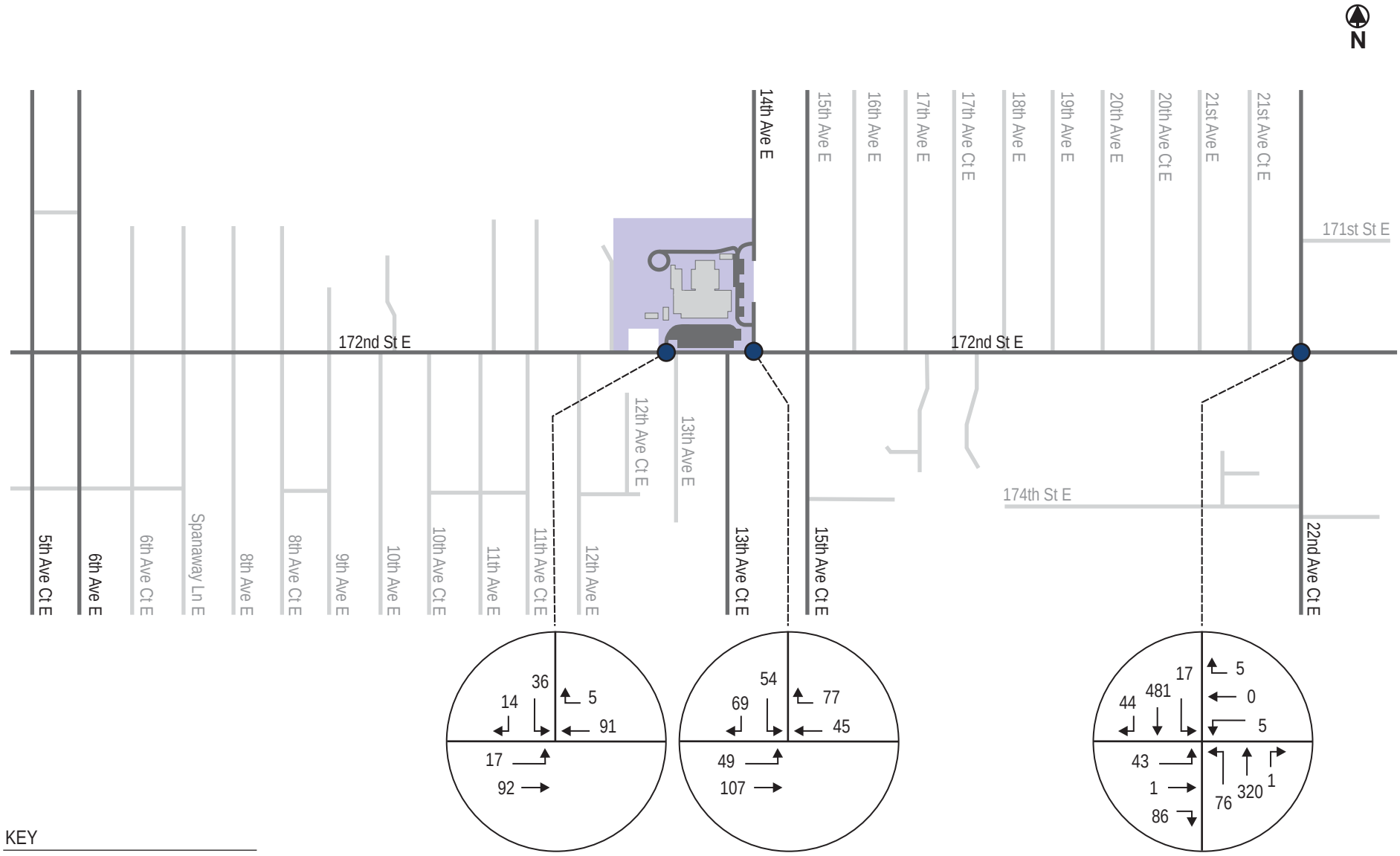

BETHEL SCHOOL DISTRICT
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Figure 10
Forecast-2028-Without-Project Traffic Volumes
Afternoon Peak Hour

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6. LEVEL OF SERVICE ANALYSIS

6.1. Existing Conditions

Traffic operations analyses were performed for the study area intersections. Traffic operations are evaluated using levels of service (LOS) with six letter designations, "A" through "F." LOS A is the best and represents the best traffic operation with little or no delay to motorists. LOS F is the worst and indicates poor traffic operations with long delays. Delay calculations rely on complex equations that consider a number of variables. Delay at unsignalized intersections is determined for vehicles that must stop or yield for oncoming traffic. That delay is related to the availability of gaps in the main street's traffic flow and the ability of a driver to enter or pass through those gaps. The level of service definitions and thresholds are provided in Appendix B.

Table 3 summarizes levels of service for existing 2023 conditions during both analysis hours. The intersections were evaluated using the methodology in the *Highway Capacity Manual, 6th Edition*[14] and modeling direction previously provided by Pierce County. All level-of-service calculations were performed using the *Synchro 11.1* traffic operations analysis software and levels of service were reported using the *HCM 6* module. The analysis reflects each analysis hour's peak hour factors (how traffic changes over the course of the hour), heavy vehicle percentages, and non-motorized volumes. As shown, the three study intersections currently operate at LOS B or better overall with all movements at LOS C or better during both analysis periods. The level-of-service calculation sheets are included in Appendix C.

Table 3. Level of Service – Existing (2023) Conditions

	Morning			Afternoon		
Intersection / Movement	LOS [a]	Delay [b]	V/C [c]	LOS	Delay	V/C
172nd Street E / 22nd Avenue E (overall)	A	3.9		A	4.0	
Northbound Left	A	8.1	0.06	A	8.6	0.06
Eastbound Movements	C	17.2	0.35	C	21.8	0.42
Westbound Movements	B	13.5	0.03	C	20.3	0.06
Southbound Left	A	7.9	0.00	A	7.9	0.01
172nd Street E / 14th Avenue E (overall)	A	4.9		B	11.3	
Eastbound Left	A	8.2	0.05	A	8.3	0.04
Southbound Turns	B	12.5	0.29	C	21.8	0.59
172nd Street E / Main School Access (overall)	A	1.5		A	2.2	
Eastbound Left	A	7.8	0.01	A	8.2	0.01
Southbound Turns	B	10.6	0.05	B	10.7	0.08

Source: Heffron Transportation, Inc., September 2023.

a. Level of service.
b. Average seconds of delay per vehicle.
c. V/C = Volume-to-Capacity ratio.

[14] Transportation Research Board 2016.

6.2. Horizon-Year Conditions

Levels of service for the study area intersections were calculated for 2028-without-project background conditions using the same methodology described previously. However, as directed by Pierce County Traffic Division staff,[15] a peak hour factor of 0.92 was applied for all movements. Table 4 shows analysis results. As shown, all three intersections are expected to operate at LOS A overall with all movements operating at LOS C or better during both periods in 2028 without the project, but with the school enrolled to its current capacity (567 students). The level-of-service calculation sheets are provided in Appendix C.

Table 4. Level of Service – Forecast-2028-Without-Project Conditions

	Morning			Afternoon		
Intersection / Movement	LOS [a]	Delay [b]	V/C [c]	LOS	Delay	V/C
172nd Street E / 22nd Avenue E (overall)	A	3.8		A	3.5	
Northbound Left	A	8.2	0.09	A	8.9	0.07
Eastbound Movements	C	18.7	0.34	C	23.7	0.40
Westbound Movements	B	14.2	0.03	C	22.4	0.05
Southbound Left	A	8.0	0.00	A	8.0	0.02
172nd Street E / 14th Avenue E (overall)	A	4.9		A	4.9	
Eastbound Left	A	8.3	0.05	A	8.3	0.04
Southbound Turns	B	12.7	0.29	B	13.7	0.21
172nd Street E / Main School Access (overall)	A	1.2		A	2.2	
Eastbound Left	A	7.9	0.02	A	7.8	0.01
Southbound Turns	B	10.7	0.04	B	10.0	0.06

Source: Heffron Transportation, Inc., September 2023.
a. Level of service.
b. Average seconds of delay per vehicle.
c. V/C = Volume-to-Capacity ratio.

6.3. Forecast With-Project Conditions

6.3.1. Channelization Needs

The potential need for center left-turn lane channelization was evaluated for the project site which has access from 172nd Street E and 14th Avenue E north of 172nd Street E. The site access configuration is not proposed to change. All family-vehicle drop-off/pick-up trips currently and would continue to access the site using 14th Avenue E from 172nd Street E; school buses and staff currently and would continue to access the site using the main driveway on 172nd Street E.

As required by Pierce County, the analysis was performed assuming all trips (including family drop-off/pick-up trips that would typically access the site from 14th Avenue E) would be consolidated to a single location on 172nd Street E. Background volumes at both locations were reviewed and the highest volumes were selected for the analysis. The evaluation was conducted using the methodology in Highway Research Record (HRR) 211 *Volume Warrants for Left-Turn Storage Lanes at Unsignalized Grade Intersections*.[16] This methodology, which is preferred by Pierce County staff, is used to assess the need

[15] Email communication, K. Leingang, September 5, 2023.
[16] Highway Research Board, 1967.

for left-turn lanes on a street or highway where left-turning drivers must yield to oncoming traffic. With this methodology, a left-turn lane is warranted if there is a high probability that left-turning vehicles would unduly delay vehicles approaching from the same direction as the left turn. The methodology is based on the relationship of advancing volume, opposing volume, and left-turn percentages at an unsignalized intersection.

To evaluate the warrant, the advancing volume, opposing volume, and left-turn percentages were entered into the HRR 211 equations. Although the speed limit is 25 mph on 172nd Street E with a school-zone speed limit of 20 mph during morning arrival and afternoon dismissal, the County requires that these analyses assume a speed of 40 mph (the lowest speed provided by the published curves). Based on prior County guidance, the average times for vehicles to make left-turns reflect values assuming 8 seconds for school buses and 3 seconds for automobiles. The critical headways required for left-turning vehicles were also adjusted and reflect 12 seconds for school buses and 5 seconds for automobiles. School bus volumes were counted separately as part of the vicinity turning movement counts described previously.

Table 5 summarizes the turning volumes and analysis results. As shown, the forecast volumes for a consolidated access on 172nd Street E are below the warrant curves during both morning and afternoon peak hours. Therefore, no center, two-way left-turn lane is recommended for this project. The HRR 211 analysis sheets are provided in Appendix D.

Table 5. Left-Turn Lane Analysis Summary – Forecast-2028-With-Project Conditions

Location / Peak Period	Left-turn Volume (buses)	Advancing Volume [a] (V_A)	Lefts as % of V_A	Opposing Volume [b] (V_O)	Above Warrant Curves?
Left to School from 172nd St E					
Morning Peak Hour	99 (3)	201	49%	236	No
Afternoon Peak Hour	66 (5)	138	48%	122	No

Source: Heffron Transportation, Inc. (Sept. 2023) using HRR 211 – Aspects of Traffic Control Devices, Highway Research Board, 1967.

a. Advancing Volume = Total of left-turning, through-, and right-turning vehicles.

b. Opposing Volume = Total of vehicles in opposing lane.

6.3.2. Level of Service Analysis

Levels of service for the study area intersection were also calculated for the 2028-with-project conditions using the same method and assumptions as the Horizon-Year. Based on the left-turn lane warrant analysis described above, no change to site-access channelization was assumed for with-project conditions. Table 6 shows the analysis results; the results for without-project conditions are shown for comparison.

Table 6. Level of Service – Forecast-2028-With-Project Conditions

Intersection / Movement	Morning Peak Hour						Afternoon Peak Hour					
	Without Project			With Project			Without Project			With Project		
	LOS [a]	Delay [b]	V/C [c]	LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C
172nd St E / 22nd Ave E (overall)	A	3.8		A	4.2		A	3.5		A	4.2	
Northbound Left	A	8.2	0.09	A	8.4	0.11	A	8.9	0.07	A	8.9	0.08
Eastbound Movements	C	18.7	0.34	C	20.8	0.39	C	23.7	0.40	D	26.6	0.46
Westbound Movements	B	14.2	0.03	B	14.9	0.03	C	22.4	0.05	C	23.8	0.05
Southbound Left	A	8.0	0.00	A	8.0	0.00	A	8.0	0.02	A	8.0	0.02
172nd St E / 14th Ave E (overall)	A	4.9		A	6.2		A	4.9		A	5.6	
Eastbound Left	A	8.3	0.05	A	8.6	0.07	A	8.3	0.04	A	8.4	0.05
Southbound Turns	B	12.7	0.29	C	15.5	0.41	B	13.7	0.21	B	14.9	0.27
172nd St E / Main Access (overall)	A	1.2		A	1.3		A	2.2		A	2.5	
Eastbound Left	A	7.9	0.02	A	8.0	0.02	A	7.8	0.01	A	7.8	0.01
Southbound Turns	B	10.7	0.04	B	11.2	0.05	B	10.0	0.06	B	10.3	0.07

Source: Heffron Transportation, Inc., September 2023.
a. Level of service.
b. Average seconds of delay per vehicle.
c. V/C = Volume-to-Capacity ratio.

As shown, all three study intersections are forecast to remain operating at LOS A overall during both peak hour analysis periods with all movements operating at LOS D or better. The traffic generated by the proposed increase in permanent school capacity would add some delay—ranging from 0.1 to 2.8 seconds per vehicles. Based on these results, the proposed Evergreen Elementary School Renovation project is not expected to cause significant adverse impacts to the intersection operations. The level-of-service calculation sheets are provided in Appendix C.

6.4. On-Site Operations and Queuing

On-site queuing capacity and estimated demand was evaluated for the on-site automobile load / unload zone. For arrivals in the morning, student drop-off activities typically occur with limited queues or delay. This is because arrivals tend to be spread out over the 20 minutes before school starts, and during this period, family drivers generally arrive, drop off students, and then immediately leave the site. For dismissal in the afternoon, many drivers arrive early and wait in the queue lane(s) or parking spaces for the students to be dismissed, and longer vehicle queues can develop.

The morning arrival queues can be modeled directly using Poisson arrival methodologies for a multi-channel service system (i.e., the number of drop-off spaces that can be used simultaneously). Assumptions documented from service time and queuing data collection at Pacific-Cascade Middle School in Issaquah, WA.[17] These observations of 120 morning-unloading maneuvers over three consecutive days found an average of about 33 seconds for the vehicle to pull to the curb and discharge students before egressing the unload area. This equates to a service rate for each drop-off space of 1.82 vehicles per minute (36.4 vehicles in 20 minutes or a rate of 109 vehicles per hour).

[17] Heffron Transportation, Inc., 3-day video observations at Pacific-Cascade Middle School, Issaquah, WA, June 2019.

The counts performed at the site in May 2023 found arriving student trips in the morning compressed with an average of about 61% of peak hour trips occurring in 30 minutes and an average of about 40% occurring in the peak 15 minutes.[18] The forecast morning peak hour arrival volume at the school is estimated at 289 vehicles; however, 47 of those trips (including 7 school buses) are expected to be destined to the main access (staff parking and school-bus load/unload loop) with 242 expected to be family drivers bringing students to school and using the automobile load/unload loop. Drop-off traffic during the peak 15-minute period was estimated at four times the peak 15-minute component of this value, which assumes that drop-off activity would be more compressed than data show for all morning arrivals. The peak 15-minute rate is equivalent to about 387 vehicles per hour (40% × 242 × 4).

Students that are driven to the site by family members are expected to be dropped off at the southeast corner of the building at the end of the load/unload loop that extends from the driveway on 14th Avenue E along the east and north sides of the building. The curb-side load zone is about 80-feet long with room for up to four vehicles to load/unload simultaneously. In addition to the load/unload spaces, the entry drive and load/unload loop provide another 1,680 feet of queue/waiting space. To provide an analysis of potential worst-case conditions, four load/unload spaces were evaluated to estimate both the average and 95th-percentile queues for the drop-off area closest to the building entry for the morning peak hour. Table 7 presents the estimated queues for the assumed drop-off spaces at the school during the morning arrival period with the school at full enrollment at 714 students. As shown, the estimated morning arrival queues (average of 10 vehicles and 95th-percentile of 26 vehicles) can be accommodated on site. The queue model calculation results are provided in Appendix E.

Table 7. Estimated Arrival (Drop-off) Vehicle Queues

Peak Hour	Vehicles Served Simultaneously	Average Queue	95th Percentile Queue	Exceeds On-Site Vehicle Capacity?
Morning	4 vehicles	10 vehicles	26 vehicles	No

Source: Heffron Transportation, Inc., Sept. 2023, using service rates derived from 3-day video observations of arrivals at Pacific-Cascade Middle School, Issaquah, WA, June 2019.

Although the queue analysis and estimation model are reasonable for application to arrival queues, afternoon dismissal queuing conditions are different. Family drivers typically arrive prior to school dismissal during a time when no vehicles are being loaded (or serviced). In addition, students arrive at vehicles at different rates, so service times per vehicle are different than during morning arrival. Planning research and guidance for elementary schools from several sources suggest providing on-site queue / waiting space of between 1.2 and 2.0 feet per student[19] (roughly 855 to 1,430 feet for this site with up to 714 students). The existing vehicle load/unload loop and queuing area provides a total of about 1,760 linear feet of queue / waiting area before queues could extend to 14th Avenue E. It is acknowledged that some fluctuation in volumes and queuing activities are common as they can be affected by weather, special events, and unfamiliarity with drop-off/pick-up procedures at the beginning of each school year.

[18] Heffron Transportation, Inc., site access counts performed at Evergreen Elementary School, May 4, 2023.
[19] Keith B. Higgins, PE, TE – Hatch Mott MacDonald, *Retooling School Drop-off/Pick-up Zones to Meet Demand,* WesternITE Meeting Paper 9C, 2010.

7. SITE ACCESS

7.1. Access Driveway Classifications and Standards

The site's two primary vehicular access driveways would remain as they currently exist. The access on 172nd Street E would continue to provide access for most on-site parking (54 spaces for staff and visitor) and the school bus load/unload loop. The existing access on 14th Avenue E (just north of 172nd Street E) would continue to provide access to a portion of the on-site parking (expanded to 33 spaces), the automobile load/unload loop, and service / delivery vehicles. The gated maintenance and emergency access on 14th Avenue E at the northeast corner of the site would also remain unchanged. According to definitions in Section 5-2 of the *Manual on Design Guidelines and Specifications for Road and Bridge Construction*,[20] the access on 172nd Street E would remain classified as a Minor Driveways since it would serve fewer than 1,500 trips per day and fewer than 150 trips during all hours. The driveway on 14th Avenue E just north of 172nd Street E would remain classified as a Major Driveway Approach, since it would continue to serve more than 150 trips during the morning and afternoon peak hours (though it is expected to serve fewer than 1,500 trips per day). The gated maintenance and emergency access on 14th Avenue E (at the northeast corner of the site) would remain classified as a Minor Driveway since it typically serves no trips.

Pierce County's access driveway spacing and sight distance requirements are also outlined in the *Manual on Design Guidelines and Specifications for Road and Bridge Construction*. It states that both Minor and Major Driveway Approaches "*…shall be located a minimum of 125 feet from an intersection.*" It also states that "*Along an arterial roadway they may also be located directly across from a local road feeder, minor, or cul-de-sac intersection.*"

The minimum Stopping Sight Distance (SSD) is the length of roadway ahead visible to a driver that would enable the vehicle traveling at the design speed to stop before reaching a stationary object in its path. It is measured from a driver's eye height of 3.5 feet to an object height of 0.5 feet. Adjacent to the school site, 172nd Street is an urban Collector Arterial with an assumed design speed of 35 mph; 14th Avenue E is a Local Road that extends less than 250 feet north of 172nd Street E with an assumed design speed of 20 mph.[21] At the existing school access driveways, the intersecting roadways (172nd Street E and 14th Avenue E) are relatively flat with no vertical or horizontal curves obstructing sight lines. The required minimum SSD is 250 feet in both directions for 172nd Street E and 115 feet in both directions for 14th Avenue E.

Minimum Entering Sight Distance (ESD) is the distance required for a vehicle at a stopped position on the minor road (or driveway approach) to view an oncoming vehicle traveling at the speed limit on the major road and appearing after the movement has begun, and safely enter or cross the major road. Minimum values are based on an object (oncoming vehicle) height of 3.5 feet and a driver's eye height of 3.5 feet set back from the edge of the travel way at least 10 feet for minor driveway approaches, and 14.5 feet for major driveway approaches. 172nd Street E has a posted speed limit of 25 mph, which require an ESD of 295 feet. The site driveway on 14th Avenue E would not require ESD since the street dead-ends just beyond the site driveway, there would be no oncoming traffic to which ESD would be required.

[20] Pierce County, Office of the County Engineer, Original Eff. date Feb. 1, 2011; amended by Ordinances: Eff. date May 1, 2022.
[21] Design speeds from *Manual on Design Guidelines and Specifications for Road and Bridge Construction*, section 2-4.

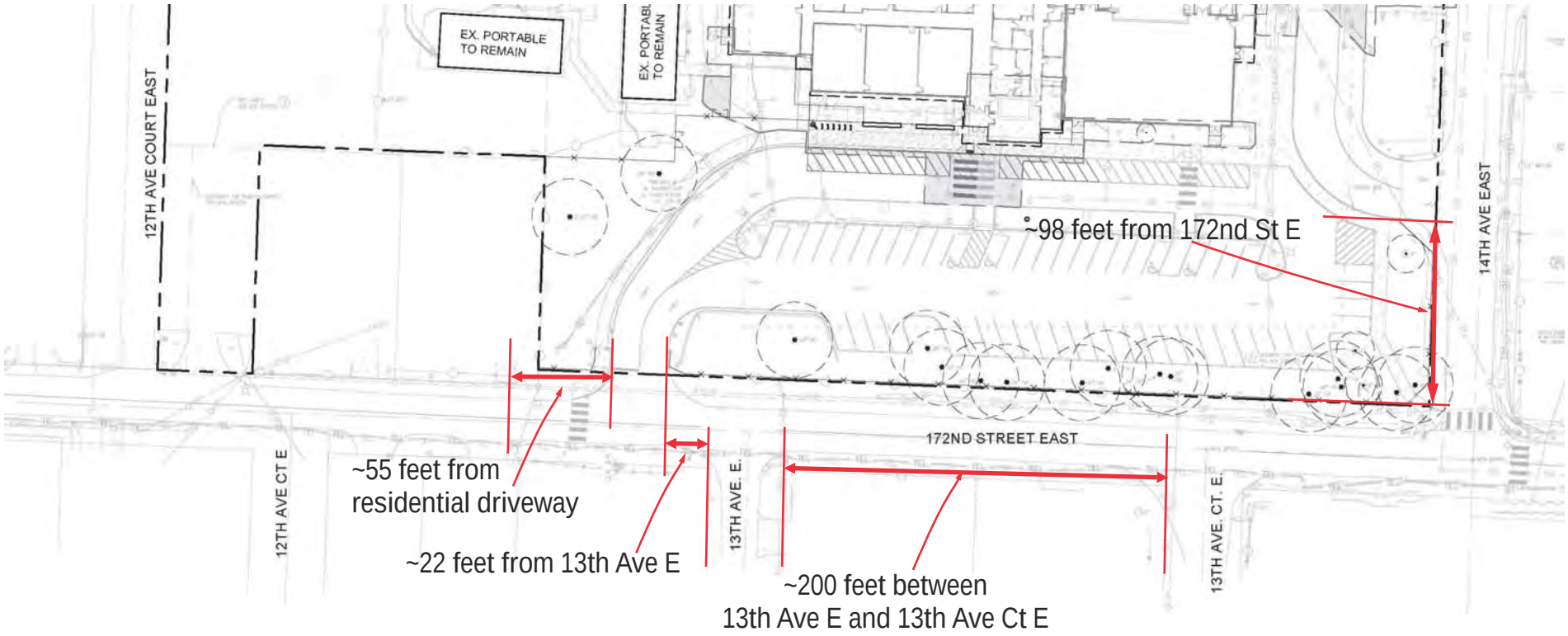
7.2. Spacing Analysis

The existing access driveway on 172nd Street E is currently offset 22 feet (between nearest edge of driveway to right-of-way line) west of 13th Avenue E located on the south side of 172nd Street E. It is also located 55 feet east of a single-family residence driveway on the opposite side of the street. On the south side of 172nd Street E, 13th Avenue E and 13th Avenue Court E are 200 feet apart (measured between rights-of-way). Therefore, it would not be possible to locate a school driveway on the north side of the street that would meet the County's minimum spacing requirements. Based on the turning movement counts conducted at the site access (described previously), which also captured movements to and from 13th Avenue E, it carries very little traffic (between 5 and 20 trips per hour during peak school arrival and dismissal hours). As a result, and because it is a long-established existing driveway, it should be permitted to remain.

The existing access on the short dead-end segment of 14th Avenue E is currently about 98 feet north of 172nd Street E (between nearest edge of driveway to right-of-way line). It is also located opposite a single-family residence driveway on the opposite side of the street. That segment of 14th Avenue E serves as access for the school and two single-family residences. As a result, and because it is a long-established existing driveway, it should be permitted to remain. Figure 11 shows the driveway spacing for both access locations.

7.3. Sight Distance Analysis

Entering and stopping sight distances at the existing access driveways were reviewed. Figure 12 shows the SSD lines and the ESD for both directions at both driveways. 172nd Street E does not have vertical or horizontal sightline obstructions within 500 feet of the existing driveway. This driveway meets both the SSD and ESD requirement. Sight lines from the driveway on 14th Avenue E are clear through the stop-controlled intersection at 172nd Street E on the south (about 150 feet), as well as from the start of the dead-end street north of the driveway (about 105 feet). While the latter would not meet SSD for a 20-mph roadway, because this is a dead-end street, and vehicle approaching from that direction would likely be travelling at a much lower speed. As previously noted, there would be no requirement for ESD since driveway traffic would not be pulling out in front of oncoming traffic.



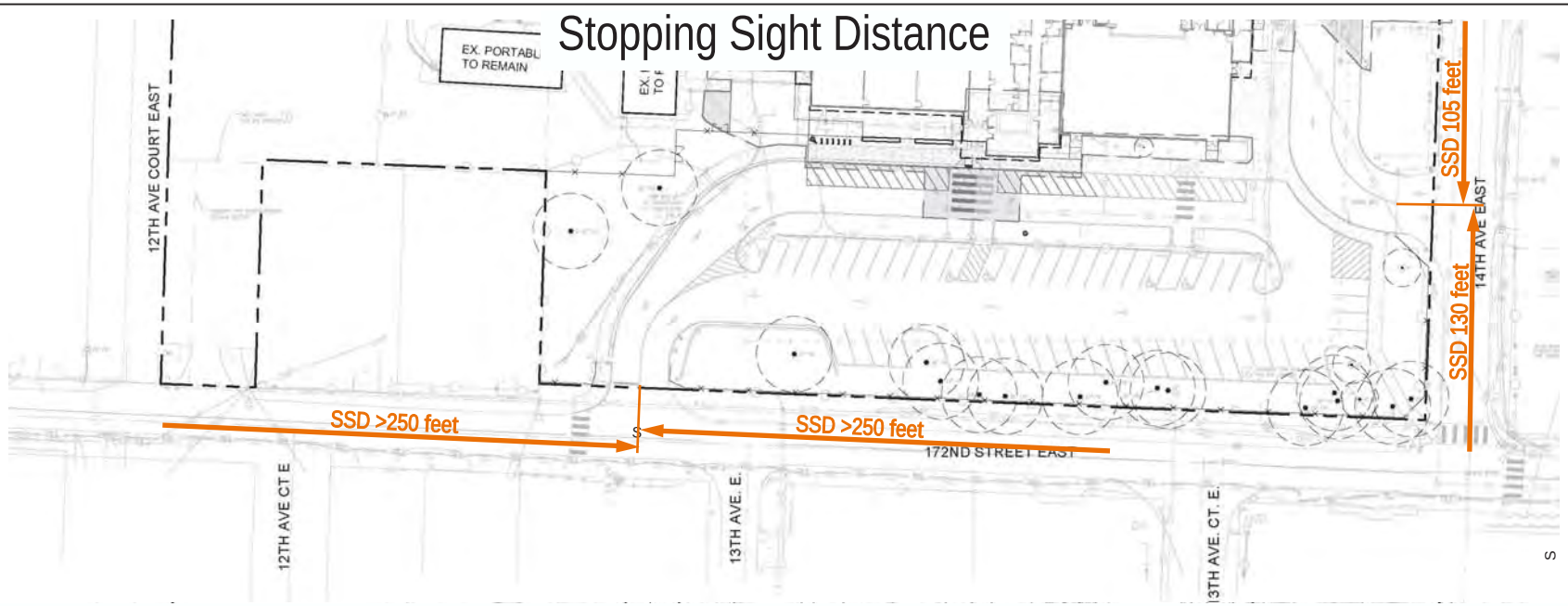
Source: Site plan by Erickson McGovern Architects and Fora Landscape Architects, April 2023; annotated by Heffron Transportation, Inc., Sep 2023..

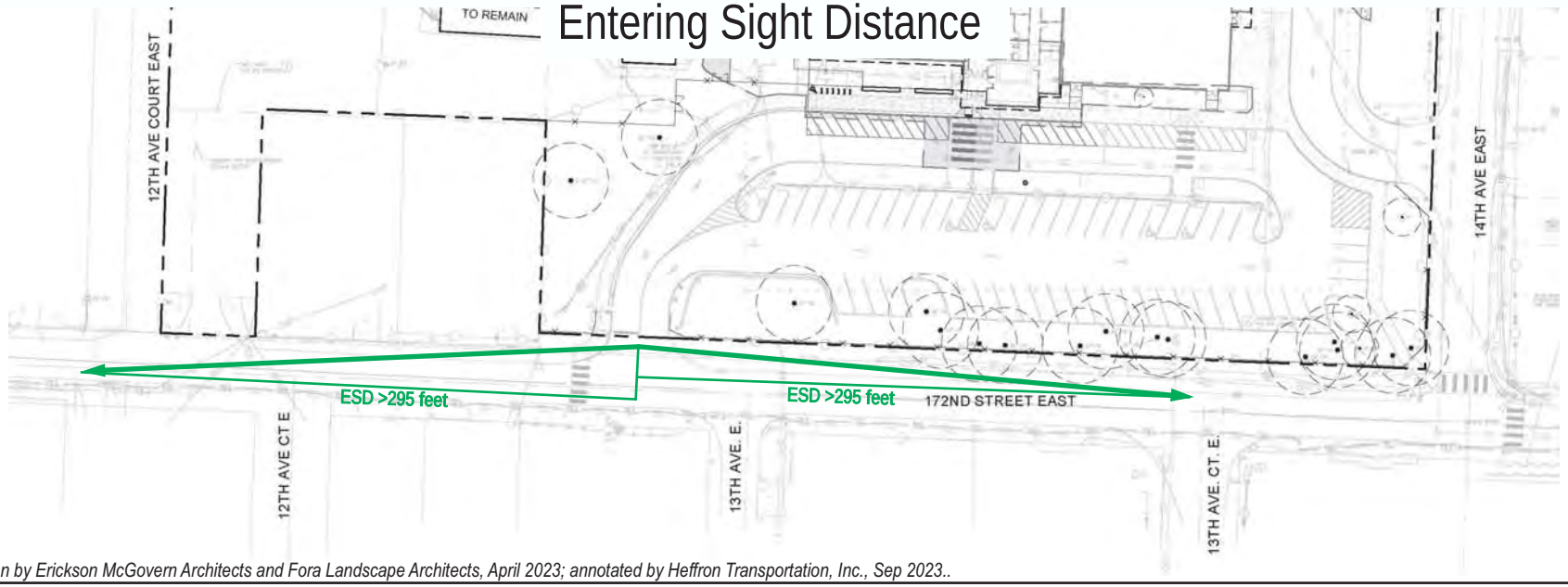
BETHEL SCHOOL DISTRICT
Evergreen Elementary
School Renovation

Figure 11

Site Access Driveway Spacing

heffron transportation inc





Source: Site plan by Erickson McGovern Architects and Fora Landscape Architects, April 2023; annotated by Heffron Transportation, Inc., Sep 2023..

BETHEL SCHOOL DISTRICT
Evergreen Elementary
School Renovation

Figure 12

Site Access Sight Distance

heffron transportation inc

8. TRANSIT AND NON-MOTORIZED FACILITIES

8.1. Transit Facilities and Service

No transit trips are expected to be generated by the school since the nearest stop is located 1.5 miles to the west of the school site on Pacific Avenue S at 168th Street E. School bus transportation would continue to be provided to Evergreen Elementary School students who qualify. As described previously, District Transportation staff indicated that, due to ongoing bus-driver shortages, the walk boundary for the school was to be modified for fall 2023 and transportation services re-optimized for the site. Based on these planned changes and in the short-term, District Transportation staff indicated the site would be served by three full-size school buses and two SPED school buses if enrolled to its proposed capacity of 714 students. The project is not expected to result in adverse impacts to transit facilities or service.

8.2. Non-Motorized Transportation Facilities

Pedestrian walkways exist within the campus connecting buildings to parking lots and vehicular load/unload zones. The project is not proposing off-site pedestrian or non-motorized improvements.

9. PARKING

9.1. Proposed Supply and Code Requirements

The school currently has 67 striped parking stalls (54 in the main staff and visitor parking lot that is accessed directly from 172nd Street E and 13 stalls accessed from 14th Avenue E). The project would add 20 parking stalls at the northeast portion of the site along the east side of the existing building. When complete, the project would have 87 parking stalls.

Pierce County Code section 18A.35.040 and Table 18A.35.040-1 outline the minimum and maximum parking requirements for a variety of land uses. For elementary schools, the County requires a minimum of 1 parking space per employee and allows a maximum of 2 spaces per employee. As noted previously, at its proposed capacity of 714 students, the District estimates the new school could have up to 87 employees. Based on these values, the County would require a minimum of 87 parking spaces and would allow a maximum of 174 parking spaces. The proposed parking supply of 87 stalls would meet the minimum County Code requirement.

9.2. Typical School-Day Demand

Parking demand observations were performed at the school in September 2023 when the school had enrollment of 522 students and a total of 78 employees. The counts found a total of 62 parked vehicles resulting in a rate of 0.795-vehicles-per employee. ITE's *Parking Generation Manual*[22] includes rates for Elementary Schools (Land Use Code 520) based on employees—0.95-vehicles-per-employee. At the rates described, and assuming full enrollment to 714 students and 87 employees, school-day parking demand is estimated to range from 69 to 83 vehicles.

With the project, the site would have 87 on-site parking spaces, which would meet the estimated demand range using the rates described above.

[22] ITE, 5th Edition, Jan

10. SUMMARY AND CONCLUSIONS

The following summarizes the analysis and conclusions.

- The proposed project would renovate and expand the existing school, removing three double portables (containing six classrooms), constructing an eight-classroom addition (approximately 8,930 square feet), and making interior renovations to the existing building that would eliminate one permanent classroom.
- With the project, the school would have 30 permanent classrooms (a net increase of seven permanent classrooms) and would retain four portable classrooms (in two double portable buildings). When complete, the elementary school would have a future capacity of 714 students, which is a net permanent capacity increase of 147 students compared to the existing school's permanent capacity.
- Based on staffing at other elementary schools, the District estimates the renovated Evergreen Elementary could have up to 87 employees if the school were enrolled to its proposed capacity.[23]
- The existing site access driveways and internal vehicular site circulation patterns would be retained.
- The main parking lot (54 stalls) and school-bus load/unload area would remain unchanged and unconnected internally to the other on-site parking and vehicular load/unload loop. The 13-stall parking area east of the school would be expanded (adding 20 stalls); the combined site would have 87 parking stalls with the project.
- Early elements of the construction effort are planned to begin in spring 2024 while students are still on campus. Students and staff would then occupy the old Naches Trail Elementary School for one school year (2024-25) while construction is completed. The renovated Evergreen Elementary School is planned to reopen in fall 2025.
- The added enrollment capacity provided by the renovation could increase volumes by 111 trips in the morning arrival peak hour, 88 trips during the afternoon dismissal peak hour, and 23 trips during the PM peak hour.
- One arterial intersection—172nd Street E / 22nd Avenue E—is forecast to experience net increases of 25 or more peak hour trips during the morning and afternoon peak hours.
- The forecast volumes at the school access on 172nd Street and 14th Avenue E would not meet the HRR 211 warrants for left-turn storage during either morning or afternoon peak hours—even when assuming all volumes and turns are consolidated to one location on 172nd Street E. Therefore, no left-turn storage pocket would be warranted.
- All three study intersections are forecast to remain operating at LOS A overall during both peak hour analysis periods with all movements operating at LOS D or better. Traffic generated by the proposed increase in permanent school capacity would add some delay—ranging from 0.1 to 2.8 seconds per vehicles. The proposed Evergreen Elementary School Renovation project is not expected to cause significant adverse impacts to the intersection operations.
- The estimated morning arrival queues (average of 10 vehicles and 95th-percentile of 26 vehicles) can be accommodated on site. The existing vehicle load/unload loop and queuing area provides a total of about 1,760 linear feet of queue / waiting area, which his more than published planning guidance for elementary schools (855 to 1,430 feet for a school with 714 students).

[23] Email communication, C. McIntyre, Bethel School District, July 27, 2023.

- The existing access driveway on 172nd Street E does not meet minimum County spacing requirements and it would not be possible to locate a school driveway that would meet the County's minimum spacing requirements. As a result, and because it is a long-established existing driveway, it should be permitted to remain.
- The existing access on the short dead-end segment of 14th Avenue E is also a long-established existing driveway and should be permitted to remain.
- Entering and stopping sight distances at the existing access driveways would continue to meet minimum County standards.
- County code would require a minimum of 87 parking spaces and allow a maximum of 174 parking spaces. The proposed parking supply would meet the minimum County Code requirement.
- Parking demand observations in September 2023 found a total of 62 parked vehicles resulting in a rate of 0.795-vehicles-per employee. ITE's *Parking Generation Manual* rate for Elementary Schools (Land Use Code 520) is 0.95-vehicles-per-employee. At these rates, and assuming full enrollment to 714 students and 87 employees, school-day parking demand is estimated to range from 69 to 83 vehicles. With the project, the site would have 87 on-site parking spaces, which would meet the estimated demand range using the rates described.

Since the existing school would remain occupied during part of the construction effort, the following operational measure is recommended to minimize the short-term construction-related transportation impacts of the project.

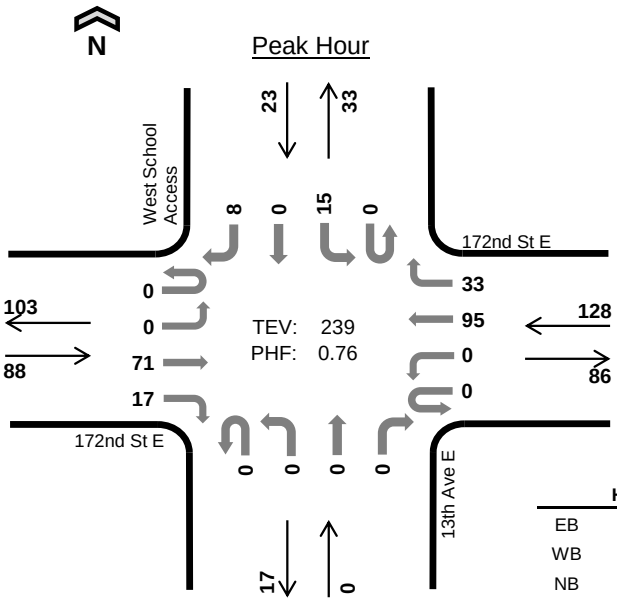
Construction Transportation Management Plan (CTMP) – The District will require the selected contractor to develop a CTMP that addresses traffic and pedestrian control during construction. It would define truck routes, lane closures, walkway closures, and parking disruptions, as necessary. The CTMP may also include measures to keep adjacent streets clean on a daily basis at the truck exit points (such as street sweeping or on-site truck wheel cleaning) to reduce tracking dirt offsite. The CTMP would identify parking locations for the construction staff.

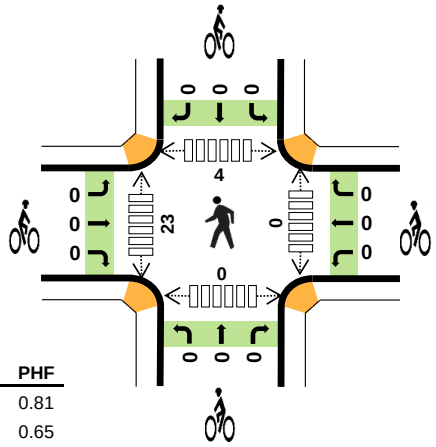
With the above measures incorporated into the proposal, the project would not result in significant adverse impacts to transportation facilities or operations.

APPENDIX A
Traffic Count Data Sheets

West School Access
172nd St E

Date: 05/04/2023
Count Period: 7:00 AM to 9:00 AM
Peak Hour: 7:45 AM to 8:45 AM





	HV %:	PHF
EB	8.0%	0.81
WB	7.0%	0.65
NB	-	-
SB	21.7%	0.48
TOTAL	8.8%	0.76

Two-Hour Count Summaries

Interval Start		172nd St E Eastbound				172nd St E Westbound				13th Ave E Northbound				West School Access Southbound				15-min Total	Rolling One Hour
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	0	10	3	0	0	13	2	0	0	0	0	0	4	0	4	36	0
7:15 AM		0	0	9	1	0	0	12	8	0	0	0	0	0	2	0	2	34	0
7:30 AM		0	0	19	3	0	0	13	8	0	0	0	0	0	1	0	0	44	0
7:45 AM		**0**	**0**	**14**	**4**	**0**	**0**	**15**	**16**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**2**	**52**	166
8:00 AM		**0**	**0**	**23**	**4**	**0**	**0**	**6**	**10**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**45**	175
8:15 AM		**0**	**0**	**19**	**5**	**0**	**0**	**45**	**4**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**2**	**79**	220
8:30 AM		**0**	**0**	**15**	**4**	**0**	**0**	**29**	**3**	**0**	**0**	**0**	**0**	**0**	**8**	**0**	**4**	**63**	**239**
8:45 AM		0	0	10	3	0	0	4	4	0	0	0	0	0	8	0	3	32	219
Count Total		0	0	119	27	0	0	137	55	0	0	0	0	0	30	0	17	385	0
Peak Hour	**All**	**0**	**0**	**71**	**17**	**0**	**0**	**95**	**33**	**0**	**0**	**0**	**0**	**0**	**15**	**0**	**8**	**239**	**0**
	HV	**0**	**0**	**3**	**4**	**0**	**0**	**5**	**4**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**1**	**21**	**0**
	HV%	**-**	**-**	**4%**	**24%**	**-**	**-**	**5%**	**12%**	**-**	**-**	**-**	**-**	**-**	**27%**	**-**	**13%**	**9%**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	0	0	0	*0*	0	0	0	0	*0*	0	1	3	0	*4*
7:15 AM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	5	0	*5*
7:30 AM	1	1	0	0	*2*	0	0	0	0	*0*	0	1	2	0	*3*
7:45 AM	**1**	**4**	**0**	**0**	***5***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:00 AM	**1**	**2**	**0**	**0**	***3***	**0**	**0**	**0**	**0**	***0***	**0**	**3**	**2**	**0**	*5*
8:15 AM	**3**	**2**	**0**	**1**	***6***	**0**	**0**	**0**	**0**	***0***	**0**	**13**	**2**	**0**	*15*
8:30 AM	**2**	**1**	**0**	**4**	***7***	**0**	**0**	**0**	**0**	***0***	**0**	**7**	**0**	**0**	***7***
8:45 AM	0	0	0	3	*3*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	8	10	0	8	*26*	0	0	0	0	*0*	0	25	14	0	*39*
Peak Hour	**7**	**9**	**0**	**5**	***21***	**0**	**0**	**0**	**0**	***0***	**0**	**23**	**4**	**0**	***27***

Two-Hour Count Summaries - Heavy Vehicles

Interval Start	172nd St E Eastbound				172nd St E Westbound				13th Ave E Northbound				West School Access Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0
7:45 AM	**0**	**0**	**1**	**0**	**0**	**0**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	7
8:00 AM	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	10
8:15 AM	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**6**	16
8:30 AM	**0**	**0**	**1**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**1**	**7**	**21**
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	19
Count Total	0	0	4	4	0	0	6	4	0	0	0	0	0	7	0	1	26	0
Peak Hour	**0**	**0**	**3**	**4**	**0**	**0**	**5**	**4**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**1**	**21**	**0**

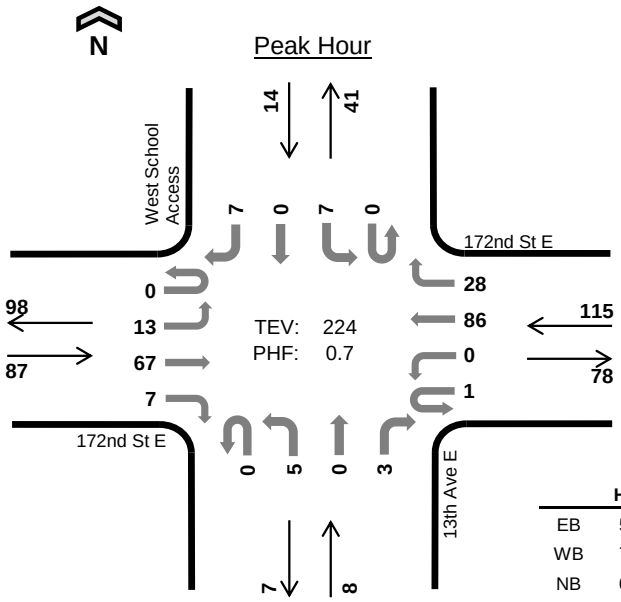
Two-Hour Count Summaries - Bikes

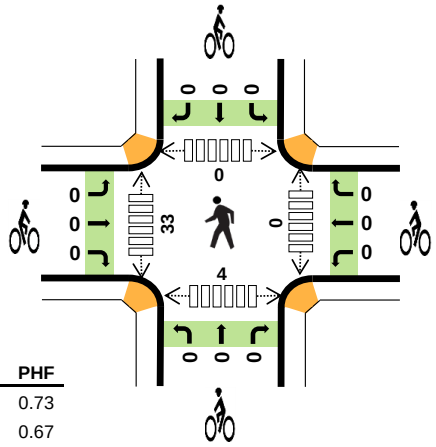
Interval Start	172nd St E Eastbound			172nd St E Westbound			13th Ave E Northbound			West School Access Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

West School Access
172nd St E

Date: 05/09/2023
Count Period: 7:00 AM to 9:00 AM
Peak Hour: 7:45 AM to 8:45 AM





	HV %:	PHF
EB	5.7%	0.73
WB	7.8%	0.67
NB	0.0%	0.50
SB	35.7%	0.44
TOTAL	8.5%	0.70

Two-Hour Count Summaries

Interval Start		172nd St E Eastbound				172nd St E Westbound				13th Ave E Northbound				West School Access Southbound				15-min Total	Rolling One Hour
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	1	9	0	0	1	3	8	0	2	0	1	0	2	0	4	31	0
7:15 AM		0	1	13	0	0	0	3	11	0	0	0	2	0	4	0	1	35	0
7:30 AM		0	3	15	0	0	0	17	3	0	1	0	0	0	0	0	2	41	0
7:45 AM		**0**	**4**	**13**	**1**	**0**	**0**	**12**	**13**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**45**	152
8:00 AM		**0**	**3**	**15**	**0**	**0**	**0**	**8**	**5**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**32**	153
8:15 AM		**0**	**4**	**21**	**5**	**0**	**0**	**39**	**4**	**0**	**3**	**0**	**1**	**0**	**2**	**0**	**1**	**80**	198
8:30 AM		**0**	**2**	**18**	**1**	**1**	**0**	**27**	**6**	**0**	**2**	**0**	**2**	**0**	**3**	**0**	**5**	**67**	**224**
8:45 AM		0	3	14	0	0	1	4	1	0	2	0	0	0	5	0	3	33	212
Count Total		0	21	118	7	1	2	113	51	0	10	0	6	0	18	0	17	364	0
Peak Hour	**All**	**0**	**13**	**67**	**7**	**1**	**0**	**86**	**28**	**0**	**5**	**0**	**3**	**0**	**7**	**0**	**7**	**224**	**0**
	HV	**0**	**3**	**2**	**0**	**0**	**0**	**5**	**4**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**1**	**19**	**0**
	HV%	**-**	**23%**	**3%**	**0%**	**0%**	**-**	**6%**	**14%**	**-**	**0%**	**-**	**0%**	**-**	**57%**	**-**	**14%**	**8%**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	2	1	*3*
7:15 AM	0	0	0	0	*0*	0	0	0	0	*0*	1	0	8	0	*9*
7:30 AM	2	0	0	0	*2*	0	0	0	0	*0*	2	0	4	1	*7*
7:45 AM	**0**	**2**	**0**	**0**	***2***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:00 AM	**0**	**1**	**0**	**0**	***1***	**0**	**0**	**0**	**0**	***0***	**0**	**3**	**0**	**0**	*3*
8:15 AM	**3**	**4**	**0**	**1**	***8***	**0**	**0**	**0**	**0**	***0***	**0**	**22**	**0**	**4**	*26*
8:30 AM	**2**	**2**	**0**	**4**	***8***	**0**	**0**	**0**	**0**	***0***	**0**	**8**	**0**	**0**	***8***
8:45 AM	0	1	0	2	*3*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	7	10	0	7	*24*	0	0	0	0	*0*	3	33	14	6	*56*
Peak Hour	**5**	**9**	**0**	**5**	***19***	**0**	**0**	**0**	**0**	***0***	**0**	**33**	**0**	**4**	***37***

Two-Hour Count Summaries - Heavy Vehicles

Interval Start	172nd St E Eastbound				172nd St E Westbound				13th Ave E Northbound				West School Access Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	4
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	5
8:15 AM	**0**	**3**	**0**	**0**	**0**	**0**	**1**	**3**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**8**	13
8:30 AM	**0**	**0**	**2**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**1**	**8**	**19**
8:45 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	3	20
Count Total	0	3	4	0	0	1	5	4	0	0	0	0	0	6	0	1	24	0
Peak Hour	**0**	**3**	**2**	**0**	**0**	**0**	**5**	**4**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**1**	**19**	**0**

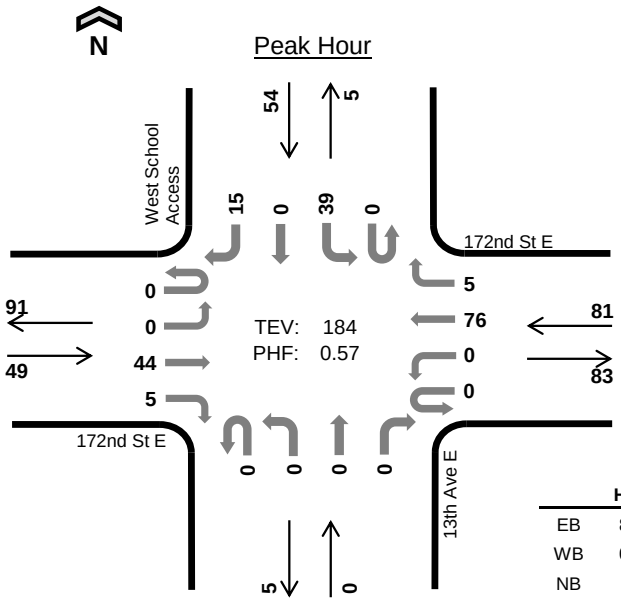
Two-Hour Count Summaries - Bikes

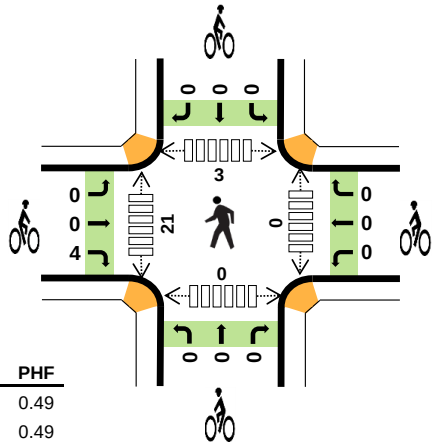
Interval Start	172nd St E Eastbound			172nd St E Westbound			13th Ave E Northbound			West School Access Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

West School Access
172nd St E

Date: 05/04/2023
Count Period: 2:30 PM to 4:30 PM
Peak Hour: 3:00 PM to 4:00 PM





	HV %:	PHF
EB	8.2%	0.49
WB	0.0%	0.49
NB	-	-
SB	14.8%	0.79
TOTAL	6.5%	0.57

Two-Hour Count Summaries

Interval Start		172nd St E Eastbound				172nd St E Westbound				13th Ave E Northbound				West School Access Southbound				15-min Total	Rolling One Hour
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
2:30 PM		0	0	14	2	0	0	7	5	0	0	0	0	0	6	0	0	34	0
2:45 PM		0	0	13	6	0	0	4	2	0	0	0	0	0	1	0	1	27	0
3:00 PM		**0**	**0**	**23**	**2**	**0**	**0**	**41**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**0**	**7**	**81**	0
3:15 PM		**0**	**0**	**3**	**2**	**0**	**0**	**10**	**2**	**0**	**0**	**0**	**0**	**0**	**8**	**0**	**2**	**27**	169
3:30 PM		**0**	**0**	**11**	**0**	**0**	**0**	**15**	**2**	**0**	**0**	**0**	**0**	**0**	**13**	**0**	**4**	**45**	180
3:45 PM		**0**	**0**	**7**	**1**	**0**	**0**	**10**	**1**	**0**	**0**	**0**	**0**	**0**	**10**	**0**	**2**	**31**	**184**
4:00 PM		0	0	14	1	0	0	8	0	0	0	0	0	0	3	0	4	30	133
4:15 PM		0	0	15	0	0	0	14	2	0	0	0	0	0	2	0	0	33	139
Count Total		0	0	100	14	0	0	109	14	0	0	0	0	0	51	0	20	308	0
Peak Hour	**All**	**0**	**0**	**44**	**5**	**0**	**0**	**76**	**5**	**0**	**0**	**0**	**0**	**0**	**39**	**0**	**15**	**184**	**0**
	HV	**0**	**0**	**1**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**2**	**12**	**0**
	HV%	**-**	**-**	**2%**	**60%**	**-**	**-**	**0%**	**0%**	**-**	**-**	**-**	**-**	**-**	**15%**	**-**	**13%**	**7%**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
2:30 PM	1	1	0	2	*4*	0	1	0	0	*1*	0	5	13	0	*18*
2:45 PM	4	0	0	0	*4*	0	2	0	0	*2*	0	1	1	0	*2*
3:00 PM	**2**	**0**	**0**	**7**	***9***	**3**	**0**	**0**	**0**	***3***	**0**	**21**	**1**	**0**	*22*
3:15 PM	**1**	**0**	**0**	**1**	***2***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
3:30 PM	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**0**	*1*
3:45 PM	**1**	**0**	**0**	**0**	***1***	**1**	**0**	**0**	**0**	***1***	**0**	**0**	**1**	**0**	***1***
4:00 PM	2	0	0	0	*2*	1	3	0	0	*4*	0	0	2	0	*2*
4:15 PM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	11	1	0	10	*22*	5	6	0	0	*11*	0	27	19	0	*46*
Peak Hour	**4**	**0**	**0**	**8**	***12***	**4**	**0**	**0**	**0**	***4***	**0**	**21**	**3**	**0**	***24***

Two-Hour Count Summaries - Heavy Vehicles

Interval Start	172nd St E Eastbound				172nd St E Westbound				13th Ave E Northbound				West School Access Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
2:30 PM	0	0	0	1	0	0	0	1	0	0	0	0	0	2	0	0	4	0
2:45 PM	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4	0
3:00 PM	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**2**	**9**	0
3:15 PM	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**2**	19
3:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	15
3:45 PM	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**12**
4:00 PM	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	5
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Count Total	0	0	3	8	0	0	0	1	0	0	0	0	0	8	0	2	22	0
Peak Hour	**0**	**0**	**1**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**2**	**12**	**0**

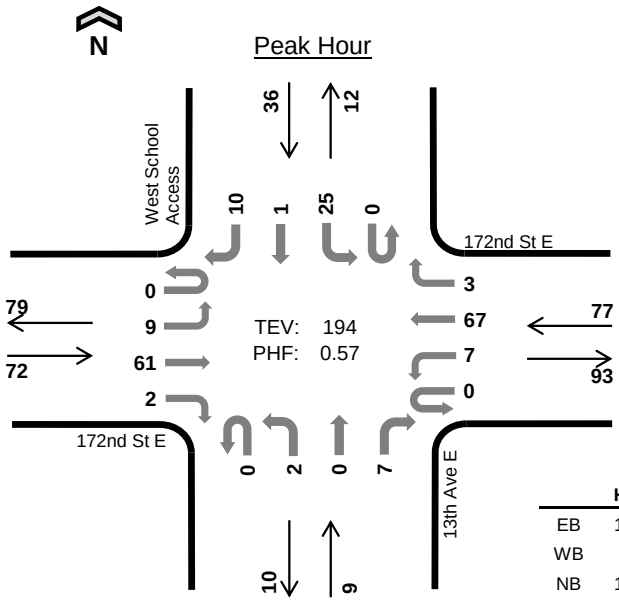
Two-Hour Count Summaries - Bikes

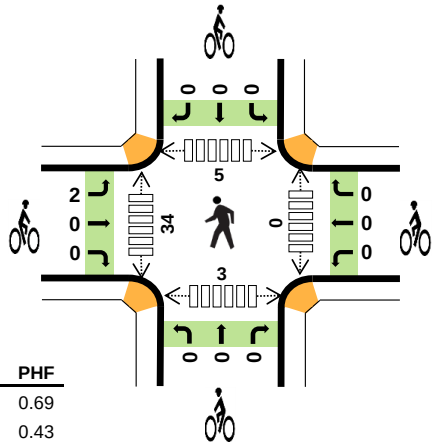
Interval Start	172nd St E Eastbound			172nd St E Westbound			13th Ave E Northbound			West School Access Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
2:30 PM	0	0	0	0	1	0	0	0	0	0	0	0	1	0
2:45 PM	0	0	0	0	2	0	0	0	0	0	0	0	2	0
3:00 PM	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	0
3:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	6
3:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	5
3:45 PM	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**4**
4:00 PM	0	1	0	0	3	0	0	0	0	0	0	0	4	5
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Count Total	0	1	4	0	6	0	0	0	0	0	0	0	11	0
Peak Hour	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

West School Access
172nd St E

Date: 05/09/2023
Count Period: 2:30 PM to 4:30 PM
Peak Hour: 2:45 PM to 3:45 PM





	HV %:	PHF
EB	12.5%	0.69
WB	2.6%	0.43
NB	11.1%	0.56
SB	19.4%	0.64
TOTAL	9.8%	0.57

Two-Hour Count Summaries

Interval Start		172nd St E Eastbound				172nd St E Westbound				13th Ave E Northbound				West School Access Southbound				15-min Total	Rolling One Hour
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
2:30 PM		0	1	10	0	0	2	8	3	0	0	0	0	0	0	0	0	24	0
2:45 PM		**0**	**5**	**19**	**2**	**0**	**3**	**5**	**0**	**0**	**1**	**0**	**3**	**0**	**1**	**0**	**0**	**39**	0
3:00 PM		**0**	**2**	**24**	**0**	**0**	**2**	**42**	**1**	**0**	**1**	**0**	**3**	**0**	**5**	**1**	**4**	**85**	0
3:15 PM		**0**	**1**	**11**	**0**	**0**	**1**	**9**	**1**	**0**	**0**	**0**	**0**	**0**	**9**	**0**	**2**	**34**	182
3:30 PM		**0**	**1**	**7**	**0**	**0**	**1**	**11**	**1**	**0**	**0**	**0**	**1**	**0**	**10**	**0**	**4**	**36**	**194**
3:45 PM		0	0	9	2	0	0	14	0	0	0	0	1	0	8	0	4	38	193
4:00 PM		0	0	21	1	0	1	13	1	0	1	0	2	0	9	0	3	52	160
4:15 PM		0	1	20	1	0	0	13	3	0	1	0	0	0	4	0	2	45	171
Count Total		0	11	121	6	0	10	115	10	0	4	0	10	0	46	1	19	353	0
Peak Hour	**All**	**0**	**9**	**61**	**2**	**0**	**7**	**67**	**3**	**0**	**2**	**0**	**7**	**0**	**25**	**1**	**10**	**194**	**0**
	HV	**0**	**5**	**3**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**5**	**0**	**2**	**19**	**0**
	HV%	**-**	**56%**	**5%**	**50%**	**-**	**0%**	**1%**	**33%**	**-**	**0%**	**-**	**14%**	**-**	**20%**	**0%**	**20%**	**10%**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
2:30 PM	0	0	0	0	*0*	0	1	0	0	*1*	1	6	9	1	*17*
2:45 PM	**5**	**1**	**0**	**1**	***7***	**0**	**0**	**0**	**0**	***0***	**0**	**4**	**4**	**1**	*9*
3:00 PM	**4**	**1**	**1**	**4**	***10***	**0**	**0**	**0**	**0**	***0***	**0**	**28**	**1**	**1**	*30*
3:15 PM	**0**	**0**	**0**	**2**	***2***	**0**	**0**	**0**	**0**	***0***	**0**	**2**	**0**	**0**	*2*
3:30 PM	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**0**	**0**	***2***	**0**	**0**	**0**	**1**	***1***
3:45 PM	0	0	0	0	*0*	0	0	0	2	*2*	0	0	0	3	*3*
4:00 PM	3	0	0	0	*3*	0	0	0	1	*1*	0	0	3	3	*6*
4:15 PM	0	2	0	0	*2*	0	0	0	0	*0*	0	0	0	1	*1*
Count Total	12	4	1	7	*24*	2	1	0	3	*6*	1	40	17	11	*69*
Peak Hour	**9**	**2**	**1**	**7**	***19***	**2**	**0**	**0**	**0**	***2***	**0**	**34**	**5**	**3**	***42***

Two-Hour Count Summaries - Heavy Vehicles

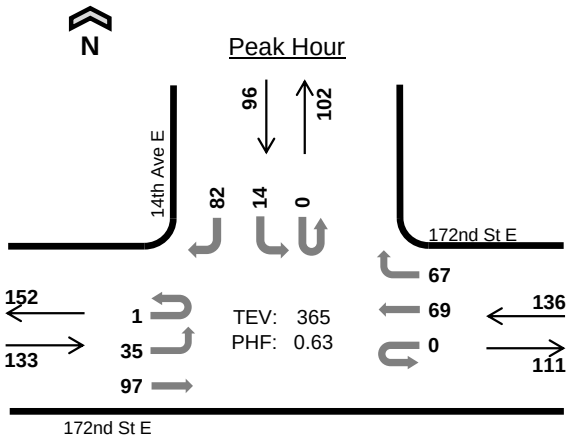
Interval Start	172nd St E Eastbound				172nd St E Westbound				13th Ave E Northbound				West School Access Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	**0**	**3**	**1**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**7**	0
3:00 PM	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**3**	**0**	**1**	**10**	0
3:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**2**	19
3:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**19**
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
4:00 PM	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5
4:15 PM	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	5
Count Total	0	5	6	1	0	0	3	1	0	0	0	1	0	5	0	2	24	0
Peak Hour	**0**	**5**	**3**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**5**	**0**	**2**	**19**	**0**

Two-Hour Count Summaries - Bikes

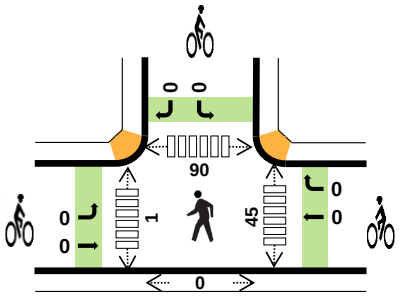
Interval Start	172nd St E Eastbound			172nd St E Westbound			13th Ave E Northbound			West School Access Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
2:30 PM	0	0	0	1	0	0	0	0	0	0	0	0	1	0
2:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
3:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
3:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
3:30 PM	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**2**
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	2	2	4
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	1	1	5
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Count Total	2	0	0	1	0	0	0	0	0	0	0	3	6	0
Peak Hour	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

14th Ave E
172nd St E



Date: 05/04/2023
Count Period: 7:00 AM to 9:00 AM
Peak Hour: 7:45 AM to 8:45 AM



	HV %:	PHF
EB	5.3%	0.67
WB	5.9%	0.71
NB	-	-
SB	0.0%	0.50
TOTAL	4.1%	0.63

Two-Hour Count Summaries

Interval Start		172nd St E Eastbound				172nd St E Westbound				0 Northbound				14th Ave E Southbound				15-min Total	Rolling One Hour
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	2	19	0	0	0	10	0	0	0	0	0	0	1	0	0	32	0
7:15 AM		0	1	30	0	0	0	18	1	0	0	0	0	0	0	0	0	50	0
7:30 AM		0	2	61	0	0	0	18	2	0	0	0	0	0	0	0	1	84	0
7:45 AM		**1**	**7**	**17**	**0**	**0**	**0**	**26**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**60**	226
8:00 AM		**0**	**9**	**12**	**0**	**0**	**0**	**20**	**10**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**52**	246
8:15 AM		**0**	**15**	**35**	**0**	**0**	**0**	**13**	**35**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**48**	**146**	342
8:30 AM		**0**	**4**	**33**	**0**	**0**	**0**	**10**	**14**	**0**	**0**	**0**	**0**	**0**	**14**	**0**	**32**	**107**	**365**
8:45 AM		0	1	23	0	0	0	6	0	0	0	0	0	0	1	0	1	32	337
Count Total		1	41	230	0	0	0	121	70	0	0	0	0	0	16	0	84	563	0
Peak Hour	**All**	**1**	**35**	**97**	**0**	**0**	**0**	**69**	**67**	**0**	**0**	**0**	**0**	**0**	**14**	**0**	**82**	**365**	**0**
	HV	**1**	**0**	**6**	**0**	**0**	**0**	**7**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**15**	**0**
	HV%	**100%**	**0%**	**6%**	**-**	**-**	**-**	**10%**	**1%**	**-**	**-**	**-**	**-**	**-**	**0%**	**-**	**0%**	**4%**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	1	0	0	1	*2*	0	1	0	0	*1*	0	0	0	0	*0*
7:15 AM	2	0	0	0	*2*	0	0	0	0	*0*	0	1	1	0	*2*
7:30 AM	4	1	0	0	*5*	0	0	0	0	*0*	3	1	0	0	*4*
7:45 AM	**1**	**3**	**0**	**0**	***4***	**0**	**0**	**0**	**0**	***0***	**1**	**1**	**0**	**0**	*2*
8:00 AM	**2**	**1**	**0**	**0**	***3***	**0**	**0**	**0**	**0**	***0***	**11**	**0**	**29**	**0**	*40*
8:15 AM	**1**	**3**	**0**	**0**	***4***	**0**	**0**	**0**	**0**	***0***	**27**	**0**	**54**	**0**	*81*
8:30 AM	**3**	**1**	**0**	**0**	***4***	**0**	**0**	**0**	**0**	***0***	**6**	**0**	**7**	**0**	***13***
8:45 AM	4	0	0	0	*4*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	18	9	0	1	*28*	0	1	0	0	*1*	48	3	91	0	*142*
Peak Hr	**7**	**8**	**0**	**0**	***15***	**0**	**0**	**0**	**0**	***0***	**45**	**1**	**90**	**0**	***136***

Two-Hour Count Summaries - Heavy Vehicles

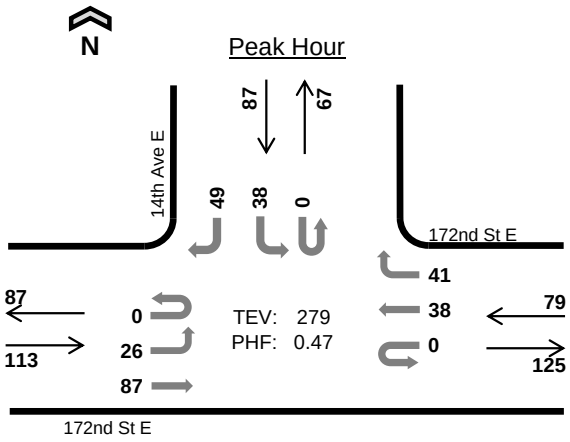
Interval Start	172nd St E Eastbound				172nd St E Westbound				0 Northbound				14th Ave E Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0
7:15 AM	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
7:30 AM	0	0	4	0	0	0	1	0	0	0	0	0	0	0	0	0	5	0
7:45 AM	**1**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	13
8:00 AM	**0**	**0**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	14
8:15 AM	**0**	**0**	**1**	**0**	**0**	**0**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	16
8:30 AM	**0**	**0**	**3**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**15**
8:45 AM	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4	15
Count Total	1	1	16	0	0	0	8	1	0	0	0	0	0	1	0	0	28	0
Peak Hour	**1**	**0**	**6**	**0**	**0**	**0**	**7**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**15**	**0**

Two-Hour Count Summaries - Bikes

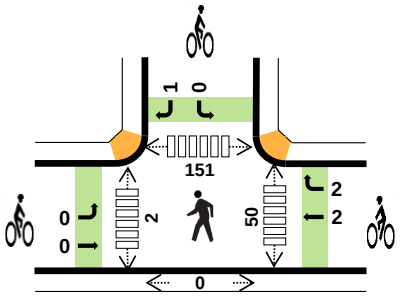
Interval Start	172nd St E Eastbound			172nd St E Westbound			0 Northbound			14th Ave E Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
7:00 AM	0	0	0	0	0	1	0	0	0	0	0	0	1	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	1
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	1	0	0	0	0	0	0	1	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

14th Ave E
172nd St E



Date: 05/04/2023
Count Period: 2:30 PM to 4:30 PM
Peak Hour: 2:45 PM to 3:45 PM



	HV %:	PHF
EB	6.2%	0.57
WB	1.3%	0.68
NB	-	-
SB	0.0%	0.29
TOTAL	2.9%	0.47

Two-Hour Count Summaries

Interval Start		172nd St E Eastbound				172nd St E Westbound				0 Northbound				14th Ave E Southbound				15-min Total	Rolling One Hour
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
2:30 PM		0	0	22	0	0	0	15	0	0	0	0	0	0	0	0	1	38	0
2:45 PM		**0**	**7**	**12**	**0**	**0**	**0**	**6**	**23**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**49**	0
3:00 PM		**0**	**16**	**34**	**0**	**0**	**0**	**5**	**18**	**0**	**0**	**0**	**0**	**0**	**30**	**0**	**45**	**148**	0
3:15 PM		**0**	**0**	**14**	**0**	**0**	**0**	**14**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**0**	**35**	270
3:30 PM		**0**	**3**	**27**	**0**	**0**	**0**	**13**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**3**	**47**	**279**
3:45 PM		0	0	25	0	0	0	7	0	0	0	0	0	0	1	0	1	34	264
4:00 PM		0	0	31	0	0	0	10	0	0	0	0	0	0	2	0	0	43	159
4:15 PM		0	0	28	0	0	0	19	0	0	0	0	0	0	3	0	0	50	174
Count Total		0	26	193	0	0	0	89	41	0	0	0	0	0	44	0	51	444	0
Peak Hour	**All**	**0**	**26**	**87**	**0**	**0**	**0**	**38**	**41**	**0**	**0**	**0**	**0**	**0**	**38**	**0**	**49**	**279**	**0**
	HV	**0**	**0**	**7**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**0**
	HV%	**-**	**0%**	**8%**	**-**	**-**	**-**	**3%**	**0%**	**-**	**-**	**-**	**-**	**-**	**0%**	**-**	**0%**	**3%**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
2:30 PM	1	0	0	0	*1*	0	1	0	0	*1*	3	2	6	0	*11*
2:45 PM	**1**	**0**	**0**	**0**	***1***	**0**	**2**	**0**	**0**	***2***	**50**	**2**	**150**	**0**	*202*
3:00 PM	**4**	**0**	**0**	**0**	***4***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**0**	*1*
3:15 PM	**2**	**1**	**0**	**0**	***3***	**0**	**1**	**0**	**0**	***1***	**0**	**0**	**0**	**0**	*0*
3:30 PM	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**0**	**1**	***2***	**0**	**0**	**0**	**0**	***0***
3:45 PM	1	0	0	0	*1*	0	0	0	0	*0*	1	0	2	0	*3*
4:00 PM	4	0	0	0	*4*	0	0	0	0	*0*	1	0	4	0	*5*
4:15 PM	1	0	0	0	*1*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	14	1	0	0	*15*	0	5	0	1	*6*	55	4	163	0	*222*
Peak Hr	**7**	**1**	**0**	**0**	***8***	**0**	**4**	**0**	**1**	***5***	**50**	**2**	**151**	**0**	***203***

Two-Hour Count Summaries - Heavy Vehicles

Interval Start	172nd St E Eastbound				172nd St E Westbound				0 Northbound				14th Ave E Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
2:30 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
2:45 PM	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	0
3:00 PM	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	0
3:15 PM	**0**	**0**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	9
3:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**8**
3:45 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8
4:00 PM	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4	8
4:15 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6
Count Total	0	0	14	0	0	0	1	0	0	0	0	0	0	0	0	0	15	0
Peak Hour	**0**	**0**	**7**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**0**

Two-Hour Count Summaries - Bikes

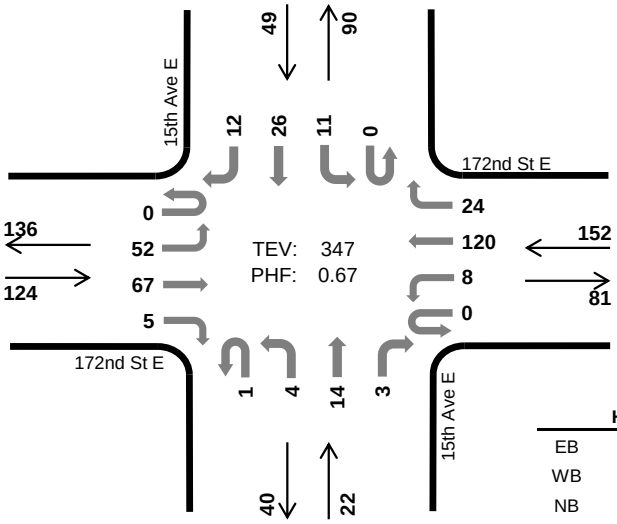
Interval Start	172nd St E Eastbound			172nd St E Westbound			0 Northbound			14th Ave E Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
2:30 PM	0	0	0	0	1	0	0	0	0	0	0	0	1	0
2:45 PM	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	0
3:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
3:15 PM	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	4
3:30 PM	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**5**
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	3
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Count Total	0	0	0	0	3	2	0	0	0	0	0	1	6	0
Peak Hour	**0**	**0**	**0**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**5**	**0**

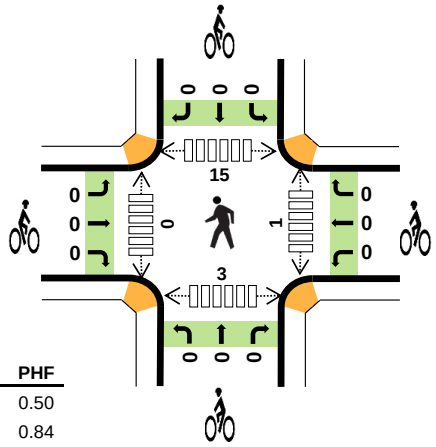
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

15th Ave E
172nd St E

Date: 05/04/2023
Count Period: 7:00 AM to 9:00 AM
Peak Hour: 7:30 AM to 8:30 AM

Peak Hour





	HV %:	PHF
EB	5.6%	0.50
WB	5.3%	0.84
NB	0.0%	0.42
SB	4.1%	0.64
TOTAL	4.9%	0.67

Two-Hour Count Summaries

Interval Start		172nd St E Eastbound				172nd St E Westbound				15th Ave E Northbound				15th Ave E Southbound				15-min Total	Rolling One Hour
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	1	17	2	0	2	9	0	0	0	0	1	0	2	9	0	43	0
7:15 AM		0	19	8	4	0	1	14	0	0	2	0	0	0	0	5	2	55	0
7:30 AM		**0**	**40**	**21**	**1**	**0**	**3**	**22**	**17**	**0**	**0**	**11**	**2**	**0**	**2**	**10**	**0**	**129**	0
7:45 AM		**0**	**7**	**9**	**0**	**0**	**3**	**29**	**4**	**0**	**0**	**3**	**0**	**0**	**5**	**11**	**3**	**74**	301
8:00 AM		**0**	**0**	**11**	**0**	**0**	**0**	**29**	**0**	**0**	**1**	**0**	**0**	**0**	**3**	**3**	**3**	**50**	308
8:15 AM		**0**	**5**	**26**	**4**	**0**	**2**	**40**	**3**	**1**	**3**	**0**	**1**	**0**	**1**	**2**	**6**	**94**	**347**
8:30 AM		0	5	39	2	0	0	20	1	0	0	0	1	0	1	3	0	72	290
8:45 AM		0	2	19	2	0	2	6	0	0	1	1	1	1	0	3	0	38	254
Count Total		0	79	150	15	0	13	169	25	1	7	15	6	1	14	46	14	555	0
Peak Hour	**All**	**0**	**52**	**67**	**5**	**0**	**8**	**120**	**24**	**1**	**4**	**14**	**3**	**0**	**11**	**26**	**12**	**347**	**0**
	HV	**0**	**3**	**4**	**0**	**0**	**1**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**17**	**0**
	HV%	**-**	**6%**	**6%**	**0%**	**-**	**13%**	**6%**	**0%**	**0%**	**0%**	**0%**	**0%**	**-**	**0%**	**4%**	**8%**	**5%**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	1	0	0	0	*1*	0	0	0	0	*0*	0	0	0	0	*0*
7:15 AM	2	0	0	0	*2*	0	0	0	0	*0*	0	0	2	0	*2*
7:30 AM	**4**	**1**	**0**	**0**	***5***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	*1*
7:45 AM	**0**	**4**	**0**	**0**	***4***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:00 AM	**2**	**1**	**0**	**1**	***4***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**8**	**0**	*8*
8:15 AM	**1**	**2**	**0**	**1**	***4***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**7**	**3**	***10***
8:30 AM	3	1	0	1	*5*	0	0	0	0	*0*	0	0	0	0	*0*
8:45 AM	4	0	0	0	*4*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	17	9	0	3	*29*	0	0	0	0	*0*	1	0	17	3	*21*
Peak Hour	**7**	**8**	**0**	**2**	***17***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**15**	**3**	***19***

Two-Hour Count Summaries - Heavy Vehicles

Interval Start	172nd St E Eastbound				172nd St E Westbound				15th Ave E Northbound				15th Ave E Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
7:15 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0
7:30 AM	**0**	**3**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**1**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	12
8:00 AM	**0**	**0**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**4**	15
8:15 AM	**0**	**0**	**1**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**4**	**17**
8:30 AM	0	0	3	0	0	0	1	0	0	0	0	0	0	1	0	0	5	17
8:45 AM	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4	17
Count Total	0	4	12	1	0	1	8	0	0	0	0	0	0	1	1	1	29	0
Peak Hour	**0**	**3**	**4**	**0**	**0**	**1**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**17**	**0**

Two-Hour Count Summaries - Bikes

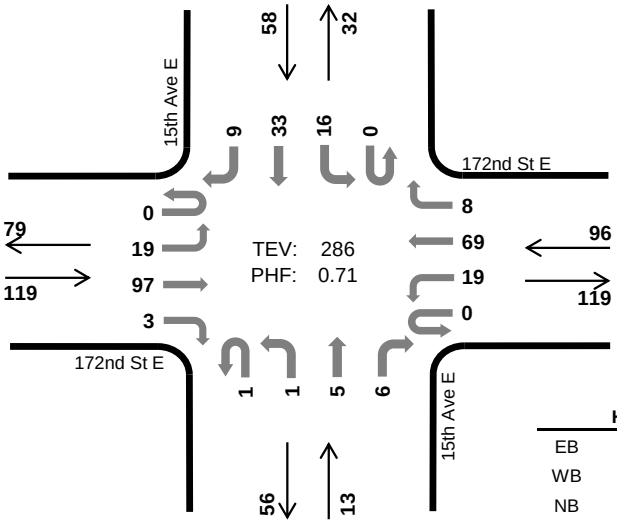
Interval Start	172nd St E Eastbound			172nd St E Westbound			15th Ave E Northbound			15th Ave E Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

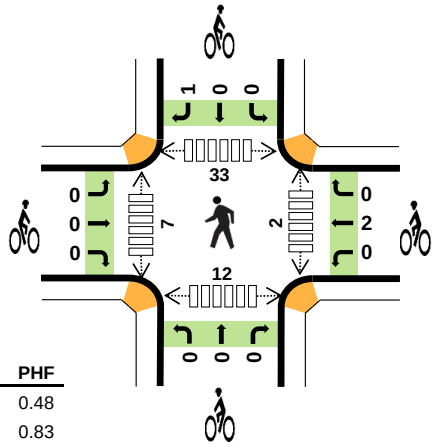
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

15th Ave E
172nd St E

Date: 05/04/2023
Count Period: 2:30 PM to 4:30 PM
Peak Hour: 2:30 PM to 3:30 PM

Peak Hour





	HV %:	PHF
EB	6.7%	0.48
WB	0.0%	0.83
NB	7.7%	0.65
SB	1.7%	0.40
TOTAL	3.5%	0.71

Two-Hour Count Summaries

Interval Start		172nd St E Eastbound				172nd St E Westbound				15th Ave E Northbound				15th Ave E Southbound				15-min Total	Rolling One Hour
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
2:30 PM		**0**	**8**	**13**	**0**	**0**	**8**	**13**	**3**	**0**	**0**	**0**	**1**	**0**	**9**	**20**	**7**	**82**	0
2:45 PM		**0**	**3**	**9**	**0**	**0**	**4**	**24**	**1**	**0**	**0**	**1**	**3**	**0**	**2**	**5**	**1**	**53**	0
3:00 PM		**0**	**4**	**55**	**3**	**0**	**3**	**20**	**3**	**1**	**0**	**2**	**2**	**0**	**4**	**4**	**0**	**101**	0
3:15 PM		**0**	**4**	**20**	**0**	**0**	**4**	**12**	**1**	**0**	**1**	**2**	**0**	**0**	**1**	**4**	**1**	**50**	**286**
3:30 PM		0	0	23	5	0	1	12	1	0	0	2	0	0	0	3	1	48	252
3:45 PM		0	2	19	5	0	3	8	1	0	0	0	1	0	0	3	0	42	241
4:00 PM		0	3	30	1	0	2	8	0	0	1	1	1	0	2	1	1	51	191
4:15 PM		0	4	26	1	0	1	18	1	0	0	2	0	0	3	0	1	57	198
Count Total		0	28	195	15	0	26	115	11	1	2	10	8	0	21	40	12	484	0
Peak Hour	**All**	**0**	**19**	**97**	**3**	**0**	**19**	**69**	**8**	**1**	**1**	**5**	**6**	**0**	**16**	**33**	**9**	**286**	**0**
	HV	**0**	**3**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**10**	**0**
	HV%	**-**	**16%**	**5%**	**0%**	**-**	**0%**	**0%**	**0%**	**0%**	**100%**	**0%**	**0%**	**-**	**6%**	**0%**	**0%**	**3%**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
2:30 PM	**1**	**0**	**0**	**0**	***1***	**0**	**1**	**0**	**0**	***1***	**2**	**5**	**0**	**0**	*7*
2:45 PM	**1**	**0**	**0**	**1**	***2***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**5**	**4**	*9*
3:00 PM	**4**	**0**	**0**	**0**	***4***	**0**	**1**	**0**	**0**	***1***	**0**	**2**	**28**	**8**	*38*
3:15 PM	**2**	**0**	**1**	**0**	***3***	**0**	**0**	**0**	**1**	***1***	**0**	**0**	**0**	**0**	***0***
3:30 PM	0	0	0	0	*0*	1	1	0	0	*2*	0	0	0	0	*0*
3:45 PM	1	1	0	0	*2*	0	1	0	0	*1*	0	0	0	1	*1*
4:00 PM	4	0	0	0	*4*	0	0	0	1	*1*	0	1	1	0	*2*
4:15 PM	1	0	0	0	*1*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	14	1	1	1	*17*	1	4	0	2	*7*	2	8	34	13	*57*
Peak Hour	**8**	**0**	**1**	**1**	***10***	**0**	**2**	**0**	**1**	***3***	**2**	**7**	**33**	**12**	***54***

Two-Hour Count Summaries - Heavy Vehicles

Interval Start	172nd St E Eastbound				172nd St E Westbound				15th Ave E Northbound				15th Ave E Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
2:30 PM	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	0
2:45 PM	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**2**	0
3:00 PM	**0**	**1**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	0
3:15 PM	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**10**
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
3:45 PM	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	2	9
4:00 PM	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4	9
4:15 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	7
Count Total	0	4	9	1	0	1	0	0	0	1	0	0	0	1	0	0	17	0
Peak Hour	**0**	**3**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**10**	**0**

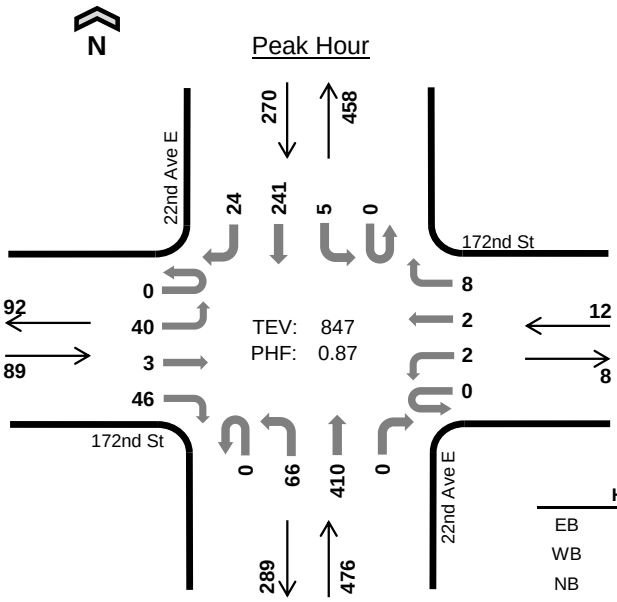
Two-Hour Count Summaries - Bikes

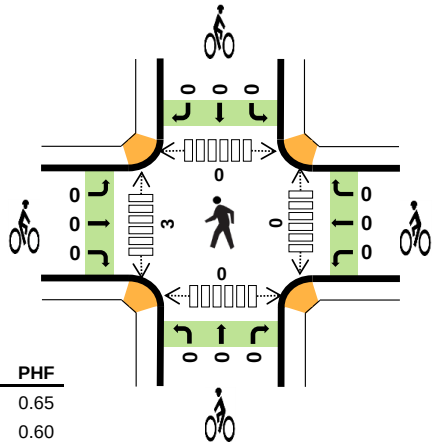
Interval Start	172nd St E Eastbound			172nd St E Westbound			15th Ave E Northbound			15th Ave E Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
2:30 PM	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	0
2:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
3:00 PM	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	0
3:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**3**
3:30 PM	0	1	0	0	1	0	0	0	0	0	0	0	2	4
3:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	1	5
4:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	1	5
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Count Total	0	1	0	0	4	0	0	0	0	0	1	1	7	0
Peak Hour	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**3**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

22nd Ave E
172nd St

Date: 05/09/2023
Count Period: 7:00 AM to 9:00 AM
Peak Hour: 7:00 AM to 8:00 AM





	HV %:	PHF
EB	6.7%	0.65
WB	0.0%	0.60
NB	3.8%	0.78
SB	7.0%	0.79
TOTAL	5.1%	0.87

Two-Hour Count Summaries

Interval Start		172nd St Eastbound				172nd St Westbound				22nd Ave E Northbound				22nd Ave E Southbound				15-min Total	Rolling One Hour
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		**0**	**11**	**0**	**11**	**0**	**0**	**0**	**1**	**0**	**11**	**102**	**0**	**0**	**1**	**58**	**2**	**197**	0
7:15 AM		**0**	**13**	**0**	**6**	**0**	**1**	**1**	**3**	**0**	**10**	**143**	**0**	**0**	**0**	**39**	**5**	**221**	0
7:30 AM		**0**	**9**	**2**	**23**	**0**	**0**	**1**	**2**	**0**	**25**	**101**	**0**	**0**	**3**	**69**	**8**	**243**	0
7:45 AM		**0**	**7**	**1**	**6**	**0**	**1**	**0**	**2**	**0**	**20**	**64**	**0**	**0**	**1**	**75**	**9**	**186**	**847**
8:00 AM		0	7	0	11	0	0	0	3	0	11	72	1	0	1	49	11	166	816
8:15 AM		0	9	2	17	0	2	0	0	0	21	73	0	0	1	48	9	182	777
8:30 AM		0	15	0	25	0	0	0	1	0	12	74	0	0	1	54	10	192	726
8:45 AM		0	10	0	17	0	0	0	5	0	1	71	0	0	0	38	5	147	687
Count Total		0	81	5	116	0	4	2	17	0	111	700	1	0	8	430	59	1,534	0
Peak Hour	**All**	**0**	**40**	**3**	**46**	**0**	**2**	**2**	**8**	**0**	**66**	**410**	**0**	**0**	**5**	**241**	**24**	**847**	**0**
	HV	**0**	**1**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**4**	**14**	**0**	**0**	**0**	**17**	**2**	**43**	**0**
	HV%	**-**	**3%**	**0%**	**11%**	**-**	**0%**	**0%**	**0%**	**-**	**6%**	**3%**	**-**	**-**	**0%**	**7%**	**8%**	**5%**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	**0**	**0**	**1**	**3**	***4***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:15 AM	**1**	**0**	**7**	**4**	***12***	**0**	**0**	**0**	**0**	***0***	**0**	**2**	**0**	**0**	*2*
7:30 AM	**5**	**0**	**6**	**4**	***15***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
7:45 AM	**0**	**0**	**4**	**8**	***12***	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**0**	**0**	***1***
8:00 AM	1	0	4	2	*7*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	1	0	4	4	*9*	0	0	0	0	*0*	1	0	1	0	*2*
8:30 AM	4	0	2	7	*13*	0	0	0	0	*0*	0	0	0	0	*0*
8:45 AM	2	0	3	6	*11*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	14	0	31	38	*83*	0	0	0	0	*0*	1	3	1	0	*5*
Peak Hour	**6**	**0**	**18**	**19**	***43***	**0**	**0**	**0**	**0**	***0***	**0**	**3**	**0**	**0**	***3***

Two-Hour Count Summaries - Heavy Vehicles

Interval Start	172nd St Eastbound				172nd St Westbound				22nd Ave E Northbound				22nd Ave E Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**3**	**0**	**4**	0
7:15 AM	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**4**	**0**	**12**	0
7:30 AM	**0**	**1**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**3**	**3**	**0**	**0**	**0**	**4**	**0**	**15**	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**3**	**0**	**0**	**0**	**6**	**2**	**12**	**43**
8:00 AM	0	1	0	0	0	0	0	0	0	0	4	0	0	0	2	0	7	46
8:15 AM	0	0	0	1	0	0	0	0	0	0	4	0	0	0	2	2	9	43
8:30 AM	0	0	0	4	0	0	0	0	0	0	2	0	0	0	6	1	13	41
8:45 AM	0	0	0	2	0	0	0	0	0	0	3	0	0	0	5	1	11	40
Count Total	0	2	0	12	0	0	0	0	0	4	27	0	0	0	32	6	83	0
Peak Hour	**0**	**1**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**4**	**14**	**0**	**0**	**0**	**17**	**2**	**43**	**0**

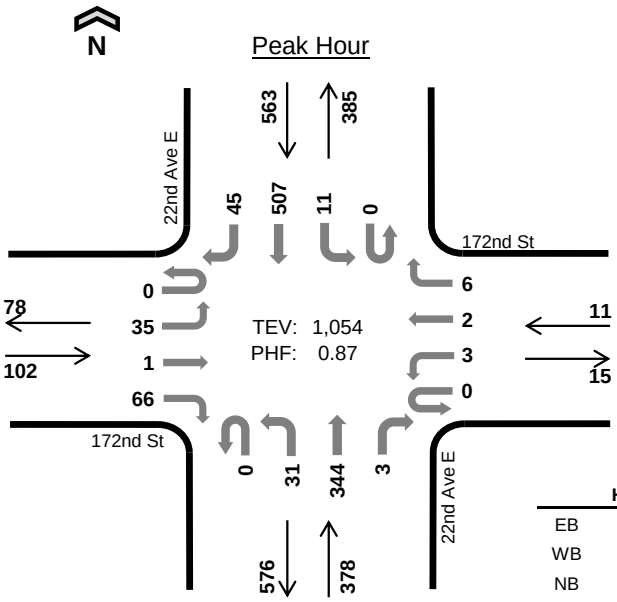
Two-Hour Count Summaries - Bikes

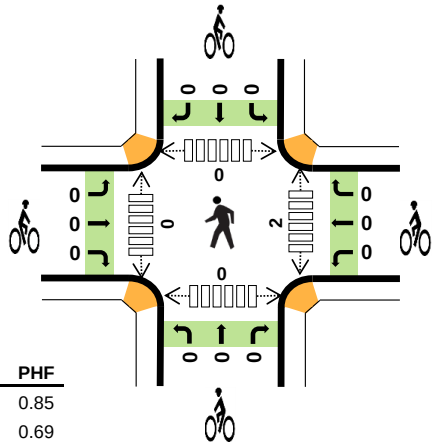
Interval Start	172nd St Eastbound			172nd St Westbound			22nd Ave E Northbound			22nd Ave E Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
7:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

22nd Ave E
172nd St

Date: 05/09/2023
Count Period: 2:30 PM to 4:30 PM
Peak Hour: 3:30 PM to 4:30 PM





	HV %:	PHF
EB	2.9%	0.85
WB	9.1%	0.69
NB	1.9%	0.91
SB	3.0%	0.85
TOTAL	2.7%	0.87

Two-Hour Count Summaries

Interval Start		172nd St Eastbound				172nd St Westbound				22nd Ave E Northbound				22nd Ave E Southbound				15-min Total	Rolling One Hour
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
2:30 PM		0	7	1	26	0	0	0	0	0	13	74	0	0	3	110	10	244	0
2:45 PM		0	6	0	8	0	0	0	0	0	12	78	0	0	1	101	7	213	0
3:00 PM		0	14	0	24	0	0	0	0	0	17	57	0	0	10	112	7	241	0
3:15 PM		0	10	1	18	0	3	0	1	0	9	64	0	0	2	99	7	214	912
3:30 PM		**0**	**4**	**0**	**18**	**0**	**1**	**0**	**3**	**0**	**12**	**84**	**1**	**0**	**2**	**113**	**8**	**246**	914
3:45 PM		**0**	**8**	**0**	**16**	**0**	**0**	**2**	**1**	**0**	**6**	**72**	**0**	**0**	**1**	**121**	**10**	**237**	938
4:00 PM		**0**	**12**	**1**	**17**	**0**	**1**	**0**	**1**	**0**	**5**	**97**	**2**	**0**	**3**	**144**	**19**	**302**	999
4:15 PM		**0**	**11**	**0**	**15**	**0**	**1**	**0**	**1**	**0**	**8**	**91**	**0**	**0**	**5**	**129**	**8**	**269**	**1,054**
Count Total		0	72	3	142	0	6	2	7	0	82	617	3	0	27	929	76	1,966	0
Peak Hour	**All**	**0**	**35**	**1**	**66**	**0**	**3**	**2**	**6**	**0**	**31**	**344**	**3**	**0**	**11**	**507**	**45**	**1,054**	**0**
	HV	**0**	**0**	**0**	**3**	**0**	**0**	**1**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**16**	**1**	**28**	**0**
	HV%	**-**	**0%**	**0%**	**5%**	**-**	**0%**	**50%**	**0%**	**-**	**0%**	**2%**	**0%**	**-**	**0%**	**3%**	**2%**	**3%**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
2:30 PM	1	0	2	9	*12*	0	0	0	0	*0*	0	0	0	0	*0*
2:45 PM	0	0	2	1	*3*	0	0	0	0	*0*	0	2	0	0	*2*
3:00 PM	2	0	4	3	*9*	0	0	0	0	*0*	0	0	0	0	*0*
3:15 PM	2	1	3	6	*12*	0	0	0	0	*0*	0	0	0	0	*0*
3:30 PM	**0**	**0**	**0**	**4**	***4***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
3:45 PM	**0**	**1**	**1**	**5**	***7***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:00 PM	**2**	**0**	**4**	**6**	***12***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:15 PM	**1**	**0**	**2**	**2**	***5***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**0**	**0**	***2***
Count Total	8	2	18	36	*64*	0	0	0	0	*0*	2	2	0	0	*4*
Peak Hour	**3**	**1**	**7**	**17**	***28***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**0**	**0**	***2***

Two-Hour Count Summaries - Heavy Vehicles

Interval Start	172nd St Eastbound				172nd St Westbound				22nd Ave E Northbound				22nd Ave E Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
2:30 PM	0	0	0	1	0	0	0	0	0	0	2	0	0	0	9	0	12	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	3	0
3:00 PM	0	1	0	1	0	0	0	0	0	0	4	0	0	0	3	0	9	0
3:15 PM	0	1	0	1	0	1	0	0	0	1	2	0	0	0	6	0	12	36
3:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**4**	28
3:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**5**	**0**	**7**	32
4:00 PM	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**5**	**1**	**12**	35
4:15 PM	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**2**	**0**	**5**	**28**
Count Total	0	2	0	6	0	1	1	0	0	1	17	0	0	0	34	2	64	0
Peak Hour	**0**	**0**	**0**	**3**	**0**	**0**	**1**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**16**	**1**	**28**	**0**

Two-Hour Count Summaries - Bikes

Interval Start	172nd St Eastbound			172nd St Westbound			22nd Ave E Northbound			22nd Ave E Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
3:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

APPENDIX B
Level of Service Definitions

Levels of service (LOS) are qualitative descriptions of traffic operating conditions. These levels of service are designated with letters ranging from LOS A, which is indicative of good operating conditions with little or no delay, to LOS F, which is indicative of stop-and-go conditions with frequent and lengthy delays. Levels of service for this analysis were developed using procedures presented in the *Highway Capacity Manual, Sixth Edition* (Transportation Research Board, 2016).

Unsignalized Intersections

For unsignalized intersections, level of service is based on the average delay per vehicle for each turning movement. The level of service for all-way stop or roundabout-controlled intersections is based upon the average delay for all vehicles that travel through the intersection. The level of service for a one- or two-way, stop-controlled intersection, delay is related to the availability of gaps in the main street's traffic flow, and the ability of a driver to enter or pass through those gaps. Table B-1 shows the level of service criteria for unsignalized intersections from the *Highway Capacity Manual, Sixth Edition*.

Table B-1. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay per Vehicle
A	0 – 10 seconds
B	> 10 – 15 seconds
C	> 15 – 25 seconds
D	> 25 – 35 seconds
E	> 35 – 50 seconds
F	> 50 seconds

Source: Transportation Research Board, Highway Capacity Manual, Exhibit 20.2, 2016.

APPENDIX C
Level of Service Calculation Sheets

Intersection												
Int Delay, s/veh	3.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	38	3	59	3	0	6	64	283	1	4	226	39
Future Vol, veh/h	38	3	59	3	0	6	64	283	1	4	226	39
Conflicting Peds, #/hr	1	0	0	0	0	1	1	0	1	1	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	63	63	75	75	75	93	93	93	79	79	79
Heavy Vehicles, %	3	0	8	0	0	0	2	5	0	0	7	13
Mvmt Flow	60	5	94	4	0	8	69	304	1	5	286	49

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	770	766	312	814	790	307	336	0	0	306	0	0
Stage 1	322	322	-	444	444	-	-	-	-	-	-	-
Stage 2	448	444	-	370	346	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.5	6.28	7.1	6.5	6.2	4.12	-	-	4.1	-	-
Critical Hdwy Stg 1	6.13	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4	3.372	3.5	4	3.3	2.218	-	-	2.2	-	-
Pot Cap-1 Maneuver	316	335	714	299	325	738	1223	-	-	1266	-	-
Stage 1	688	655	-	597	579	-	-	-	-	-	-	-
Stage 2	588	579	-	654	639	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	295	310	713	242	301	737	1222	-	-	1265	-	-
Mov Cap-2 Maneuver	295	310	-	242	301	-	-	-	-	-	-	-
Stage 1	641	651	-	556	539	-	-	-	-	-	-	-
Stage 2	542	539	-	561	635	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.2	13.5	1.5	0.1
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1222	-	-	452	438	1265	-	-
HCM Lane V/C Ratio	0.056	-	-	0.351	0.027	0.004	-	-
HCM Control Delay (s)	8.1	0	-	17.2	13.5	7.9	0	-
HCM Lane LOS	A	A	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	1.6	0.1	0	-	-

Intersection						
Int Delay, s/veh	4.9					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	36	97	69	67	14	82
Future Vol, veh/h	36	97	69	67	14	82
Conflicting Peds, #/hr	90	0	0	90	45	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	67	67	71	71	50	50
Heavy Vehicles, %	0	6	10	2	0	0
Mvmt Flow	54	145	97	94	28	164

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	281	0	-	0	532	235
Stage 1	-	-	-	-	234	-
Stage 2	-	-	-	-	298	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1293	-	-	-	512	809
Stage 1	-	-	-	-	810	-
Stage 2	-	-	-	-	758	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1196	-	-	-	417	748
Mov Cap-2 Maneuver	-	-	-	-	417	-
Stage 1	-	-	-	-	713	-
Stage 2	-	-	-	-	701	-

Approach	EB	WB	SB
HCM Control Delay, s	2.2	0	12.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1196	-	-	-	670
HCM Lane V/C Ratio	0.045	-	-	-	0.287
HCM Control Delay (s)	8.2	0	-	-	12.5
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	1.2

Intersection						
Int Delay, s/veh	1.5					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	13	74	91	28	7	7
Future Vol, veh/h	13	74	91	28	7	7
Conflicting Peds, #/hr	0	0	0	0	0	33
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	73	73	67	67	44	44
Heavy Vehicles, %	23	3	6	14	57	14
Mvmt Flow	18	101	136	42	16	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	178	0	-	0	294	190
Stage 1	-	-	-	-	157	-
Stage 2	-	-	-	-	137	-
Critical Hdwy	4.33	-	-	-	6.97	6.34
Critical Hdwy Stg 1	-	-	-	-	5.97	-
Critical Hdwy Stg 2	-	-	-	-	5.97	-
Follow-up Hdwy	2.407	-	-	-	4.013	3.426
Pot Cap-1 Maneuver	1281	-	-	-	595	822
Stage 1	-	-	-	-	754	-
Stage 2	-	-	-	-	771	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1281	-	-	-	586	799
Mov Cap-2 Maneuver	-	-	-	-	586	-
Stage 1	-	-	-	-	743	-
Stage 2	-	-	-	-	771	-

Approach	EB	WB	SB
HCM Control Delay, s	1.2	0	10.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1281	-	-	-	676
HCM Lane V/C Ratio	0.014	-	-	-	0.047
HCM Control Delay (s)	7.8	0	-	-	10.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	34	1	68	4	0	4	50	283	1	15	425	29
Future Vol, veh/h	34	1	68	4	0	4	50	283	1	15	425	29
Conflicting Peds, #/hr	2	0	0	0	0	2	2	0	0	0	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	68	68	68	50	50	50	86	86	86	91	91	91
Heavy Vehicles, %	6	0	3	25	0	0	2	3	0	0	3	3
Mvmt Flow	50	1	100	8	0	8	58	329	1	16	467	32

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	969	963	485	1012	979	332	501	0	0	330	0	0
Stage 1	517	517	-	446	446	-	-	-	-	-	-	-
Stage 2	452	446	-	566	533	-	-	-	-	-	-	-
Critical Hdwy	7.16	6.5	6.23	7.35	6.5	6.2	4.12	-	-	4.1	-	-
Critical Hdwy Stg 1	6.16	5.5	-	6.35	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.16	5.5	-	6.35	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.554	4	3.327	3.725	4	3.3	2.218	-	-	2.2	-	-
Pot Cap-1 Maneuver	229	258	580	198	252	714	1063	-	-	1241	-	-
Stage 1	534	537	-	549	577	-	-	-	-	-	-	-
Stage 2	579	577	-	471	528	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	211	236	579	153	230	713	1061	-	-	1241	-	-
Mov Cap-2 Maneuver	211	236	-	153	230	-	-	-	-	-	-	-
Stage 1	497	526	-	512	538	-	-	-	-	-	-	-
Stage 2	533	538	-	382	517	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	21.8	20.3	1.3	0.3
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1061	-	-	364	252	1241	-	-
HCM Lane V/C Ratio	0.055	-	-	0.416	0.063	0.013	-	-
HCM Control Delay (s)	8.6	0	-	21.8	20.3	7.9	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	2	0.2	0	-	-

Intersection						
Int Delay, s/veh	11.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	26	87	38	41	38	49
Future Vol, veh/h	26	87	38	41	38	49
Conflicting Peds, #/hr	151	0	0	151	50	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	57	57	68	68	29	29
Heavy Vehicles, %	0	8	3	0	0	0
Mvmt Flow	46	153	56	60	131	169

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	267	0	-	0	532	239
Stage 1	-	-	-	-	237	-
Stage 2	-	-	-	-	295	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1308	-	-	-	512	805
Stage 1	-	-	-	-	807	-
Stage 2	-	-	-	-	760	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1143	-	-	-	374	703
Mov Cap-2 Maneuver	-	-	-	-	374	-
Stage 1	-	-	-	-	675	-
Stage 2	-	-	-	-	664	-

Approach	EB	WB	SB
HCM Control Delay, s	1.9	0	21.8
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1143	-	-	-	508
HCM Lane V/C Ratio	0.04	-	-	-	0.591
HCM Control Delay (s)	8.3	0	-	-	21.8
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	3.8

Intersection						
Int Delay, s/veh	2.2					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	9	63	69	3	26	10
Future Vol, veh/h	9	63	69	3	26	10
Conflicting Peds, #/hr	5	0	0	5	0	34
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	69	69	43	43	64	64
Heavy Vehicles, %	56	6	1	33	19	20
Mvmt Flow	13	91	160	7	41	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	172	0	-	0	286	203
Stage 1	-	-	-	-	169	-
Stage 2	-	-	-	-	117	-
Critical Hdwy	4.66	-	-	-	6.59	6.4
Critical Hdwy Stg 1	-	-	-	-	5.59	-
Critical Hdwy Stg 2	-	-	-	-	5.59	-
Follow-up Hdwy	2.704	-	-	-	3.671	3.48
Pot Cap-1 Maneuver	1136	-	-	-	670	794
Stage 1	-	-	-	-	821	-
Stage 2	-	-	-	-	867	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1131	-	-	-	657	768
Mov Cap-2 Maneuver	-	-	-	-	657	-
Stage 1	-	-	-	-	808	-
Stage 2	-	-	-	-	864	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	10.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1131	-	-	-	684
HCM Lane V/C Ratio	0.012	-	-	-	0.082
HCM Control Delay (s)	8.2	0	-	-	10.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Intersection												
Int Delay, s/veh	3.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	47	3	73	3	0	7	97	320	1	5	256	59
Future Vol, veh/h	47	3	73	3	0	7	97	320	1	5	256	59
Conflicting Peds, #/hr	1	0	0	0	0	1	1	0	1	1	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	0	8	0	0	0	2	5	0	0	7	13
Mvmt Flow	51	3	79	3	0	8	105	348	1	5	278	64

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	885	881	311	921	913	351	343	0	0	350	0	0
Stage 1	321	321	-	560	560	-	-	-	-	-	-	-
Stage 2	564	560	-	361	353	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.5	6.28	7.1	6.5	6.2	4.12	-	-	4.1	-	-
Critical Hdwy Stg 1	6.13	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4	3.372	3.5	4	3.3	2.218	-	-	2.2	-	-
Pot Cap-1 Maneuver	265	288	715	253	276	697	1216	-	-	1220	-	-
Stage 1	689	655	-	516	514	-	-	-	-	-	-	-
Stage 2	509	514	-	662	634	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	239	255	714	204	245	696	1215	-	-	1219	-	-
Mov Cap-2 Maneuver	239	255	-	204	245	-	-	-	-	-	-	-
Stage 1	615	651	-	460	458	-	-	-	-	-	-	-
Stage 2	449	458	-	583	630	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	18.7	14.2	1.9	0.1
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1215	-	-	396	404	1219	-	-
HCM Lane V/C Ratio	0.087	-	-	0.338	0.027	0.004	-	-
HCM Control Delay (s)	8.2	0	-	18.7	14.2	8	0	-
HCM Lane LOS	A	A	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0.3	-	-	1.5	0.1	0	-	-

Intersection						
Int Delay, s/veh	4.9					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	58	114	90	107	25	146
Future Vol, veh/h	58	114	90	107	25	146
Conflicting Peds, #/hr	95	0	0	95	47	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	6	9	1	0	0
Mvmt Flow	63	124	98	116	27	159

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	309	0	-	0	548	252
Stage 1	-	-	-	-	251	-
Stage 2	-	-	-	-	297	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1263	-	-	-	501	792
Stage 1	-	-	-	-	795	-
Stage 2	-	-	-	-	758	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1163	-	-	-	400	729
Mov Cap-2 Maneuver	-	-	-	-	400	-
Stage 1	-	-	-	-	690	-
Stage 2	-	-	-	-	698	-

Approach	EB	WB	SB
HCM Control Delay, s	2.8	0	12.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1163	-	-	-	651
HCM Lane V/C Ratio	0.054	-	-	-	0.286
HCM Control Delay (s)	8.3	0	-	-	12.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	1.2

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	21	102	157	44	12	12
Future Vol, veh/h	21	102	157	44	12	12
Conflicting Peds, #/hr	0	0	0	0	0	35
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	14	2	3	9	33	8
Mvmt Flow	23	111	171	48	13	13

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	219	0	-	0	352	230
Stage 1	-	-	-	-	195	-
Stage 2	-	-	-	-	157	-
Critical Hdwy	4.24	-	-	-	6.73	6.28
Critical Hdwy Stg 1	-	-	-	-	5.73	-
Critical Hdwy Stg 2	-	-	-	-	5.73	-
Follow-up Hdwy	2.326	-	-	-	3.797	3.372
Pot Cap-1 Maneuver	1282	-	-	-	588	795
Stage 1	-	-	-	-	769	-
Stage 2	-	-	-	-	801	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1282	-	-	-	577	772
Mov Cap-2 Maneuver	-	-	-	-	577	-
Stage 1	-	-	-	-	754	-
Stage 2	-	-	-	-	801	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	0	10.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1282	-	-	-	660
HCM Lane V/C Ratio	0.018	-	-	-	0.04
HCM Control Delay (s)	7.9	0	-	-	10.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection												
Int Delay, s/veh	3.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	38	1	77	5	0	5	66	320	1	17	481	38
Future Vol, veh/h	38	1	77	5	0	5	66	320	1	17	481	38
Conflicting Peds, #/hr	2	0	0	0	0	2	2	0	0	0	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	6	0	3	25	0	0	2	3	0	0	3	3
Mvmt Flow	41	1	84	5	0	5	72	348	1	18	523	41

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1079	1075	546	1115	1095	351	566	0	0	349	0	0
Stage 1	582	582	-	493	493	-	-	-	-	-	-	-
Stage 2	497	493	-	622	602	-	-	-	-	-	-	-
Critical Hdwy	7.16	6.5	6.23	7.35	6.5	6.2	4.12	-	-	4.1	-	-
Critical Hdwy Stg 1	6.16	5.5	-	6.35	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.16	5.5	-	6.35	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.554	4	3.327	3.725	4	3.3	2.218	-	-	2.2	-	-
Pot Cap-1 Maneuver	193	221	536	167	215	697	1006	-	-	1221	-	-
Stage 1	492	502	-	517	550	-	-	-	-	-	-	-
Stage 2	548	550	-	438	492	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	175	196	535	129	191	696	1004	-	-	1221	-	-
Mov Cap-2 Maneuver	175	196	-	129	191	-	-	-	-	-	-	-
Stage 1	447	490	-	471	501	-	-	-	-	-	-	-
Stage 2	495	501	-	361	480	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	23.7	22.4	1.5	0.3
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1004	-	-	317	218	1221	-	-
HCM Lane V/C Ratio	0.071	-	-	0.398	0.05	0.015	-	-
HCM Control Delay (s)	8.9	0	-	23.7	22.4	8	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	1.8	0.2	0	-	-

Intersection						
Int Delay, s/veh	4.9					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	39	101	44	61	43	55
Future Vol, veh/h	39	101	44	61	43	55
Conflicting Peds, #/hr	159	0	0	159	53	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	8	3	0	0	0
Mvmt Flow	42	110	48	66	47	60

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	273	0	-	0	487	242
Stage 1	-	-	-	-	240	-
Stage 2	-	-	-	-	247	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1302	-	-	-	543	802
Stage 1	-	-	-	-	805	-
Stage 2	-	-	-	-	799	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1129	-	-	-	392	695
Mov Cap-2 Maneuver	-	-	-	-	392	-
Stage 1	-	-	-	-	670	-
Stage 2	-	-	-	-	693	-

Approach	EB	WB	SB
HCM Control Delay, s	2.3	0	13.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1129	-	-	-	519
HCM Lane V/C Ratio	0.038	-	-	-	0.205
HCM Control Delay (s)	8.3	0	-	-	13.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.8

Intersection						
Int Delay, s/veh	2.2					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	13	88	78	4	29	11
Future Vol, veh/h	13	88	78	4	29	11
Conflicting Peds, #/hr	5	0	0	5	0	36
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	38	5	1	25	17	18
Mvmt Flow	14	96	85	4	32	12

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	94	0	-	0	216	128
Stage 1	-	-	-	-	92	-
Stage 2	-	-	-	-	124	-
Critical Hdwy	4.48	-	-	-	6.57	6.38
Critical Hdwy Stg 1	-	-	-	-	5.57	-
Critical Hdwy Stg 2	-	-	-	-	5.57	-
Follow-up Hdwy	2.542	-	-	-	3.653	3.462
Pot Cap-1 Maneuver	1302	-	-	-	740	881
Stage 1	-	-	-	-	895	-
Stage 2	-	-	-	-	866	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1297	-	-	-	726	851
Mov Cap-2 Maneuver	-	-	-	-	726	-
Stage 1	-	-	-	-	882	-
Stage 2	-	-	-	-	863	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	10
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1297	-	-	-	757
HCM Lane V/C Ratio	0.011	-	-	-	0.057
HCM Control Delay (s)	7.8	0	-	-	10
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection												
Int Delay, s/veh	4.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	50	3	78	3	0	7	118	320	1	5	256	72
Future Vol, veh/h	50	3	78	3	0	7	118	320	1	5	256	72
Conflicting Peds, #/hr	1	0	0	0	0	1	1	0	1	1	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	0	8	0	0	0	2	5	0	0	7	13
Mvmt Flow	54	3	85	3	0	8	128	348	1	5	278	78

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	938	934	318	977	973	351	357	0	0	350	0	0
Stage 1	328	328	-	606	606	-	-	-	-	-	-	-
Stage 2	610	606	-	371	367	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.5	6.28	7.1	6.5	6.2	4.12	-	-	4.1	-	-
Critical Hdwy Stg 1	6.13	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4	3.372	3.5	4	3.3	2.218	-	-	2.2	-	-
Pot Cap-1 Maneuver	243	268	709	232	254	697	1202	-	-	1220	-	-
Stage 1	683	651	-	487	490	-	-	-	-	-	-	-
Stage 2	480	490	-	653	626	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	215	231	708	181	219	696	1201	-	-	1219	-	-
Mov Cap-2 Maneuver	215	231	-	181	219	-	-	-	-	-	-	-
Stage 1	592	647	-	422	425	-	-	-	-	-	-	-
Stage 2	412	425	-	569	622	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	20.8	14.9	2.2	0.1
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1201	-	-	368	375	1219	-	-
HCM Lane V/C Ratio	0.107	-	-	0.387	0.029	0.004	-	-
HCM Control Delay (s)	8.4	0	-	20.8	14.9	8	0	-
HCM Lane LOS	A	A	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0.4	-	-	1.8	0.1	0	-	-

Intersection						
Int Delay, s/veh	6.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	73	117	101	135	32	185
Future Vol, veh/h	73	117	101	135	32	185
Conflicting Peds, #/hr	120	0	0	120	59	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	6	9	1	0	0
Mvmt Flow	79	127	110	147	35	201

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	377	0	-	0	648	305
Stage 1	-	-	-	-	304	-
Stage 2	-	-	-	-	344	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1193	-	-	-	438	740
Stage 1	-	-	-	-	753	-
Stage 2	-	-	-	-	722	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1074	-	-	-	327	665
Mov Cap-2 Maneuver	-	-	-	-	327	-
Stage 1	-	-	-	-	624	-
Stage 2	-	-	-	-	650	-

Approach	EB	WB	SB
HCM Control Delay, s	3.3	0	15.5
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1074	-	-	-	577
HCM Lane V/C Ratio	0.074	-	-	-	0.409
HCM Control Delay (s)	8.6	0	-	-	15.5
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.2	-	-	-	2

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	26	113	194	55	15	15
Future Vol, veh/h	26	113	194	55	15	15
Conflicting Peds, #/hr	0	0	0	0	0	44
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	11	2	3	7	27	7
Mvmt Flow	28	123	211	60	16	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	271	0	-	0	420	285
Stage 1	-	-	-	-	241	-
Stage 2	-	-	-	-	179	-
Critical Hdwy	4.21	-	-	-	6.67	6.27
Critical Hdwy Stg 1	-	-	-	-	5.67	-
Critical Hdwy Stg 2	-	-	-	-	5.67	-
Follow-up Hdwy	2.299	-	-	-	3.743	3.363
Pot Cap-1 Maneuver	1242	-	-	-	545	742
Stage 1	-	-	-	-	744	-
Stage 2	-	-	-	-	795	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1242	-	-	-	532	715
Mov Cap-2 Maneuver	-	-	-	-	532	-
Stage 1	-	-	-	-	726	-
Stage 2	-	-	-	-	795	-

Approach	EB	WB	SB
HCM Control Delay, s	1.5	0	11.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1242	-	-	-	610
HCM Lane V/C Ratio	0.023	-	-	-	0.053
HCM Control Delay (s)	8	0	-	-	11.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2

Intersection												
Int Delay, s/veh	4.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	43	1	86	5	0	5	76	320	1	17	481	44
Future Vol, veh/h	43	1	86	5	0	5	76	320	1	17	481	44
Conflicting Peds, #/hr	2	0	0	0	0	2	2	0	0	0	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	6	0	3	25	0	0	2	3	0	0	3	3
Mvmt Flow	47	1	93	5	0	5	83	348	1	18	523	48

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1104	1100	549	1145	1124	351	573	0	0	349	0	0
Stage 1	585	585	-	515	515	-	-	-	-	-	-	-
Stage 2	519	515	-	630	609	-	-	-	-	-	-	-
Critical Hdwy	7.16	6.5	6.23	7.35	6.5	6.2	4.12	-	-	4.1	-	-
Critical Hdwy Stg 1	6.16	5.5	-	6.35	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.16	5.5	-	6.35	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.554	4	3.327	3.725	4	3.3	2.218	-	-	2.2	-	-
Pot Cap-1 Maneuver	185	214	534	159	207	697	1000	-	-	1221	-	-
Stage 1	490	501	-	503	538	-	-	-	-	-	-	-
Stage 2	533	538	-	433	488	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	166	187	533	118	181	696	998	-	-	1221	-	-
Mov Cap-2 Maneuver	166	187	-	118	181	-	-	-	-	-	-	-
Stage 1	439	489	-	451	483	-	-	-	-	-	-	-
Stage 2	474	483	-	348	476	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	26.6	23.8	1.7	0.3
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	998	-	-	305	202	1221	-	-
HCM Lane V/C Ratio	0.083	-	-	0.463	0.054	0.015	-	-
HCM Control Delay (s)	8.9	0	-	26.6	23.8	8	0	-
HCM Lane LOS	A	A	-	D	C	A	A	-
HCM 95th %tile Q(veh)	0.3	-	-	2.3	0.2	0	-	-

Intersection						
Int Delay, s/veh	5.6					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	49	107	45	77	54	69
Future Vol, veh/h	49	107	45	77	54	69
Conflicting Peds, #/hr	159	0	0	159	53	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	8	3	0	0	0
Mvmt Flow	53	116	49	84	59	75

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	292	0	-	0	525	252
Stage 1	-	-	-	-	250	-
Stage 2	-	-	-	-	275	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1281	-	-	-	516	792
Stage 1	-	-	-	-	796	-
Stage 2	-	-	-	-	776	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1111	-	-	-	368	686
Mov Cap-2 Maneuver	-	-	-	-	368	-
Stage 1	-	-	-	-	655	-
Stage 2	-	-	-	-	673	-

Approach	EB	WB	SB
HCM Control Delay, s	2.6	0	14.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1111	-	-	-	497
HCM Lane V/C Ratio	0.048	-	-	-	0.269
HCM Control Delay (s)	8.4	0	-	-	14.9
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	1.1

Intersection						
Int Delay, s/veh	2.5					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	17	92	91	5	36	14
Future Vol, veh/h	17	92	91	5	36	14
Conflicting Peds, #/hr	5	0	0	5	0	36
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	29	5	1	20	14	14
Mvmt Flow	18	100	99	5	39	15

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	109	0	-	0	243	143
Stage 1	-	-	-	-	107	-
Stage 2	-	-	-	-	136	-
Critical Hdwy	4.39	-	-	-	6.54	6.34
Critical Hdwy Stg 1	-	-	-	-	5.54	-
Critical Hdwy Stg 2	-	-	-	-	5.54	-
Follow-up Hdwy	2.461	-	-	-	3.626	3.426
Pot Cap-1 Maneuver	1329	-	-	-	720	874
Stage 1	-	-	-	-	888	-
Stage 2	-	-	-	-	862	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1323	-	-	-	704	844
Mov Cap-2 Maneuver	-	-	-	-	704	-
Stage 1	-	-	-	-	872	-
Stage 2	-	-	-	-	859	-

Approach	EB	WB	SB
HCM Control Delay, s	1.2	0	10.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1323	-	-	-	738
HCM Lane V/C Ratio	0.014	-	-	-	0.074
HCM Control Delay (s)	7.8	0	-	-	10.3
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

APPENDIX D
Turn Lane Storage Charts

Left-Turn Lane Warrant Analysis (HRR 211)

Evergreen Elementary - Consolidated Access (west + 14th) on 172nd Street E			
T Intersection			
Afternoon	**Morning**	**Morning**	**Afternoon**
66	99 ↑	↑ 190	82
72	102 →	← 46	40
5	**3**		

Left Turning Buses *

T Intersection	**V_a**	**V_o**	**L% of V_a**	**Average** Turn Time (seconds)**	**Average*** Headway (seconds)**
Morning	201	236	49%	3.15	5.21
Afternoon	138	122	48%	3.38	5.53

** Number of school buses included in the above left- and right-turn volumes for each hour.*
*** Weighted average times for making left turns; 3 seconds for autos; 8 seconds for buses.*
**** Weighted average critical headways; 5 seconds for autos; 12 seconds for buses.*

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

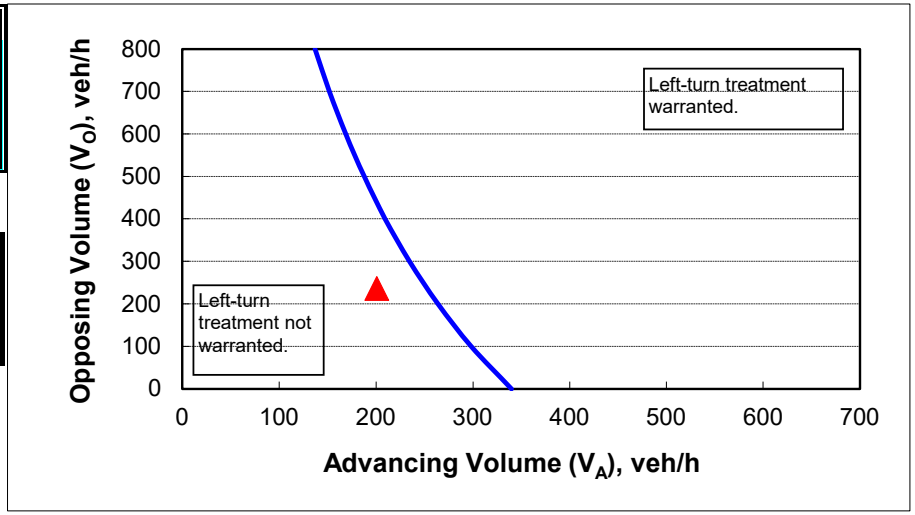
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	40
Percent of left-turns in advancing volume (V_A), %:	49%
Advancing volume (V_A), veh/h:	201
Opposing volume (V_O), veh/h:	236

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	253
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.2
Critical headway, s:	5.2
Average time for left-turn vehicle to clear the advancing lane , s:	1.9

2028 W-Project - Morning Peak
Assumed Consolidated Access on 172nd St E

heffron transportation inc

INPUT			COMPUTATIONS		
Speed:	40	mph	rho	0.020	
LT_percent:	49%		f =	0.79	
			Time_tw	1.0	s
Volume_Vo:	236	veh/h	serv_rate:	965	veh/h
			Volume_Va:	253	veh/h

Vo	Time_tw
0	0.0
100	0.4
200	0.8
300	1.3
400	1.8
500	2.4
600	3.1
700	3.8
800	4.6

Vo	Serv_rate
0	1142
100	1064
200	991
300	922
400	857
500	796
600	739
700	686
800	636

Time_t1:	3.2	s
CriticalGap_Gc	5.2	s
Time_te:	1.9	s

% LT veh.	49%	10%	15%	20%	40%
Vo	V_A	V_A	V_A	V_A	V_A
0	340	566	476	425	347
100	298	497	418	373	304
200	264	440	369	330	269
300	235	391	328	293	239
400	210	349	293	262	214
500	188	313	263	235	192
600	169	281	236	211	172
700	152	253	213	190	155
800	137	228	192	171	140

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

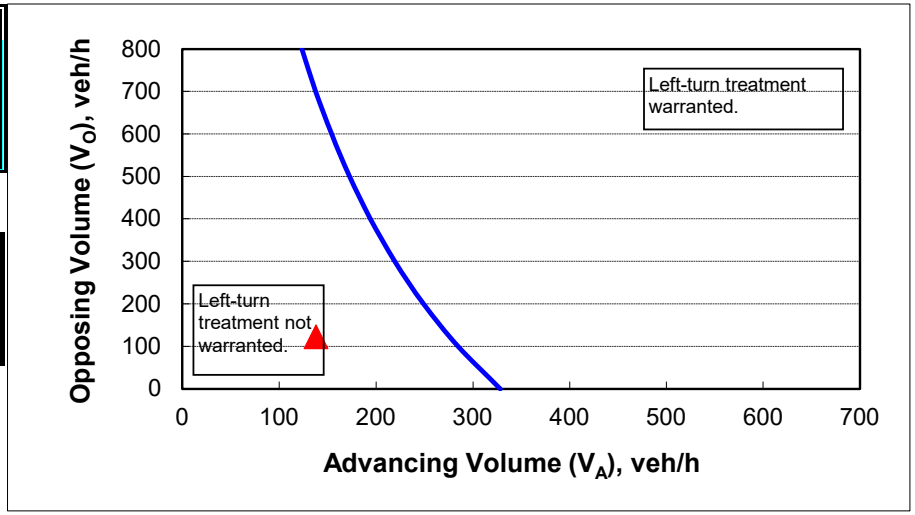
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	40
Percent of left-turns in advancing volume (V_A), %:	48%
Advancing volume (V_A), veh/h:	138
Opposing volume (V_O), veh/h:	122

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	276
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.4
Critical headway, s:	5.5
Average time for left-turn vehicle to clear the advancing lane , s:	1.9

2028 W-Project - Afternoon Peak
Assumed Consolidated Access on 172nd St E

heffron transportation inc

INPUT			COMPUTATIONS		
Speed:	40	mph	rho	0.020	
LT_percent:	48%		f =	0.79	
			Time_tw	0.6	s
Volume_Vo:	122	veh/h	serv_rate:	972	veh/h
			Volume_Va:	276	veh/h

Vo	Time_tw
0	0.0
100	0.4
200	0.9
300	1.5
400	2.1
500	2.8
600	3.6
700	4.4
800	5.3

Vo	Serv_rate
0	1065
100	989
200	917
300	849
400	786
500	728
600	673
700	622
800	574

Time_t1:	3.4	s
CriticalGap_Gc	5.5	s
Time_te:	1.9	s

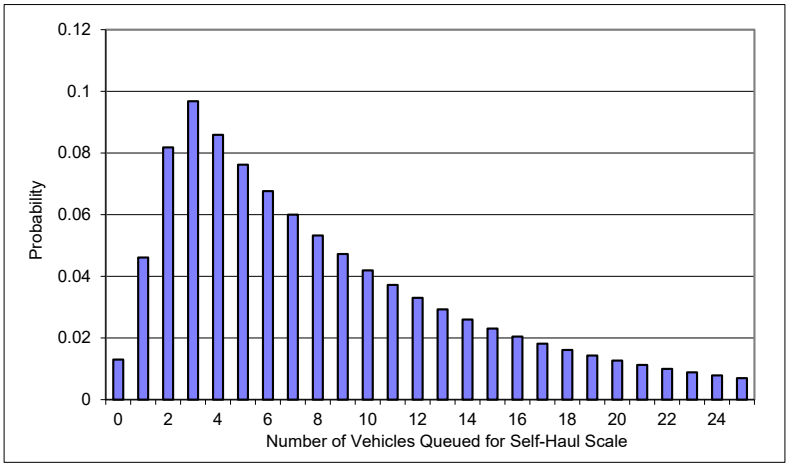
% LT veh.	48%	10%	15%	20%	40%
Vo	V_A	V_A	V_A	V_A	V_A
0	328	547	459	410	335
100	285	474	398	355	290
200	249	415	348	311	254
300	219	365	307	274	224
400	194	324	272	243	198
500	173	288	242	216	176
600	154	257	216	192	157
700	138	229	193	172	140
800	123	205	173	154	126

APPENDIX E
On-Site Queue Model Calculations

M/M/s Queueing Model for BSD's Evergreen Elementary Load/Unload Zone

Morning Peak Hour (Arrival)

Data		
λ =	387.2	(average arrival rate)
μ =	109.1	(average service rate)
s =	4	(# servers)



where:

L = average number of vehicles queued at the load/unload zone at any one time

L_q=average number of vehicles in queue

W = average wait time at the load/unload zone (hours)

W_q = ave. wait time in queue (hours)

ρ = Load/Unload Zone utilization

P_0 = probability of 0 vehicles at the Load/Unload Zone

P_1 = probability of 1 vehicle at the Load/Unload Zone, etc.

10 =Average number of vehicles at the load/unload zone at any one time

26 =Peak (95th-percentile) number of vehicles in load/unload zone at any one time

95.1% <= Closest probability to 95%

Results			
L =	9.553078225		
L_q =	6.003744891		
		Minutes	
W =	0.025	1.5	
W_q =	0.016	0.9	
ρ =	0.887333333		
		Prob < x vehicles	
P_0 =	0.012988243	1.3%	0
P_1 =	0.046099605	5.9%	1
P_2 =	0.081811432	14.1%	2
P_3 =	0.096792014	23.8%	3
P_4 =	0.085886781	32.4%	4
P_5 =	0.076210203	40.0%	5
P_6 =	0.067623854	46.7%	6
P_7 =	0.0600049	52.7%	7
P_8 =	0.053244348	58.1%	8
P_9 =	0.047245484	62.8%	9
P_{10} =	0.041922493	67.0%	10
P_{11} =	0.037199226	70.7%	11
P_{12} =	0.033008113	74.0%	12
P_{13} =	0.029289199	76.9%	13
P_{14} =	0.025989282	79.5%	14
P_{15} =	0.023061157	81.8%	15
P_{16} =	0.020462933	83.9%	16
P_{17} =	0.018157443	85.7%	17
P_{18} =	0.016111704	87.3%	18
P_{19} =	0.014296452	88.7%	19
P_{20} =	0.012685718	90.0%	20
P_{21} =	0.011256461	91.1%	21
P_{22} =	0.009988233	92.1%	22
P_{23} =	0.008862892	93.0%	23
P_{24} =	0.007864339	93.8%	24
P_{25} =	0.006978291	94.5%	25
P_{25} =	0.00619207	95.1%	26
P_{26} =	0.00549443	95.7%	27
P_{27} =	0.004875391	96.2%	28
P_{28} =	0.004326097	96.6%	29
P_{29} =	0.00383869	97.0%	30
P_{30} =	0.003406198	97.3%	31
P_{31} =	0.003022433	97.6%	32
P_{32} =	0.002681905	97.9%	33
P_{33} =	0.002379744	98.1%	34
P_{34} =	0.002111626	98.3%	35
P_{35} =	0.001873716	98.5%	36
P_{36} =	0.001662611	98.7%	37
P_{37} =	0.00147529	98.8%	38
P_{38} =	0.001309074	99.0%	39
P_{39} =	0.001161585	99.1%	40
P_{40} =	0.001030713	99.2%	41